phn
NORTH WESTERN MELBOURNE
An Australian Government Initiative

Diabetes Update – Same diagnosis, different decisions: personalised diabetes care across age, ethnicity and risk

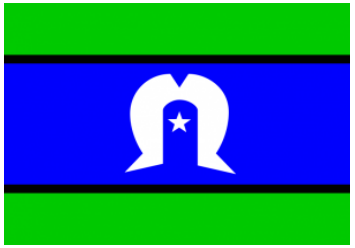
Thursday 20th November 2025

The content in this session is valid at date of presentation

Acknowledgement of Country

North Western Melbourne Primary Health Network and Western Health would like to acknowledge the Traditional Custodians of the land on which our work takes place, The Wurundjeri Woi Wurrung People, The Boon Wurrung People and The Wathaurong People.

We pay respects to Elders past, present and emerging as well as pay respects to any Aboriginal and Torres Strait Islander people in the session with us today.



Housekeeping – Zoom Webinar

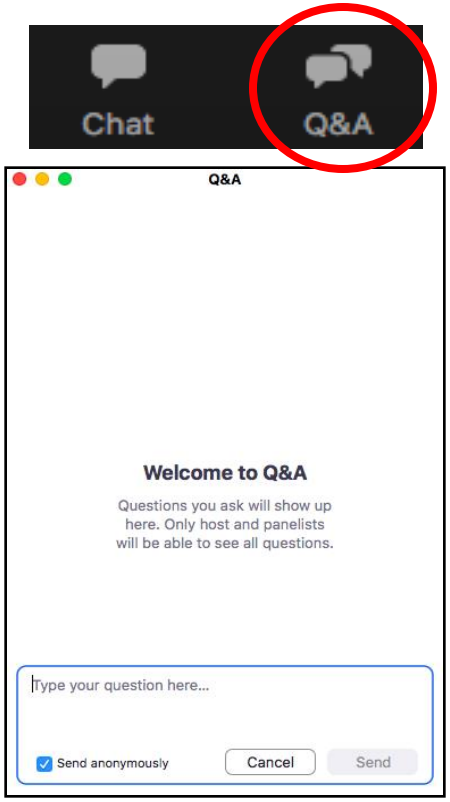
All attendees are muted

Please ask questions via the Q&A box only

Q&A will be at the end of the presentation

This session is being recorded, you will receive a link to this recording and copy of slides in post session correspondence.

Questions will be asked anonymously to protect your privacy

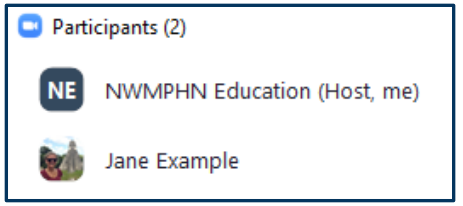


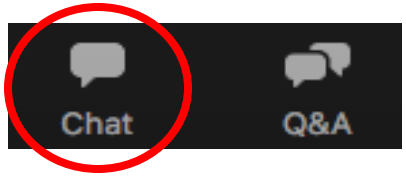
Housekeeping – Zoom Webinar

Please ensure you have joined the session using the same name as your event registration (or phone number, if you have dialled in)

NWMPHN uses Zoom's participant list to mark attendance and certificates and CPD will not be issued if we cannot confirm your attendance.

If you are not sure if your name matches, please send a Chat message to 'NWMPHN Education' to identify yourself.





HealthPathways Melbourne

Diabetes Update – Same diagnosis, different decisions: personalised diabetes care across age, ethnicity and risk

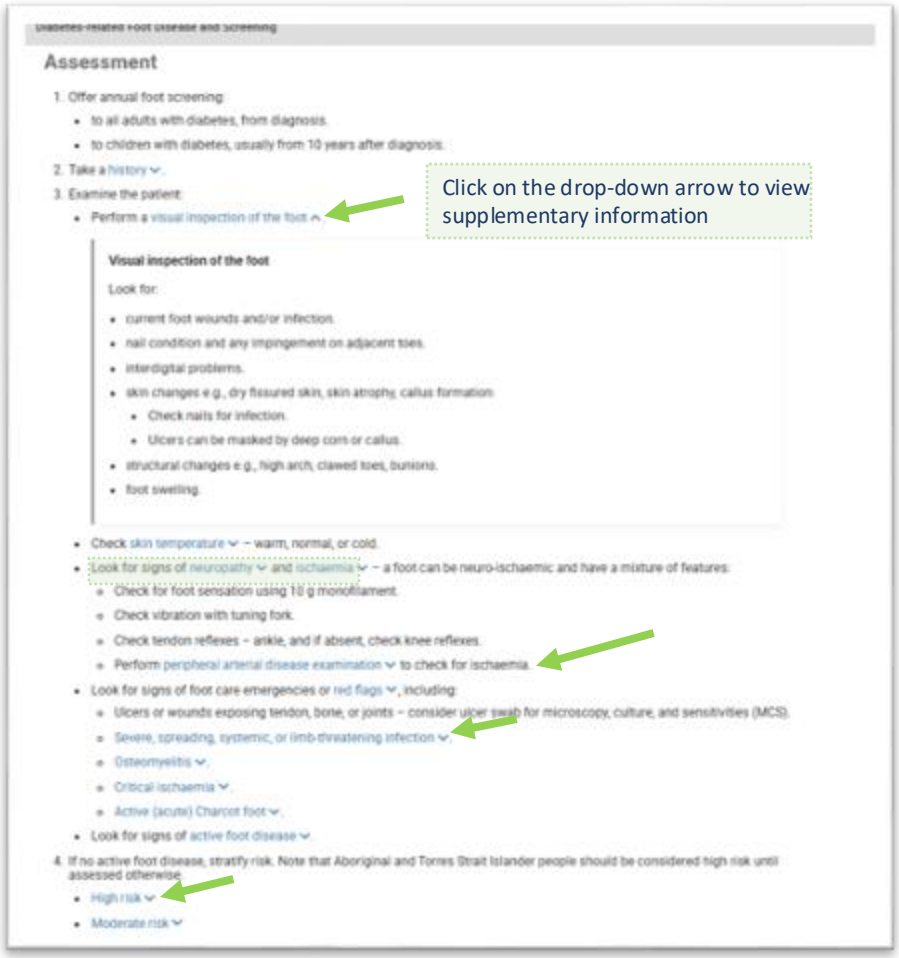
20 November 2025

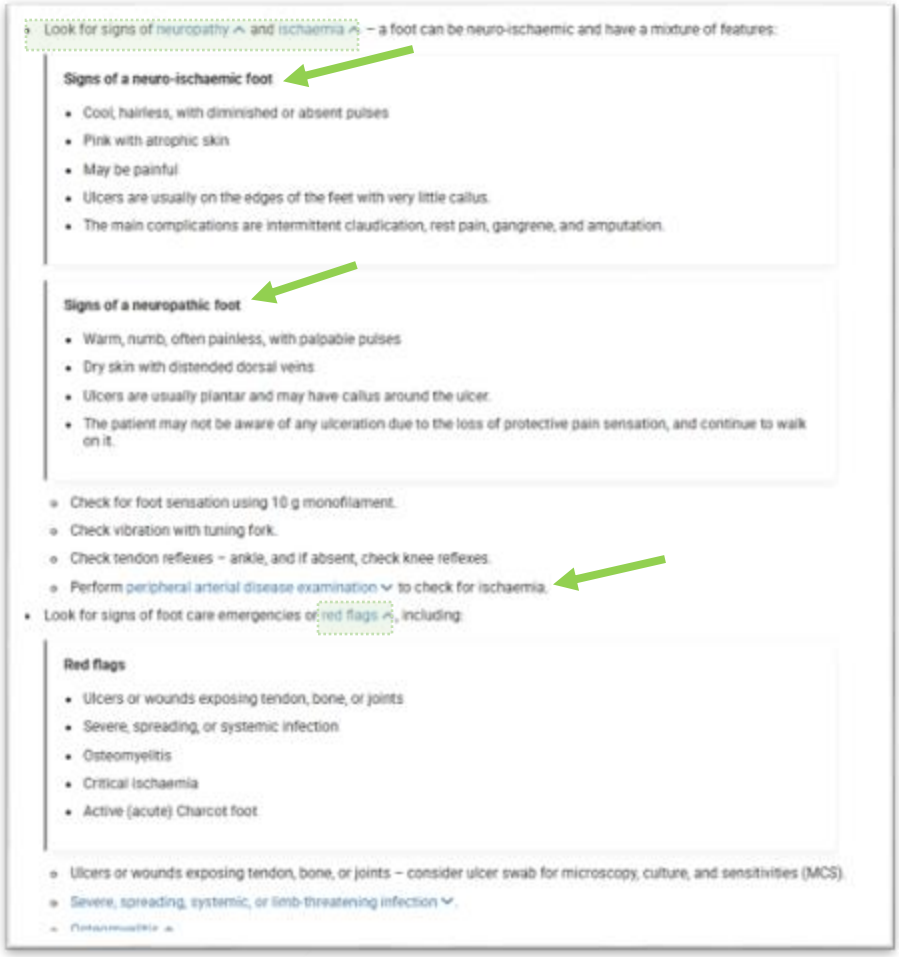
Pathways are written by GP clinical editors with support from local GPs, hospital-based specialists and other subject matter experts

- clear and concise, evidence-based medical advice
- Reduce variation in care
- how to refer to the most appropriate hospital, community health service or allied health provider.
- what services are available to my patients

HealthPathways – Diabetes-related Foot Disease and Screening

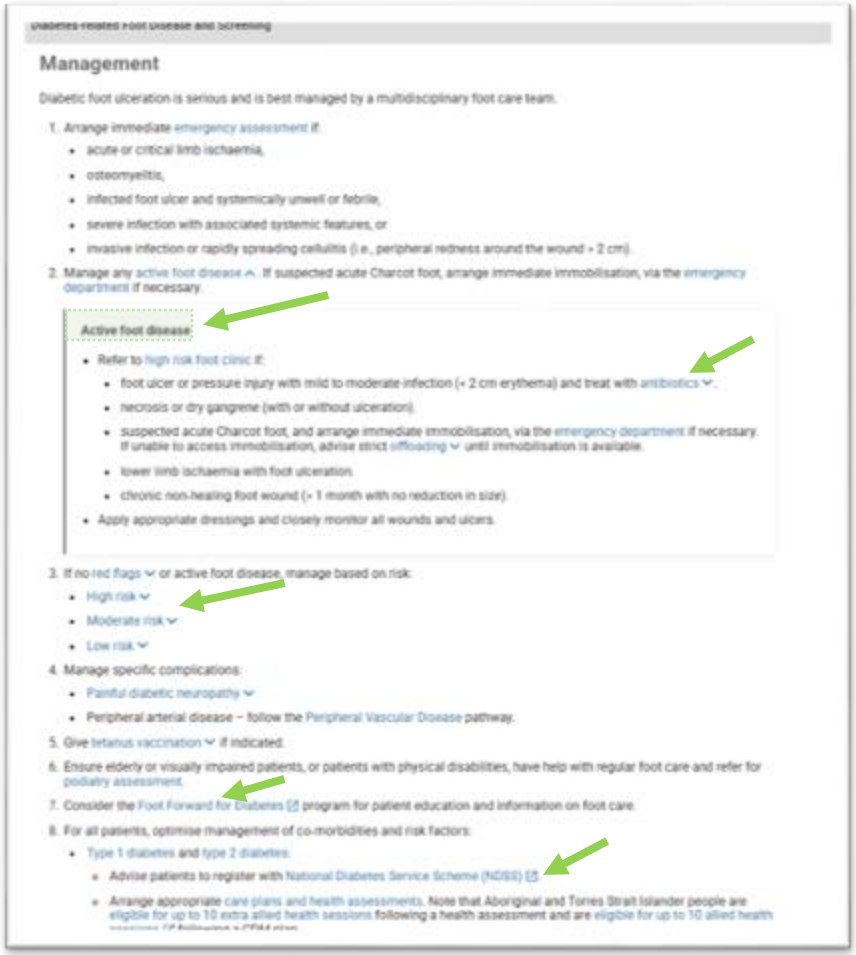
HealthPathways – Diabetes-related Foot Disease and Screening





HealthPathways Melbourne

HealthPathways – Diabetes-related Foot Disease and Screening



Management

Diabetic foot ulceration is serious and is best managed by a multidisciplinary foot care team.

1. Arrange immediate emergency assessment if:
   - acute or critical limb ischaemia,
   - osteomyelitis,
   - infected foot ulcer and systemically unwell or febrile,
   - severe infection with associated systemic features, or
   - invasive infection or rapidly spreading cellulitis (i.e., peripheral redness around the wound > 2 cm).
2. Manage any active foot disease. If suspected acute Charcot foot, arrange immediate immobilisation, via the emergency department if necessary.

Active foot disease

- Refer to high risk foot clinic if:
  - foot ulcer or pressure injury with mild to moderate infection (< 2 cm erythema) and treat with antibiotics.
  - necrosis or dry gangrene (with or without ulceration),
  - suspected acute Charcot foot, and arrange immediate immobilisation, via the emergency department if necessary. If unable to access immobilisation, advise strict offloading until immobilisation is available,
  - lower limb ischaemia with foot ulceration,
  - chronic non-healing foot wound (> 1 month with no reduction in size).
- Apply appropriate dressings and closely monitor all wounds and ulcers.

3. If no red flags or active foot disease, manage based on risk:
   - High risk
   - Moderate risk
   - Low risk
4. Manage specific complications:
   - Painful diabetic neuropathy
   - Peripheral arterial disease – follow the Peripheral Vascular Disease pathway.
5. Give tetanus vaccination if indicated.
6. Ensure elderly or visually impaired patients, or patients with physical disabilities, have help with regular foot care and refer for podiatry assessment.
7. Consider the Foot Forward for Diabetes program for patient education and information on foot care.
8. For all patients, optimise management of co-morbidities and risk factors:
   - Type 1 diabetes and type 2 diabetes:
     - Advise patients to register with National Diabetes Service Scheme (NDSS).
     - Arrange appropriate care plans and health assessments. Note that Aboriginal and Torres Strait Islander people are eligible for up to 10 extra allied health sessions following a health assessment and are eligible for up to 10 allied health

Active foot disease

- Refer to high risk foot clinic if:
  - foot ulcer or pressure injury with mild to moderate infection (< 2 cm erythema) and treat with antibiotics.

Antibiotics

General Principles:

- Common pathogens in mild infections include *Staphylococcus aureus* and beta-haemolytic streptococci.
- Polymicrobial infections are more likely if the ulcer is > 4 weeks old or recent antibiotics were used.
- Consider MRSA risk in high-risk patients (e.g. prior MRSA colonisation/infection, recent hospitalisation, residential care).
- Always modify treatment based on culture and sensitivity results.

Mild infections – low risk of polymicrobial infection

First-line:

- Flucloxacillin 500 mg orally 6-hourly, or
- Dicloxacillin 500 mg orally 6-hourly

Penicillin allergy (non-severe) – cefalexin 500 mg orally 6-hourly

Penicillin allergy (severe) – treat as high MRSA risk

Mild infections – low risk of polymicrobial infection, high risk of MRSA

- Clindamycin 450 mg orally 8-hourly, or
- Doxycycline 100 mg orally 12-hourly

Alternative (monitor renal function):

- Trimethoprim + sulfamethoxazole 160 + 800 mg orally 12-hourly
- Check creatinine and potassium before and within 7 days of starting.

Mild infections – high risk of polymicrobial infection

First-line:

- Amoxicillin + clavulanic acid 875 + 125 mg orally 12-hourly, or
- Cefalexin 500 mg orally 6-hourly
- **Plus** metronidazole 400 mg orally 12-hourly

Penicillin allergy (non-severe) – use cefalexin + metronidazole regimen

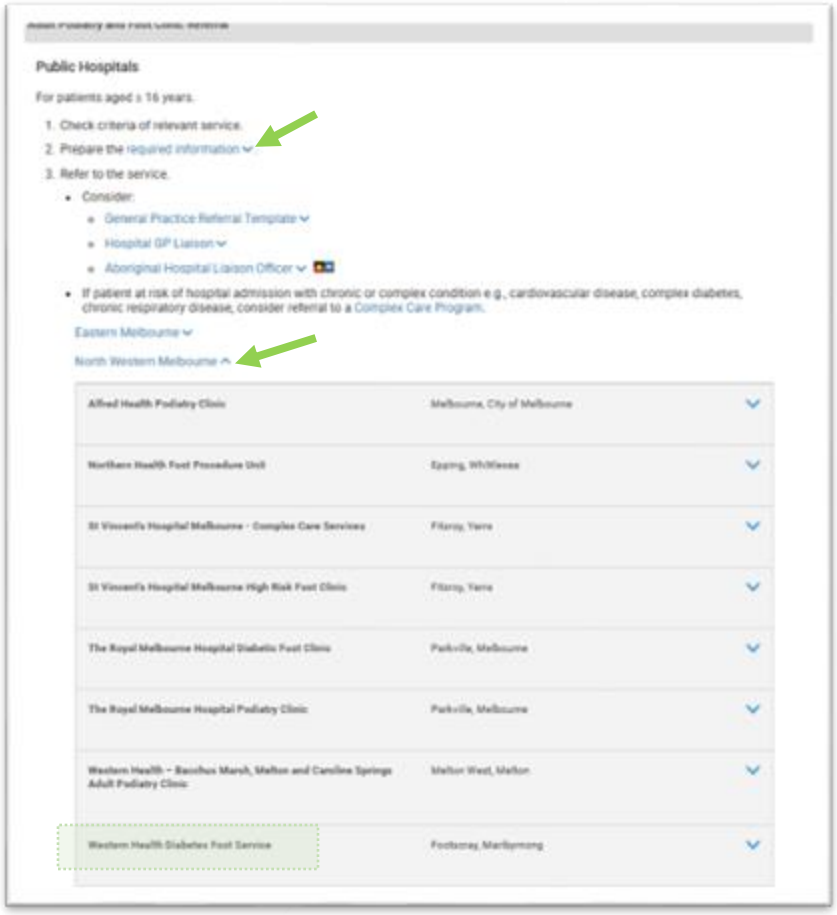
Penicillin allergy (severe) – treat as high MRSA risk – see below.

Mild infections – high risk of polymicrobial infection and MRSA

- Trimethoprim + sulfamethoxazole 160 + 800 mg orally 12-hourly, **plus**
- Metronidazole 400 mg orally 12-hourly

Monitor renal function and potassium at baseline and within 7 days.

HealthPathways – Adult Podiatry and Foot Clinic Referral



Public Hospitals

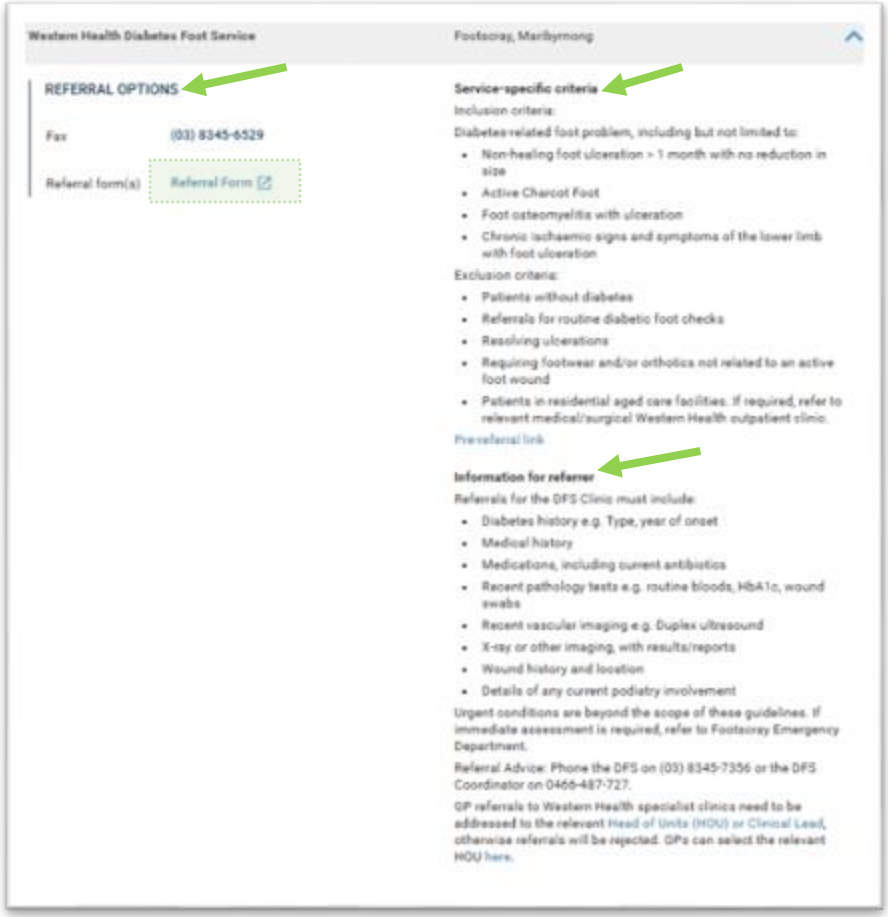
For patients aged ≥ 16 years.

1. Check criteria of relevant service.
2. Prepare the required information
3. Refer to the service.
   - Consider:
     - General Practice Referral Template
     - Hospital GP Liaison
     - Aboriginal Hospital Liaison Officer
   - If patient at risk of hospital admission with chronic or complex condition e.g., cardiovascular disease, complex diabetes, chronic respiratory disease, consider referral to a Complex Care Program.

Eastern Melbourne

North Western Melbourne

Alfred Health Podiatry Clinic	Melbourne, City of Melbourne
Northern Health Foot Procedure Unit	Epping, Whittlesea
St Vincent's Hospital Melbourne - Complex Care Services	Fitzroy, Yarra
St Vincent's Hospital Melbourne High Risk Foot Clinic	Fitzroy, Yarra
The Royal Melbourne Hospital Diabetic Foot Clinic	Parkville, Melbourne
The Royal Melbourne Hospital Podiatry Clinic	Parkville, Melbourne
Western Health – Bacchus Marsh, Melton and Caroline Springs Adult Podiatry Clinic	Melton West, Melton
Western Health Diabetes Foot Service	Footscray, Maribyrnong



Western Health Diabetes Foot Service — Footscray, Maribyrnong

REFERRAL OPTIONS

Fax (03) 8345-6529

Referral form(s) Referral Form

Service-specific criteria

Inclusion criteria:

Diabetes-related foot problem, including but not limited to:

- Non-healing foot ulceration > 1 month with no reduction in size
- Active Charcot Foot
- Foot osteomyelitis with ulceration
- Chronic ischaemic signs and symptoms of the lower limb with foot ulceration

Exclusion criteria:

- Patients without diabetes
- Referrals for routine diabetic foot checks
- Resolving ulcerations
- Requiring footwear and/or orthotics not related to an active foot wound
- Patients in residential aged care facilities. If required, refer to relevant medical/surgical Western Health outpatient clinic.

Pre-referral link

Information for referrer

Referrals for the DFS Clinic must include:

- Diabetes history e.g. Type, year of onset
- Medical history
- Medications, including current antibiotics
- Recent pathology tests e.g. routine bloods, HbA1c, wound swabs
- Recent vascular imaging e.g. Duplex ultrasound
- X-ray or other imaging, with results/reports
- Wound history and location
- Details of any current podiatry involvement

Urgent conditions are beyond the scope of these guidelines. If immediate assessment is required, refer to Footscray Emergency Department.

Referral Advice: Phone the DFS on (03) 8345-7356 or the DFS Coordinator on 0466-487-727.

GP referrals to Western Health specialist clinics need to be addressed to the relevant Head of Units (HOU) or Clinical Lead, otherwise referrals will be rejected. GPs can select the relevant HOU here.

Relevant and Related Pathways

Relevant and Related Pathways

Managing Type 2 Diabetes
Medications for Type 2 Diabetes (Excluding Insulin)
Diabetes-related Foot Disease and Screening
Glycaemic Control
Hypoglycaemia
Insulin
Newly Diagnosed or Suspected Type 1 Diabetes in Adults
Self-monitoring Blood Glucose (SMBG)
Screening and Detection of Diabetes and Pre-diabetes
Health Assessments
Diabetes-related Foot Disease and Screening

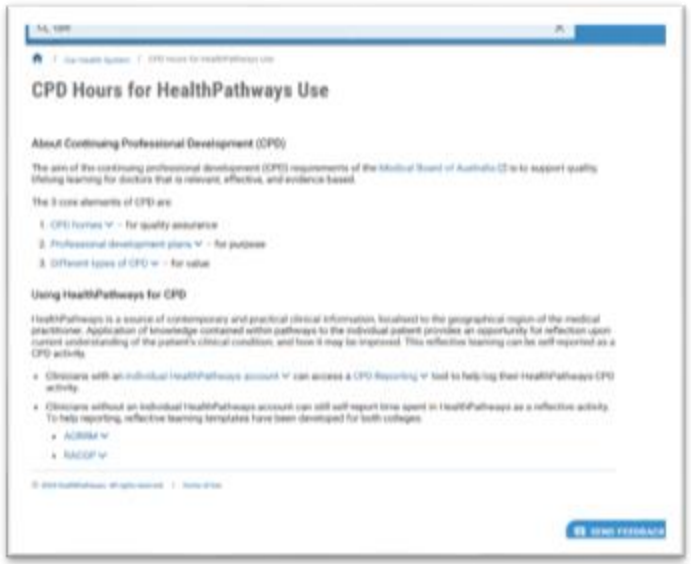
Referral Pathways

Acute Diabetes Referral (Same-day)
Non-acute Diabetes Referral (> 24 hours)
Diabetes Education Referrals
Acute Endocrinology Referral (Same-day)
Non-acute Endocrinology Referral (> 24 hours)
Adult Dietetic Referral
Exercise Physiology Referral

CPD Hours for HealthPathways Use

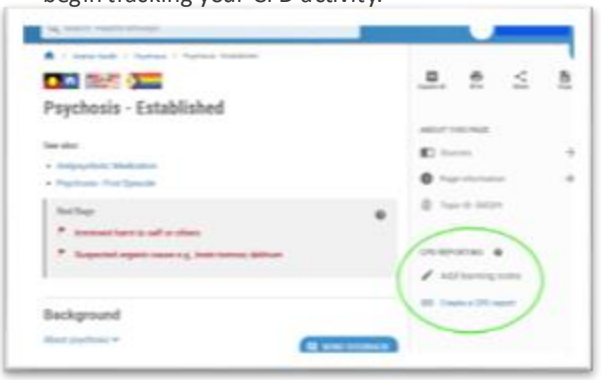
CPD Hours for HealthPathways Use and the CPD Reporting Tool

HealthPathways Melbourne has CPD hours for HealthPathways Use to support clinicians in meeting their CPD requirements through everyday use of the platform

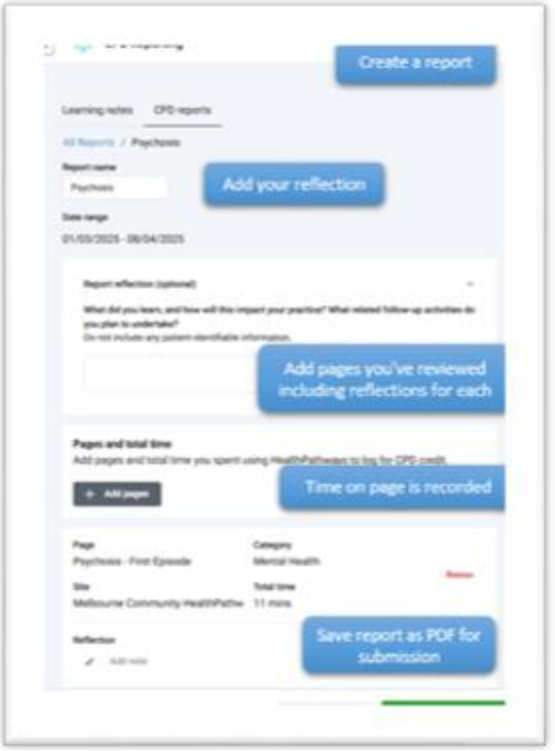


Step 1: Access Pathway page

- Navigate to a clinical pathway (e.g., *Psychosis – Established*).
- Click **"Add learning notes"** or **"Create a CPD report"** to begin tracking your CPD activity.



Step 2: Add Learning Notes



Step 3: Generate Your CPD Report

- Go to the **CPD Reporting** section.
- Add reflections, review pages, and confirm time spent.
- Export your report as a **PDF for submission**.

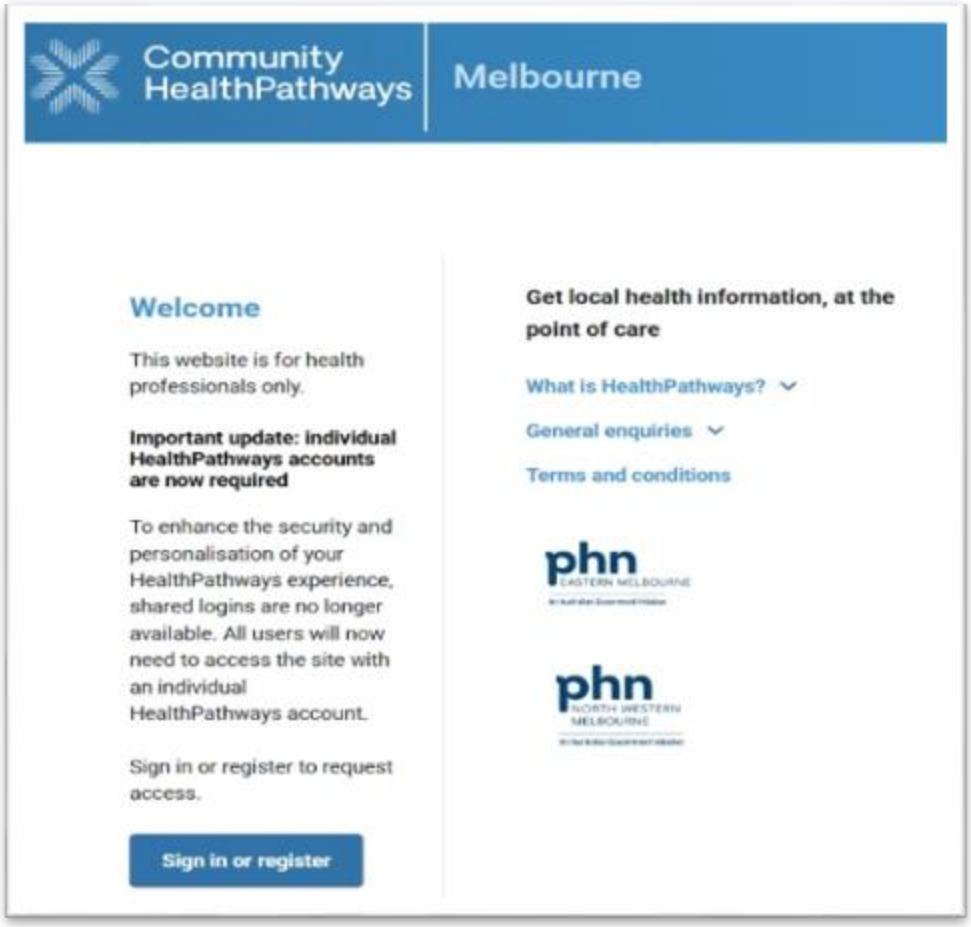
For further information on the CPD reporting tool, please see these videos:

- How to create a CPD report
- How to add learning notes

Accessing HealthPathways

Please click on the **Sign in or register** button to create your individual account or scan the QR code below.

If you have any questions, please email the team
info@healthpathwaysmelbourne.org.au



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Click "Subscribe to Updates" on HealthPathways homepage
or email info@healthpathwaysmelbourne.org.au

Tonight's speakers from Western Health

- Dr. Debbie Gordon, Endocrinologist

  Senior consultant in Rapid Access Diabetes Clinic, Young Adult Diabetes Clinic, Diamond high risk Endocrine/ Diabetes clinic

- Dr. I-Lynn Lee, Endocrinologist

  Clinical Lead Obstetric Endocrinology

- Dr. Fiona Bodey, Endocrinologist

  Clinical Lead Diabetic Foot Service, Director of Medical Student Education for the school of Translational Medicine at Monash University

- Dr. Huy Do, Endocrinology Registrar

  Research Fellow and Endocrine Registrar

Case 1 Hba1c ≠ fasting BSL

- A 50-year-old man, known with Type 2 Diabetes, diagnosed 4 years ago, presents for follow up .
- He is noted to be very overweight , with a BMI of 40 kg/m2
- He has microalbuminuria, for the second time with an Hba1c of 9%.
- He is adamant he can only finger-prick BSL once a day, and when he does his BSL is 5-6mmol/L!!
- His lipogram showed a total cholesterol of 4.8mmol/L, LDL cholesterol of 2.2mmol/L, triglycerides of 1.8mmol/L and an HDL of 0.7mmol/L

His fasting glucose does not correlate with his HBA1C – which should be trusted?

- Fingerprick BSL measures glucose at a single point in time
- HBA1C is an average of glycated Hb in a 3 month period

Error in Hba1c may be due to slower / faster turnover of RBC or changes in glycosylation

-**falsely high--low rbc turnover states:** asplenia, anaemia, lead poisoning

-**falsely low--high rbc turnover:** splenomegaly, haemolysis, blood loss, sickle cell, ESRF pregnancy

-inhibition of glycosylation : high dose vitamin C and E

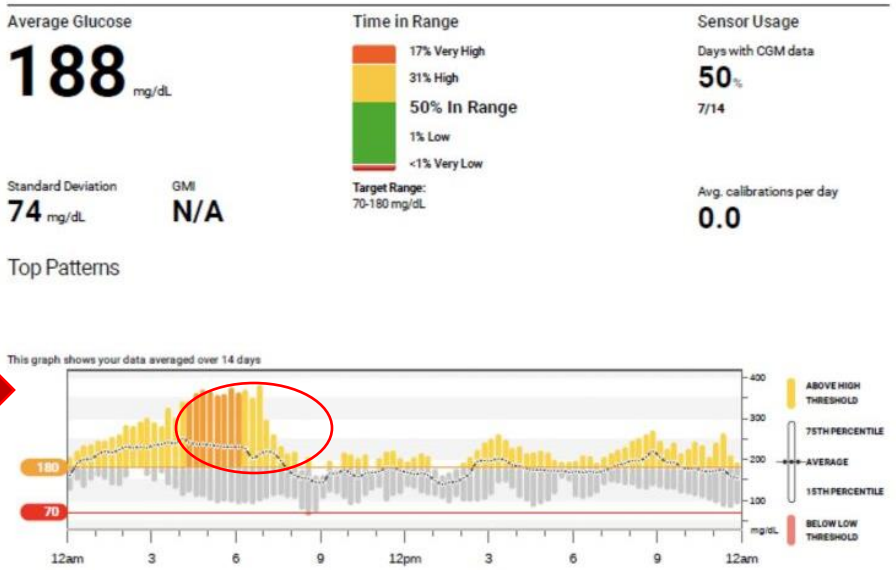
-**hba1c assay interference:** uraemia, severe hyperTg, severe hyper BR, chronic salicylate, alcohol or opioid ingestion

Radin. Jnl Gen Int Med. 2014

CGM "fills the gaps in knowledge"

Western Health

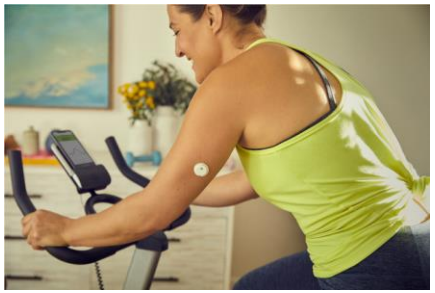
Continuous Glucose Monitoring (CGM) gives **ongoing continuous feedback** about the **trend of interstitial glucose**



- Hba1c reductions
- Less hypoglycaemia
- Educational tool with real time decision making of the effects of food and exercise

Kwon. Endocrinol Metab. 2025

limitations to CGM



- Costly, if not on the PBS
- Sometimes trends in glucose are more important than a single values
- “Pretty reliable” (interstitial fluid), but not as reliable as a fingerprick (capillary blood)
- Social stigma
- Skin rash, infection
- Can create/ exacerbate anxiety- data overload, alarm fatigue, sleep disruption

Western Health

Is there anyone who shouldn't use cgm?

- Consider- cell phone compatibility and availability
- Anxiety
- Patient who is on 1 oral hypoglycaemic agent

Western Health

Accuracy of cgm

- Physiological factors:

  lag time (2-5 mins), hydration, sweat, body temperature

- Sensor factors:

  sensor placement, calibration, sensor age, sensor insertion site tissue

- Environmental factors:

  compression, altitude, electromagnetic interference

- Medications:

  hydroxyurea, salicylates, paracetamol, vitamin C

Types of cgm in Australia

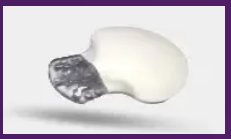
DEXCOM

ONE + | G6 | G7

LIBRE

2 | 2+

MEDTRONIC GUARDIAN



Mard	8.2-9.1	9.2-9.7	10.1-11.2
Warm up	30 mins	60 mins	2 hours
duration	10 days	14-15 days	7 days
Sites of wear	Arms, abdomen , buttock, thigh	arms	Arms, abdomen , buttock, thigh
Insulin pen integration	-----	Novopen 6 (novorapid, Ryzodeg)	Inpen (Humalog, Fiasp, novorapid)

NDSS funding of CGM in Australia

Western Health

Conditions very similar to type 1 diabetes, eligible to access the CGM Initiative through the NDSS

Children and young people under 21 years with conditions very similar to type 1 diabetes who require insulin.

Category	Condition
A. Genetic defect of beta cell function	Chromosome 20, HNF-4alpha (MODY 1)
	Chromosome 12, HNF-1alpha (MODY 3)
	Chromosome 13, IPF-1 (MODY 4)
	Chromosome 17, HNF-1 beta (MODY 5)
	Chromosome 2, NeuroD1 (MODY 6)
	Chromosome 2, KLF11 (MODY 7)
	Chromosome 9, CEL (MODY 8)
	Chromosome 7, PAX4 (MODY 9)
	Chromosome 11, INS (MODY 10)
	Chromosome 8, BLK (MODY 11)
	Chromosome 11, ABCC8
	Chromosome 11, KCNJ11
	Mitochondrial DNA
	Permanent neonatal diabetes
	Transient neonatal diabetes
B. Genetic defect in insulin action	Type A insulin resistance
	Leprechaunism
	Rabson-Mendenhall syndrome
	Lipoatrophic diabetes

Any person with TYPE 1 DIABETES

Any person <21 yrs with a chronic condition listed

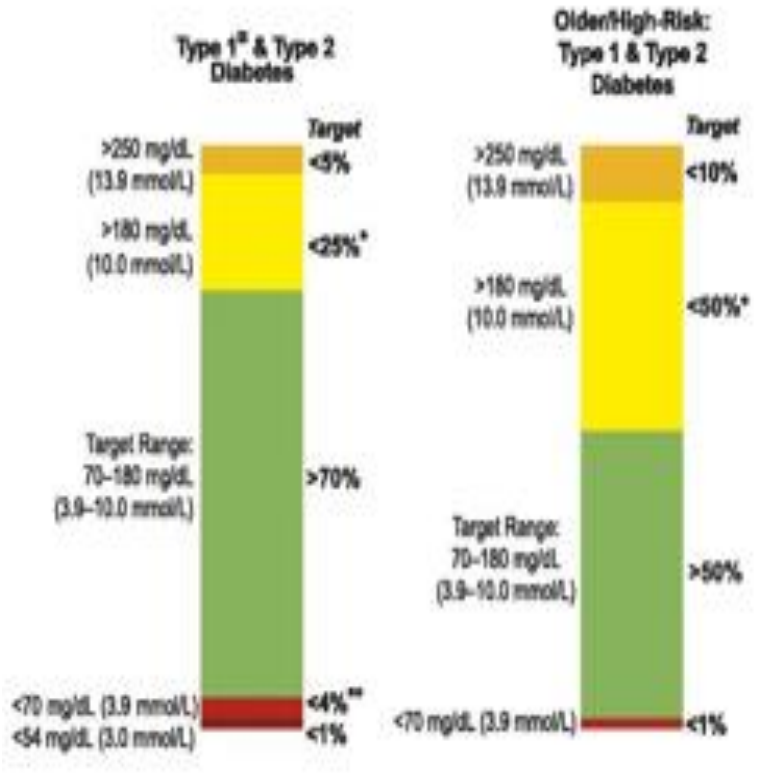
Application can only be made by an Endocrinologist, physician, paediatrician

Category	Condition
C. Diseases of the exocrine pancreas	Pancreatectomy
	Neoplasia
	Cystic fibrosis
	Insulinoma
D. Endocrinopathies	Glucagonoma
E. Drug or chemical induced	Vacor
	Pentamidine
	Glucocorticoids
	Diazoxide
	Alpha-interferon
	NODAT or Post renal transplant
	Post liver transplant
	Calcineurin inhibitors
	Fluoroquinolones
	Highly active antiretroviral therapy (HAART)
F. Infections	Congenital rubella
	Cytomegalovirus
	Coxsackie
G. Uncommon forms of immune-mediated diabetes	"Stiff-man" syndrome
	Anti-insulin receptor antibodies
H. Other genetic syndromes sometimes associated with diabetes	Down syndrome
	Turner syndrome
	Wolfram syndrome
	Friedreich's ataxia
	Huntington chorea
	Laurence-Moon-Bardet-Biedl syndrome
	Myotonic dystrophy
	Porphyria
	Prader-Willi syndrome
	Glycogen storage disease

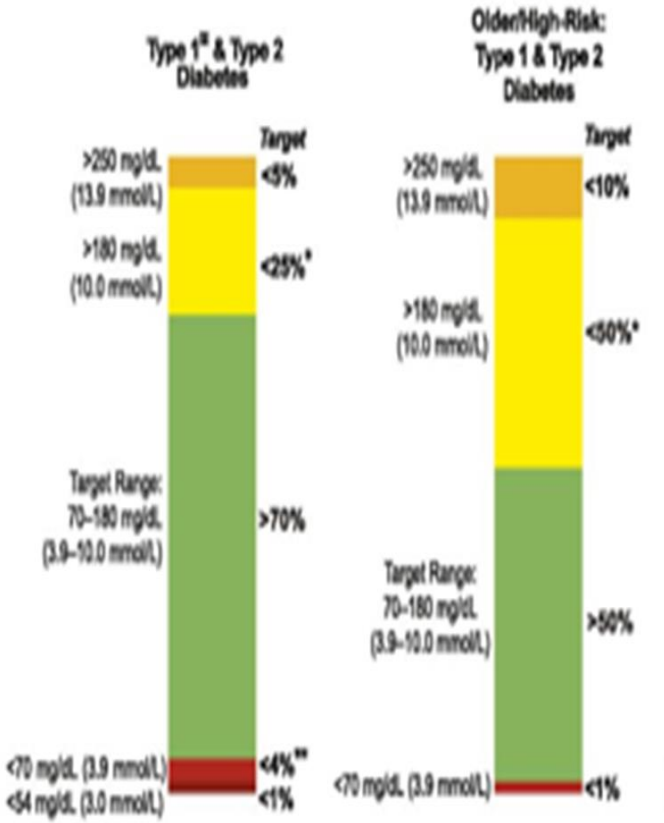
Goals of diabetes care

1. hba1c <7%, but individualized for the person
2. no hypoglycaemia
3. avoid glucose swings up and down
4. quality of life
5 . CGM GOALS:

TIR > 70%, <4% HYPOS, variability < 32%



But what does this mean?



TIR of 70% means that bsl 3.9-10mmol/L 2/3 of the day (16 hrs /day)
TIR of 50% means that bsl 3.9-10mmol/L ½ of the day (12 hrs/day)

We know that for every 0.5% above hba1c 6.5% there is risk if microvascular complications (DCCT trial)

Every 10% ↓ in TIR -↑ 64% HR retinopathy, 40% HR microalbuminuria

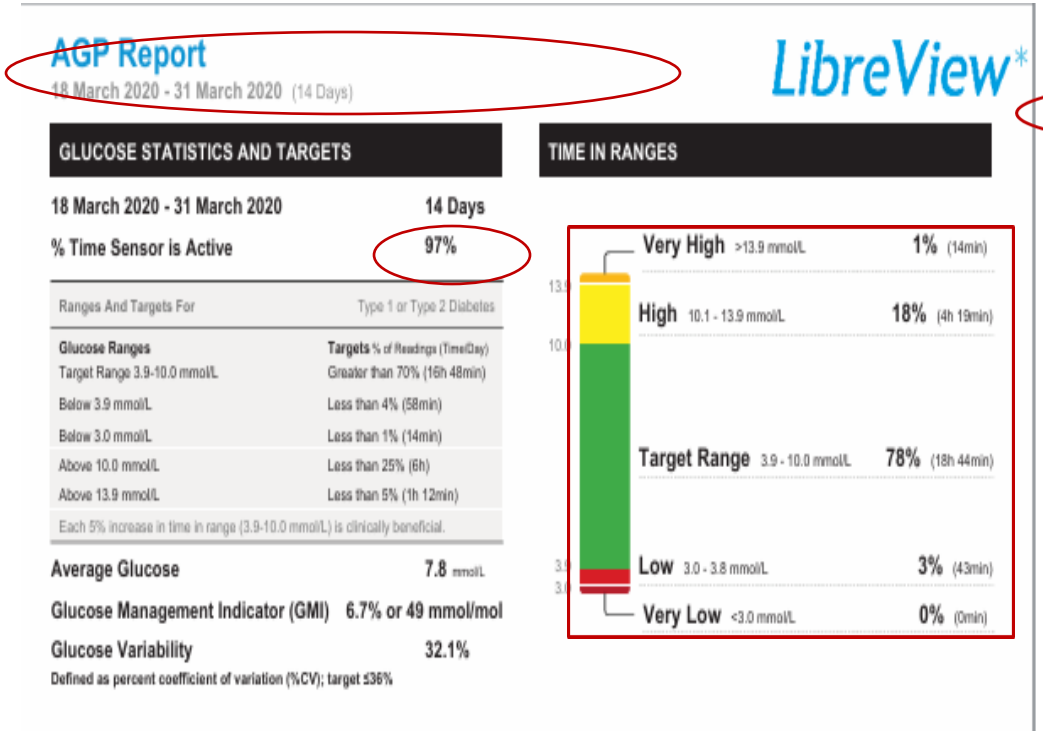
In pregnancy ↑TIR by 7% ….↓ risk foetal macrosomia, hypoglycaemia, neonatal hospitalizations

TIR 70% = HbA1C 7%
TIR 50% = HbA1C 8%
Change TIR 10% = HbA1c change 0.5%

ADA Standards in Care. Diabetes Care. 2017
Beck. J diabetes Sci Technol. 2019
Vigersky . J Diabetes Technol Ther . 2019

Interpretation of cgm

Western Health



AGP Report

18 March 2020 - 31 March 2020 (14 Days)

LibreView

GLUCOSE STATISTICS AND TARGETS

18 March 2020 - 31 March 2020	14 Days
% Time Sensor is Active	97%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 3.9-10.0 mmol/L	Greater than 70% (16h 48min)
Below 3.9 mmol/L	Less than 4% (58min)
Below 3.0 mmol/L	Less than 1% (14min)
Above 10.0 mmol/L	Less than 25% (6h)
Above 13.9 mmol/L	Less than 5% (1h 12min)

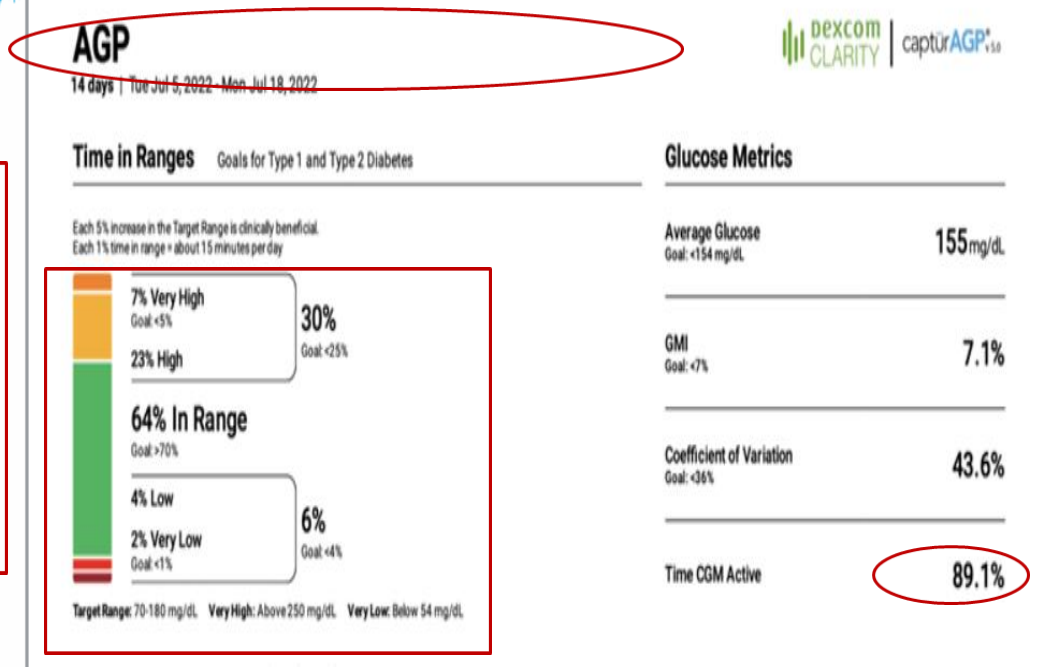
Each 5% increase in time in range (3.9-10.0 mmol/L) is clinically beneficial.

Average Glucose	7.8 mmol/L
Glucose Management Indicator (GMI)	6.7% or 49 mmol/mol
Glucose Variability	32.1%

Defined as percent coefficient of variation (%CV); target ≤36%

TIME IN RANGES

Very High	>13.9 mmol/L	1% (14min)
High	10.1 - 13.9 mmol/L	18% (4h 19min)
Target Range	3.9 - 10.0 mmol/L	78% (18h 44min)
Low	3.0 - 3.8 mmol/L	3% (43min)
Very Low	<3.0 mmol/L	0% (0min)



AGP

14 days | Tue Jul 5, 2022 - Mon Jul 18, 2022

dexcom CLARITY | captürAGP

Time in Ranges Goals for Type 1 and Type 2 Diabetes

Each 5% increase in the Target Range is clinically beneficial.
Each 1% time in range = about 15 minutes per day

7% Very High	Goal <5%	30% Goal <25%
23% High		
64% In Range	Goal >70%	
4% Low		6% Goal <4%
2% Very Low	Goal <1%	

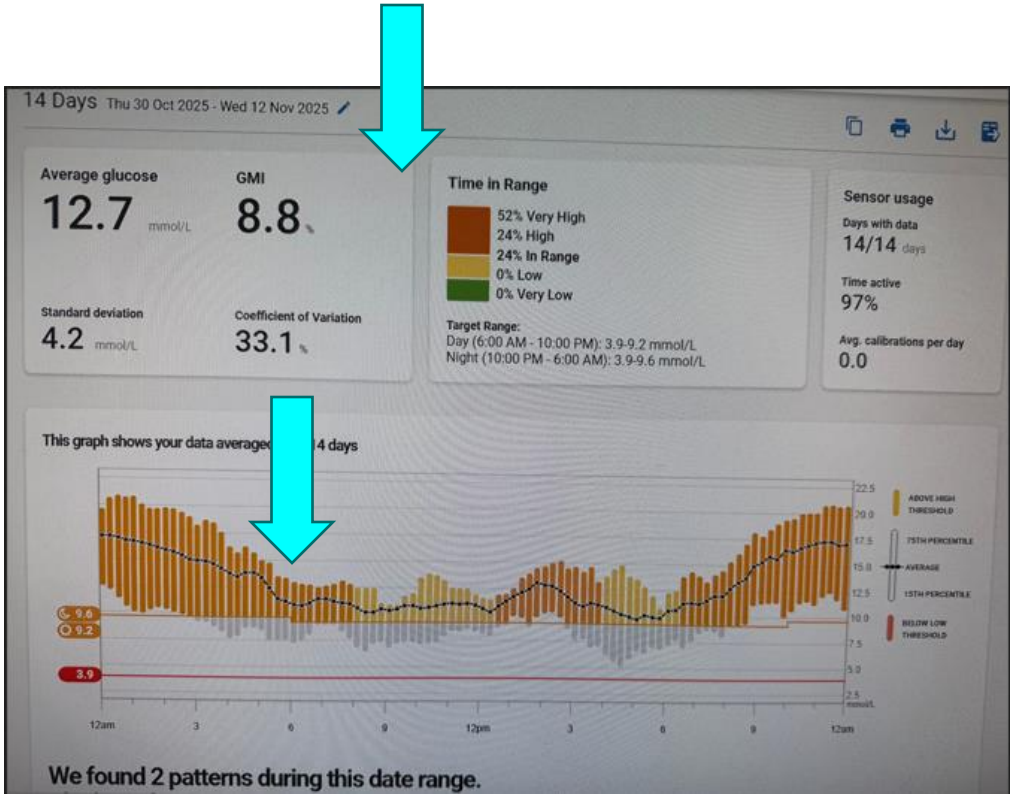
Target Range: 70-180 mg/dL Very High: Above 250 mg/dL Very Low: Below 54 mg/dL

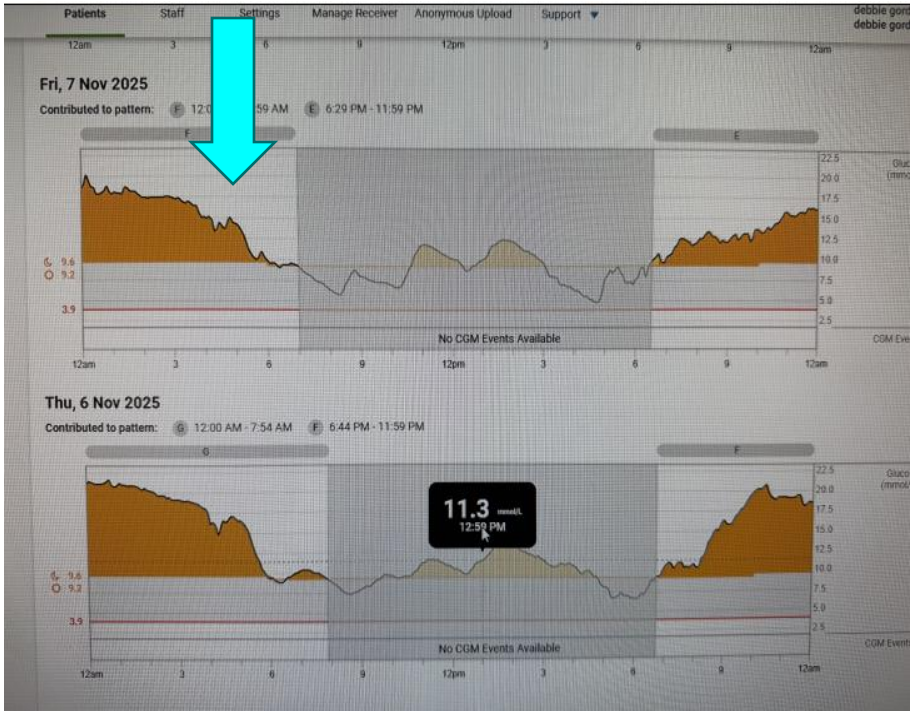
Glucose Metrics

Average Glucose Goal: <154 mg/dL	155 mg/dL
GMI Goal: <7%	7.1%
Coefficient of Variation Goal: <36%	43.6%
Time CGM Active	89.1%

Patient name, date of review, time that sensor is active,
Set the review period to 2 weeks
Start with TIR >80%, hypo's <3%,
GMI
Variability (< 32%)

Looking at the patient's CGM





Beyond CGM- seeing the person—a look at lipids and BP

- Beyond the scope of today

but :

LDL-cholesterol <1.8mmol/L 1' prevention, < 1.4 mmol/L for 2' prevention

trig < 1.7mmol/L (on a fasting specimen)

BP < 130/80 mmHg

Case 1

Western Health

A 50 year-old man, with known Type 2 diabetes, diagnosed 4 years ago, presents for follow up.

He is currently taking Metformin XR 500mg daily.

He is noted to be very overweight, with a BMI of 40 kg/m^2

He has microalbuminuria, for the second time with ACR of 24 and and a GFR level of 36mmol/min with an HbA1c of 9%.

His lipogram showed a total cholesterol of 4.8mmol/L, LDL cholesterol of 2.2mmol/L, triglycerides of 1.8mmol/L and an HDL of 0.7mmol/L

He is adamant he can only perform finger-prick BGL once a day

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Which Agent to Use and Why?

- Metformin
- SGLT2 Inhibitor
- GLP-1 analogue or DPP-4 Inhibitor
- Sulphonylurea
- Pioglitazone
- Insulin

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Western Health

SGLT2 Inhibitor therapy

- Sodium glucose co-transporter 2 inhibitors
- Limit renal glucose absorption, promoting urinary excretion of glucose
- Weight neutral
- No hypoglycaemia (on their own)
- Mild diuretic effect
- Well tolerated

Western Health

SGLT2 Inhibitors

- Reduction in Cardiovascular morbidity and mortality

- Also beneficial for patients with HFpEF and HFrEF *without* diabetes mellitus

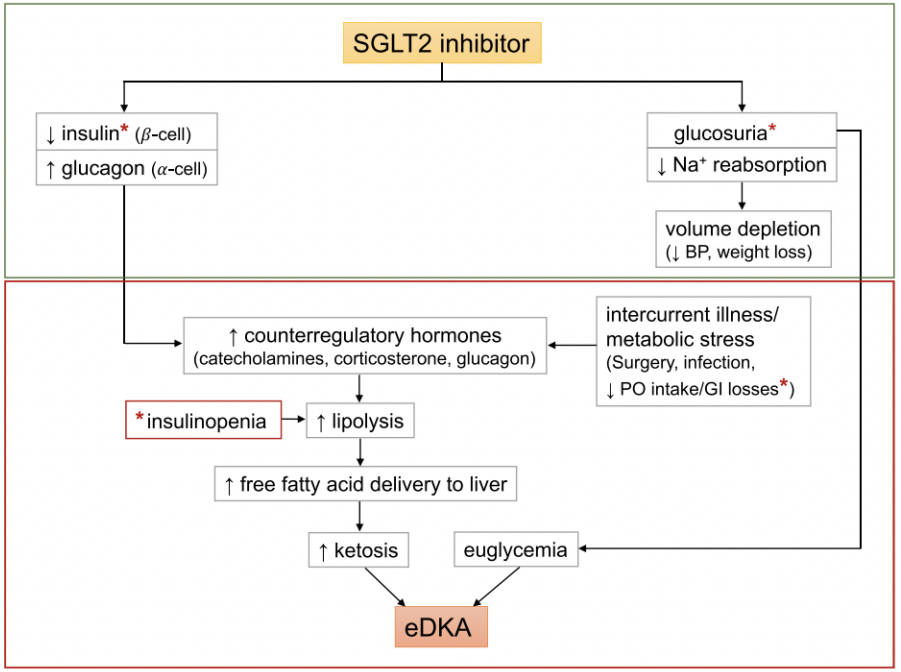
Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes, Zinman et al, NEJM 2015
Dapagliflozin and Cardiovascular Outcomes in Type 2 Diabetes, Wiviott et al, NEJM 2019
Dapagliflozin in Patients with Heart Failure and Reduced Ejection Fraction, McMurray et al, NEJM 2019
Empagliflozin in Heart Failure with a Preserved Ejection Fraction, Anker et al, NEJM 2021

SGLT2 Inhibitors

- Preservation of renal function and reduction in proteinuria
- Effect also demonstrated in patients without diabetes mellitus
- Reduced intraglomerular pressure due to increased afferent arteriole resistance
- Reduced hyperfiltration

Canagliflozin and Renal Outcomes in Type 2 Diabetes and Nephropathy, Perkovic et al, NEJM 2019
Empagliflozin in Patients with Chronic Kidney Disease, NEJM 2023
Dapagliflozin in Patients with Chronic Kidney Disease, Heerspink et al, NEJM 2020

SGLT2 Inhibitors Adverse Effects



Urinary Tract Infections

Thrush

Genital infections

Amputation risk?

Atypical fracture risk?

Diabetic Ketoacidosis

- Euglycaemic (ie BGLs not especially elevated)
- Increased risk especially in the setting of fasting or reduced oral intake and illness
- Mechanism thought to relate to elevated glucagon/insulin ratio favoring lipolysis, insulin reduction due to renal excretion of glucose, further reduction in insulin in the setting of reduced intake
- SGLT2 inhibitors also thought to reduce renal ketone excretion

SGLT2 Inhibitors Increase the Risk of Diabetic Ketoacidosis Developing in the Community and During Hospital Admission, Hamblin et al, JCEM 2019
SGLT2 Inhibitor–Induced Euglycemic Diabetic Ketoacidosis: A Case Report, Wang et al, Kidney Med 2020

Incretins

- Gut peptides that are secreted after nutrient intake
- GIP (glucose-dependent insulinotropic polypeptide) and GLP-1 (glucagon-like peptide-1) are the known incretin hormones

- Enhance appropriate Beta cell secretion (insulin and amylin)
- Suppression of glucagon secretion from pancreatic alpha cells
- Reduce hepatic glucose production
- Increase satiety through CNS mediated effects
- Slow gastric emptying time
- Promote weight loss

Incretin hormones: Their role in health and disease. Nauck et al, Diabetes Obes Metab, 2018
A review of GLP-1 receptor agonists in type 2 diabetes: A focus on the mechanism of action of once-weekly agents. Cornell, J Clin Pharm Ther. 2020

Incretin Based Therapies

Western Health

GLP-1 analogues

- Weight Loss
- Injectable
- GI side effects, pancreatitis
- Dulaglutide, Semaglutide
- Tirzepatide (Dual GLP-1 and GIP agonist)
    - Dual glucose dependent insulinotrophic polypeptide and GLP-1 agonist
    - Thought to potentiate the effect of GLP-1 on appetite

DPP-IV inhibitors

- Weight neutral, no hypoglycaemia
- Oral tablet
- Nausea, constipation
- Linagliptin, sitagliptin, saxagliptin, alogliptin

GLP1 analogues

- Effective reduction in BGLs and HbA1c
- Weight loss (even in patients without T2DM)
- Adverse effects include nausea/vomiting, constipation, pancreatitis
- Hypoglycaemia is minimal (but possible)

Cardiovascular, mortality, and kidney outcomes with GLP-1 receptor agonists in patients with type 2 diabetes: a systematic review and meta-analysis of randomised trials, Sattar et al, The Lancet, October 2021

GLP1 analogues

- Cardiovascular benefits
  - Reduction in cardiovascular mortality
  - Improved symptoms of heart failure

- Cardiovascular outcomes may be imparted by reduction in atherosclerosis due to improving inflammatory markers and antioxidative effects
- This may also result in reduced mesangial expansion and improved glomerular hyperfiltration and endothelial function

Effects of Semaglutide on Chronic Kidney Disease in Patients with Type 2 Diabetes V. Perkovic and Others N Engl J Med 2024;391:109-121
Tirzepatide for Heart Failure with Preserved Ejection Fraction and Obesity M. Packer and Others N Engl J Med 2025;392:427-437
Semaglutide in Patients with Obesity-Related Heart Failure and Type 2 Diabetes M.N. Kosiborod and Others N Engl J Med 2024;390:1394-1407

GLP1 analogues

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- Renal benefits
    - Preservation of eGFR
    - Reduction in albuminuria
        - FLOW trial - Semaglutide reduced the risk of the primary composite outcome (kidney failure, sustained 50% decrease in eGFR, or kidney-related/cardiovascular death) by 24% compared to placebo
- Likely due to reduction in oxidative stress and fibrosis
- Effect unrelated to change in body weight
- Intrinsic kidney and immune cells contain the GLP-1 receptor, and GLP-1 receptor agonists reduce cellular expression of proinflammatory and profibrotic mediators

Effects of Semaglutide on Chronic Kidney Disease in Patients with Type 2 Diabetes V. Perkovic and Others N Engl J Med 2024;391:109-121
Tirzepatide for Heart Failure with Preserved Ejection Fraction and Obesity M. Packer and Others N Engl J Med 2025;392:427-437
Semaglutide in Patients with Obesity-Related Heart Failure and Type 2 Diabetes M.N. Kosiborod and Others N Engl J Med 2024;390:1394-1407

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Case 2

A 50 year-old man, with known Type 2 diabetes, diagnosed 4 years ago, presents for follow up.

He is currently taking Metformin XR 500mg daily.

He is noted to be very overweight, with a BMI of 40 kg/m^2

He has microalbuminuria, for the second time with ACR of 24 and an eGFR level of 36mmol/min with an HbA1c of 9%.

His lipogram showed a total cholesterol of 4.8mmol/L, LDL cholesterol of 2.2mmol/L, triglycerides of 1.8mmol/L and an HDL of 0.7mmol/L

He is adamant he can only perform fingerprick BGL once a day

GLP-1 analogue or SGLT2 Inhibitor?


WHY NOT BOTH?

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Current Financial Situation

Non-Diabetes PBS indications for SGLT2 inhibitors

- Empagliflozin
  - Chronic heart failure (HFrEF and HFpEF) with NYHA Class II to IV symptoms
  - Additional TTE requirements for HFpEF - ie LVEF >40%
  - CKD with eGFR 20-45 or eGFR 20-90 and ACR of at least 22.6 mg/mmol/L

- Dapagliflozin
  - Chronic heart failure with LVEF <40% (HFrEF) and NYHA Class II to IV symptoms
  - Additional TTE requirements for HFpEF
  - CKD with eGFR 25-75 and ACR 22.6-565 mg/mmol inclusive

Western Health

Which Agent to Use and Why?

- Metformin
- SGLT2 Inhibitor
- GLP-1 analogue or DPP-4 Inhibitor
- Sulphonylurea
- Pioglitazone
- Insulin

Case 2 Miss TN the young person

- 28 yr old , married lady , from Vietnam, P_0G_0, recently immigrated to Australia and found to have high fasting BSL 8 mmol/L, during her medical for her visa application

- She would like to fall pregnant soon, but her BMI is 28kg/m2 and she wanted to loose weight first.

- She has no family history of diabetes or any other medical problems and is not on any medication

Question 1: initial management should be?

1. diet modification and exercise, including about 150 mins a week of mixed cardiac and resistance training?

2. diet and exercise with Hba1c measurement

3. diet and exercise with Hba1c measurement and metformin initiation

4. diet and exercise , Hba1c and testing for type 1 diabetes

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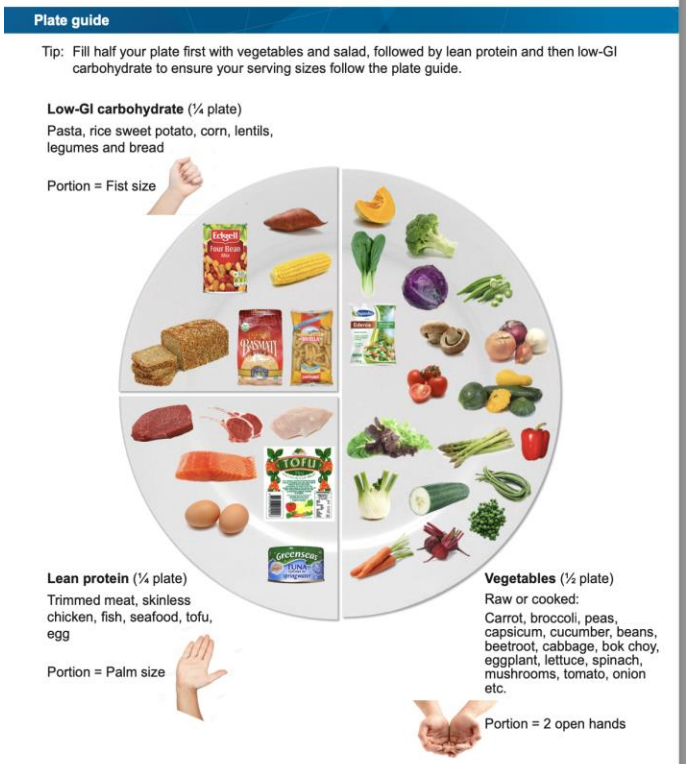
Goal: remission of diabetes

Modification of diet and physical activity to achieve good life habits and foundation of diabetes

Broad dietary principles : plate model, whole foods, reduce sugary beverages

Physical activity: increase incidental activity

Trial of 3 months of modifications to aim for target HbA1c



1st line pharmacotherapy

UKPDS 34 – Substudy with Metformin

Study design: Randomised controlled trial

Population: 1704 overweight adults with newly diagnosed T2DM

Intervention:

- Metformin group vs. conventional therapy (diet alone)
- Also compared with intensive therapy using sulfonylurea or insulin

Follow up: 10 years

UKPDS Group Lancet Sept 1998

UK Prospective Diabetes Study

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Outcome	Metformin vs. Diet	Metformin vs. SU/insulin
All-cause mortality	↓ 36%	↓39%
Diabetes related mortality	↓ 42%	↓42%
Myocardial infarction	↓ 39%	↓36%
Any diabetes related endpoint	↓32%	↓21%
All cause mortality	7.5 vs. 12.7 deaths per 100 patient years (RR 36%)	7.5 vs 12.3 deaths per 100 patient years (RR 39%)
Weight gain & hypoglycaemia	Less than SU/insulin	

GLP1-RA use pre-conception

Risk of congenital malformation in general population is 2-3%

With diabetes this is increased to 5-10%.

Risk is directly linked to degree of hyperglycemia at time of conception

Distinguish risk of malformations from hyperglycemia and GLP-1RAs

Price et al. Archives of Gynecology and Obstetrics (2025) 311

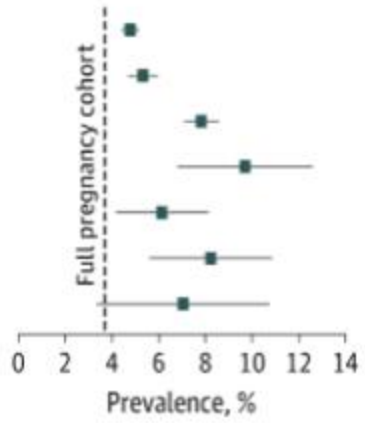
Human studies of GLP-1-RA

Multinational population based cohort study n=50,000 pregnant women with T2DM

No greater risk of malformations after periconceptional use of sulfonylureas, DPP-4 inhibitors, GLP1-RA or SGLT-2i compared to insulin use.

A Any major congenital malformation

Medication	Pooled prevalence, % (95% CI)
No ADM	4.77 (4.42-5.12)
Metformin only	5.32 (4.68-5.95)
Insulin	7.83 (7.09-8.57)
Sulfonylureas	9.71 (6.80-12.62)
DPP-4 inhibitors	6.14 (4.15-8.14)
GLP-1 receptor agonists	8.23 (5.58-10.88)
SGLT2 inhibitors	7.04 (3.35-10.73)



Cesta et al. JAMA Intern Med 2023 Dec 11;184(2)

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Areas of uncertainty

- ? Metabolic benefits of GLP-1RAs used prior to pregnancy are sustained or if improve pregnancy outcomes.

- ? Ideal time to cease these drugs , 5 half lives before conception (ie. Semaglutide half life 5-7 days, so drug ceased ~6 weeks before conception).

- Women who have bariatric surgery: data suggest significant weight loss may benefit mother but be detrimental for the offsprings.

Recommendations

There are no studies examining peri-conceptional use of GLP-1RAs with data on maternal glycemic control

- The data on teratogenicity is neither proven or disproven.

More studies are needed to investigate any impact on first trimester loss, congenital malformations, fetal growth, maternal glycemic control, preterm birth, placental and breast milk passage is required.

Recommendation that patients use contraception while taking GLP-1RAs to prevent unintended pregnancy.

SGLT2 Inhibitor safety in young women

Animal data			
Drug	Developmental toxicity	Dilatation of renal pelvis and tubules	Reversibility of renal changes
Canagliflozin	Ossification delays of metatarsal bones	+ A/B	No fully reversible
Empagliflozin	-	+ A/B	Reversible
Dapagliflozin	-	+ A/B	No fully reversible

A= EMA product information
B= FDA product information

Muller et al. Frontiers in Endocrinology Oct 2023

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preparation for pregnancy

Cease all potentially teratogenic medications (ACE inhibitors), statins)

Start folic acid 5mg 3 months prior to conception

Microvascular complications screen

Target HbA1c< 6.5% prior to conception

Metformin and it safety needs to be discussed.

Initiate basal insulin to target fasting blood glucose <6.0mmol/L

Bolus insulin to target 2-hr post prandial BGL < 7.5mmol/L

Rudland et al. ANZJOG 2020

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Case 2 continued

Her mother calls her from overseas and expresses a concern that there is no family history of Type 2 Diabetes, and remembered that her brother, her mother and her maternal grandfather all had a mild form of Diabetes that did not need treatment despite her being of South East Asian ethnicity, could there be another diagnosis?

Question 2: How should she be tested now?

1. OGTT
2. fasting glucose and c-peptide
3. anti-GAD, anti-IA2 and anti-Zn transporter antibodies?
4. all of the above
5. none of the above

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When to suspect Type 1 Diabetes

- When the presentation appears somewhat atypical…
- Age
- Phenotype
- Catabolic state
- Family Hx, including autoimmune disease
- Time course
  - Rapidly escalating hyperglycaemia

Table 1 | Clinical features at presentation that help to distinguish type 1 and type 2 diabetes

	Type 1 diabetes	Type 2 diabetes
Weight loss	Yes (though not always, eg, in slow onset type 1)[1]	Unusual[1]
Ketonuria	Yes (though not always in slow onset type 1)[1]	No, unless patient has been fasting recently[1]
Time course for symptoms	Weeks or days[1]	Months to years[1]
Severity of symptoms (eg, nocturia >3x)	Often marked[1]	Variable, but usually not severe[1]
Family history	Possible family history of autoimmune disease[2] and/or insulin dependence at a young age[3]	Family history present in 30% with onset in adult life[4]
Age	Peak age in pre-school and teenage years, but can present at any age[5,6]	Typically after the age of 40, but can present in younger patients[5,6]

Type 1 Diabetes – 'the' Antibodies

- Anti-GAD (Glutamic acid Decarboxylase)
- Anti-IA2 (Islet antigen 2)
- ZnT8 (Zinc transporter 8) antibodies
- Anti-insulin not routinely tested (positive once exposed to exogenous insulin)

Table 1: Key autoantibodies in type 1 diabetes

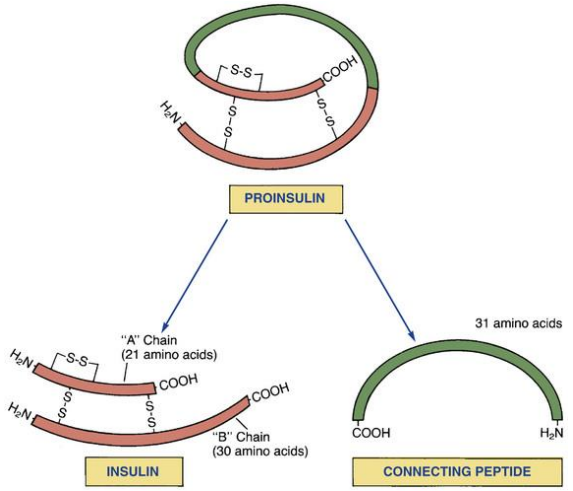
Autoantibody	Occurrence at diagnosis
Anti-GAD (glutamic acid decarboxylase)	70%
Anti-IA2 (a protein tyrosine phosphatase)	60%
Anti-Islet cell	Up to 80%
Anti-Zinc transporter 8 protein	Up to 80%

C-Peptide and Glucose: Why the need?

- Assessment of beta cell function

At diagnosis

- If antibodies negative
- If concerned for pancreatic insufficiency
    - E.g. T3cDM
- Paired C-peptide & Glucose
    - Fasting
    - Hyperglycaemia
        - Low or low-normal + hyperglycaemia



Utility of OGTT

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- OGTT: Gold standard to diagnosing diabetes or GDM
- Useful in indeterminant/borderline cases
- If HbA1c unreliable (e.g. anaemia)
- Could suggest certain MODY types e.g. GCK

References

Non-pregnant:

Normal: Fasting ≤6.1 mmol/L; 2h <7.8 mmol/L

Impaired glucose tolerance: Fasting <7.0 mmol/L; 2h 7.8 - 11.0 mmol/L

Impaired fasting glycaemia: Fasting 6.1 - 6.9 mmol/L; 2h <7.8 mmol/L

Diabetes mellitus: Fasting ≥7.0 mmol/L; 2h ≥11.1 mmol/L

Pregnant:

Normal: Fasting ≤5.0 mmol/L; 1h <10.0 mmol/L 2h glucose <8.5 mmol/L

Gestational diabetes mellitus: Fasting 5.3-6.9 mmol/L OR 1h ≥10.6 mmol/L OR 2h 9.0-11.0 mmol/L

Overt diabetes in pregnancy: Fasting ≥7.0 mmol/L OR 2h ≥11.1 mmol/L

MODY

- Mature onset Diabetes of the Young
- Collection of inherited, non-autoimmune monogenic diabetes
- Prevalence 1/10,000 in adults, 1/23,000 in children
    - <5% of diabetes

- May not fit T1 or T2DM mould
- Classically onset of hyperglycaemia before 25yo (but can be diagnosed later)
- Strong family hx (most autosomal dominant)
- Some may only develop mild hyperglycaemia (GCK), others require treatment (HNF1a)

Mody Calculator

Western Health

EXETER DIABETES

MODY Probability Calculator

Age at diagnosis (years)	
Sex	○ Male ○ Female
Currently treated with insulin **or** tablets	○ Yes ○ No
Time to insulin treatment (if currently treated with insulin)	○ Not currently treated with insulin ○ Within 6 months of diagnosis ○ Over 6 months after diagnosis
BMI (kg/m²)	
HbA1c (%) or	
HbA1c mmol/mol	
Current Age (years)	
Parent affected with diabetes	○ Yes ○ No
Ethnicity	○ White ○ Non-white
Other	☐ Renal cysts ☐ Deafness ☐ Partial lipodystrophy ☐ Severe Insulin Resistance in absence of obesity ☐ Severe obesity with other syndromic features

www.diabetesgenes.org/exeter-diabetes-app/ModyCalculator App

MODY

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Table 1 The causative genes for maturity-onset diabetes of the young (MODY) and medical conditions associated with each MODY subtype

MODY gene	Frequency (% in MODYs)	Pathophysiology	Other features	Possible treatment
HNF4α	5	β-Cell dysfunction	Neonatal diabetes, hyperinsulinemic hypoglycemia during infancy, low triglycerides	Sensitive to sulfonylurea
GCK	15–20	Glucose sensing defect	Stable mild fasting glucose	No medication, or Diet
HNF1α	30–50	β-Cell dysfunction	Glucosuria	Sensitive to sulfonylurea
PDX1	<1	β-Cell dysfunction	Homozygote: permanent neonatal diabetes, pancreas agenesis	Diet or OAD or insulin
HNF1β	5	β-Cell dysfunction	Renal malformations, genito-urinary tract anomalies, pancreatic hypoplasia, low birth weight	Insulin
NEUROD1	<1	β-Cell dysfunction	Neonatal diabetes, child or adult-onset diabetes neurological abnormalities.	OAD or insulin
KLF11	<1	β-Cell dysfunction	Similar to type 2 diabetes	OAD or insulin
CEL	<1	Pancreas endocrine and exocrine dysfunction	Exocrine dysfunction, lipomatosis	OAD or insulin
PAX4	<1	β-Cell dysfunction	Ketoacidosis-prone	Diet or OAD or insulin
INS	<1	Insulin gene mutation	Neonatal diabetes, child or adult-onset diabetes	OAD or insulin
BLK	<1	Insulin secretion defect	Overweight, relative insulin secretion failure	Diet or OAD or insulin
ABCC8	<1	ATP-sensitive potassium channel dysfunction	Homozygote: permanent neonatal diabetes, Heterozygote: transient neonatal diabetes	OAD (sulfonylurea)
KCNJ11	<1	ATP-sensitive potassium channel dysfunction	Homozygote: neonatal diabetes	OAD or insulin
APPL1	<1	Insulin secretion defect	Child or adult-onset diabetes	Diet or OAD or insulin

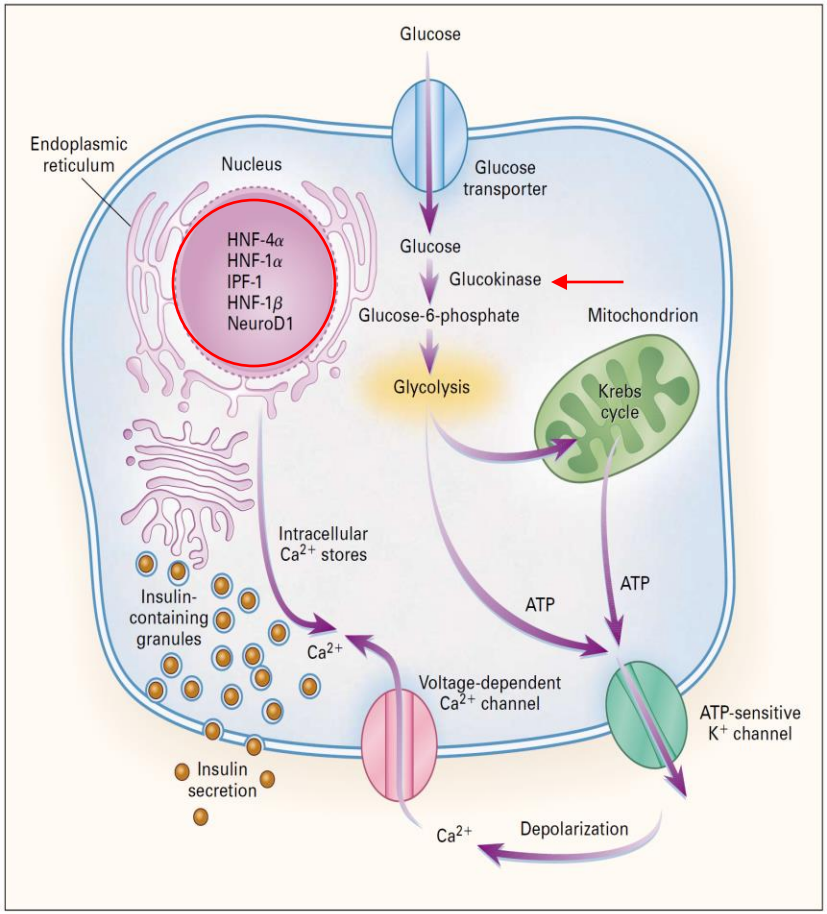

Figure 1. Model of a Pancreatic Beta Cell and the Proteins Implicated in Maturity-Onset Diabetes of the Young (MODY).

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Summary

- T2DM remains the most common type of diabetes
  - But consider alternative diagnoses in presence of atypical features
    - Important to reclassify – access to resources e.g. CGM
- History and Exam remains key
- Biochemical tests (e.g. Islet Cell autoantibodies) and calculators (MODY probability) available to guide diagnosis
- If in doubt, contact/refer to an Endocrinologist

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Conclusion

- CGM has an important role to play and should be used to gather more glycaemic information, which can assist in management decisions, but the cost limits its routine use in clinical practice
- Deciding when to use a GLP-1RA , a SGLT2–I or both together should be considered carefully in patients with multiple complications of Diabetes
- Preparing for a possible pregnancy in a patient with Diabetes is difficult and there are many considerations and little conclusive evidence
- When a patient does not quite fit " the typical Type 2 diabetes mould", think of MODY

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When in doubt,

give a shout.....your friendly endocrinologist is always ready to help

Thank you for attending!!

Q & A

Session Conclusion

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