Diabetes Management in Non-pregnant Adult Patients with COVID19 Infection

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Section: Connecting Care	Sub-Section: Care Assessment/Planning/Delivery

1. Overview

Inpatient ward-based diabetes treatment guidelines do not exist at Western Health at present.

COVID19 disease and treatment with dexamethasone has increased the prevalence of hyperglycaemia and unstable diabetes in inpatients with COVID19.

This guideline offers a standardised hyperglycaemia and diabetes management in the COVID19 clinical setting.

2. Applicability

This guideline applies to all Western Health medical, nursing and pharmacy staff involved in the management of patients with diabetes that have COVID19 infection.

3. Responsibility

The Heads of Endocrinology and Diabetes and General Medicine have responsibility for the development and review of this guideline.

Medical, nursing and pharmacy staff caring for patients with diabetes and COVID19 infection must be aware of and comply with this guideline.

4. Authority

Medical staff of the Endocrinology & Diabetes Unit, General Medicine Department and Intensive Care Unit may vary this guideline at their discretion.

5. Associated Documentation

In support of this guideline, the following Manuals, Guidelines, Instructions, Guidelines, and/or Forms apply:

Code	Name
P-GC6	Medication Use and Management
OP-CC3	Capillary Blood Ketone Testing in Diabetes Mellitus Across All Age Groups
OP-CC4	Diabetic Ketoacidosis (DKA) Management in Adults
OP-CC4	Hypoglycaemia Management in Adults with Diabetes
OP-GC3	Intravenous Therapy (IVT) Management
OP-GC6	Insulin Infusion (Intravenous) in Adults
OP-GC6	Insulin Prescription, Supply, Storage and Administration
OP-GC6	Medication Prescription, Supply, Storage and Administration
OP-GC6	Patient Controlled Continuous Subcutaneous Infusion of Insulin (CSII or Insulin Pump) in the Inpatient Setting
Children's Services DG-GC6	Diabetes Mellitus (Paediatric) Patients aged <18 years on Insulin Therapy: Guideline for Patients undergoing Elective or Emergency Surgery
Women's Services DG-CC4	Type 1 and Type 2 Diabetes Mellitus in Pregnancy

6. Credentialing Requirements

No specific credentialing requirements.

7. Definitions and Abbreviations

7.1 Definitions

For purposes of this guideline, unless otherwise stated, the following definitions shall apply:

Adult	Any patient 18 years of age or older.
Insulin Requiring Diabetes Mellitus	A patient with any diabetes diagnosis (e.g. Type 1 Diabetes Mellitus, Type 2 Diabetes Mellitus, steroid-induced diabetes) who uses insulin on a regular, daily basis.
Short-acting Insulin	Insulin with a duration of action of up to 8 hours (e.g. NovoRapid, Humalog, Apidra, Actrapid).
Long-acting (basal) Insulin	Insulin with duration of action of up to 24 hours (e.g. Optisulin, Levemir).
Mixed Insulin	Insulin containing both short and long acting insulin (e.g. NovoMix, Ryzodeg, Humalog Mix, Mixtard).
SGLT2 inhibitors	Sodium-Glucose Co-Transporter 2 inhibitors e.g. dapagliflozin (Forxiga), empagliflozin (Jardiance), ertugliflozin (Steglatro), may be combined with metformin (Xigduo, Jardiamet, Segluromet), or with DPP4 inhibitors (Glyxambi, Qtern, Steglujan).
GLP1 receptor agonist	Glucagon-Like Peptide-1 agonists e.g, Exenatide (Byetta, Bydureon), Dulaglutide (Trulicity), Semaglutide (Ozempic)
DPP-IV inhibitors	Dipeptidyl peptidase-4 inhibitors e.g. sitagliptin (Januvia), linagliptin (Trajenta), saxagliptin (Onglyza)

7.2 Abbreviations

For purposes of this guideline, unless otherwise stated, the following abbreviations shall apply:

BGL	Blood Glucose Level (as assessed by capillary finger-prick)
FH/SH	Footscray Hospital/Sunshine Hospital
MAR	Medication Administration Record (on approved electronic prescribing program)
TDD	Total Daily Dose
VBG	Venous Blood Gas

8. Guideline Detail

What is different about diabetes and glycaemic management in people with suspected or confirmed COVID19?

- Diabetes and hyperglycaemia are risk factors for severe illness and mortality in COVID19 disease.
- Individuals **with** pre-existing diabetes are at risk of unstable diabetes due to counter-regulatory stress response, treatment with glucocorticoids (dexamethasone) and interruption to nutrition.
- Individuals **without** pre-existing diabetes may develop newly-detected hyperglycaemia due to counter-regulatory stress response, treatment with glucocorticoids and possible direct effect of SARS-CoV-2 virus on pancreatic islet cells [1]. Data from Wuhan, USA and France suggest 20-30% of individuals without pre-existing diabetes develop hyperglycaemia (fasting BGL > 7 mmol/L). [2-4]
- Acute hyperglycaemia causes immune, cardiovascular and endothelial dysfunction, and is associated with worse outcomes in hospital in COVID19 disease. [4,5]

8.1 Assessment

8.1.1 Glucose Monitoring

Scenario	Risk of adverse glycaemic event (BGL <4 or >15mmol/L)	Glucose monitoring recommendation
No diabetes + No Dexamethasone	Low	Single glucose measure (with VBG) at admission
No diabetes + Dexamethasone	Hyperglycaemia potential	BD glucose measure (AM pre breakfast and PM predinner) for 72 hrs (from commencement of Dexamethasone)
Diabetes + No insulin/sulphonylurea	Hyperglycaemia potential	BD glucose measure (AM pre breakfast and PM predinner)
Diabetes + Insulin/sulphonylurea	Hypo and hyperglycaemia potential	QID glucose measure (Pre meals and Pre bed)

Capillary glucose monitoring frequency should be increased or decreased as clinically indicated.

Individuals who fulfil the criteria for newly-detected diabetes (AM blood glucose ≥7.0 mmol/L or random blood glucose ≥11.1 mmol/L) should trigger escalation in blood glucose monitoring to QID).

Individuals who commence insulin should trigger escalation in blood glucose monitoring to QID.

8.1.2 Biochemical Assessment

- HbA1c to be performed for all patients admitted with COVID19 infection

8.1.3 Glycaemic Targets

- General target: 5.0 – 10.0 mmol/L
- Frail, complex comorbidities: 5.0 – 15.0 mmol/L
- End of life care: Avoid symptomatic hyperglycaemia or hypoglycaemia.

8.2 Escalation Criteria

Diabetes and Endocrinology team are keen to be involved in glycaemia management of COVID19 patients.

Refer to Diabetes and Endocrinology team (weekday-referrals FH or SH Registrars; weekend/night- Registrar on-call) if:

- Critical hyperglycaemia (BGL >20 mmol/L).
- Persistent hyperglycaemia (BGL >15 mmol/L, >24 hours despite insulin initiation or titration).
- Recurrent hypoglycaemia (defined as 2 readings <4mmol/L).
- Significant change in glucocorticoid dose in insulin treated patients (e.g. dexamethasone dose increased or decreased by >0.5mg or prednisolone dose increased or decreased by >5mg).
- High-risk clinical scenarios: Type 1 diabetes, Type 3c (pancreatogenic e.g. chronic pancreatitis) diabetes, complex insulin regimen, cessation of insulin infusion, diabetic ketoacidosis.
- Newly detected diabetes.

8.3 Management

Note: The following management guideline pertains to ward-based diabetes management.

In the intensive care setting, intravenous insulin infusion may be commonly employed as per standard practice.

Ward-based glycaemic management principles:

- Aim to achieve safe glycaemia control (e.g. avoid hypoglycaemia. avoid hyperglycaemia >15 mmol/L).
- Escalate treatment if ≥ 2 glucose measurements are above target within 24 hours.
- De-escalate treatment if any glucose measurements ≤ 5.0 mmol/L.
- Initiation or uptitration of glucocorticoid treatment will require escalation in insulin dose.
- Cessation or reduction in dose of glucocorticoid will require de-escalation in insulin dose.

Glucose-lowering medication management:

- Metformin, sulphonylurea, GLP1 receptor agonist, SGLT2 inhibitor → **WITHHOLD.**
- DPP-IV inhibitors → may be **CONTINUED.**
- Consider recommencement of glucose-lowering medications when clinically stabl.e
  (e.g. resolution of sepsis or systemic inflammatory response, resumption of normal diet, stabilised renal function at baseline, awaiting discharge).

Insulin management:

- Type 1 diabetes → continue insulin regimen.
- Type 2 diabetes (non-insulin requiring) → initiate insulin if hyperglycaemia (2 x BGL above target in 24hrs).
- Type 2 diabetes & others (insulin-requiring) → continue insulin, consider converting to basal-bolus insulin.
  (see below for guidelines on insulin initiation, titration and management).
- Note: prescribe insulin on the electronic MAR using insulin ordersets. Insulin is prescribed using **the proprietary (brand)** name to avoid any potential errors. See *OP-GC6 Insulin Prescription, Supply, Storage and Administration.*

8.3.1 Initiating Insulin (insulin naïve)

- Use the following guide to estimate the initiating insulin dose using ideal body weight. Chart basal-bolus & supplemental insulin.

Clinical scenario	Total daily dose (TDD)	Insulin type	Example: 80kg patient
General situation	0.4 units/kg	½ basal (once daily) ½ prandial (split into 3 meals) + supplemental scale insulin	TDD 32 units - Optisulin (previously known as Lantus) 16 units (mane or nocte) - NovoRapid 5 units TDS with meals (if eating) - NovoRapid supplemental insulin

Renal impairment (eGFR <30 or AKI) Liver impairment	0.2 units/kg		TDD 16 units - Optisulin 8 units daily - NovoRapid 3 units TDS with meals (if eating) - NovoRapid supplemental scale insulin

8.3.2 Converting Pre-existing Insulin Regimen to Basal-bolus Insulin

- Use the total daily dose from pre-admission regimen to convert to basal-bolus & supplemental insulin.

Regimen pre-admission	Insulin type	Example
Pre-mixed insulin - NovoMix - Mixtard - Humalog Mix	Obtain TDD from pre-admission regimen Chart - ½ TDD basal (once daily) - ½ TDD prandial (split into 3 meals) - + supplemental scale insulin	NovoMix 30: 30 units BD (TDD = 60 units) Chart: - Optisulin (previously known as Lantus) 30 units daily - NovoRapid 10 units TDS with meals (if eating) - NovoRapid supplemental insulin
Basal insulin only	Obtain TDD from pre-admission regimen Chart - ½ TDD basal (once daily) - ½ TDD prandial (split into 3 meals) - + supplemental scale insulin	Optisulin 50 units nocte (TDD = 50 units) Chart - Optisulin 25 units daily - NovoRapid 8 units TDS with meals (if eating) - NovoRapid supplemental scale insulin
Special situation Ryzodeg 70/30	Contact Endocrinology Registrar for assistance	

8.3.3 Supplemental Scale Insulin

- Based on patient's usual TDD or body weight (if insulin naïve).

NovoRapid (TDS pre-meals or Q4H whilst fasting)	Based on usual total daily dose of insulin (units/day) or bodyweight (kg) if insulin naive		
BGL (mmol/L)	**< 40 units/day (or <60kg)**	**40-80 units/day (or 60-90kg)**	**>80 units/day (>90kg)**
10.1 – 12.0	0	0	0
12.1 – 16.0	4	6	8
16.1 – 18.0	6	8	10
>18.0	Call Endocrinology Registrar	Call Endocrinology Registrar	Call Endocrinology Registrar

8.3.4 Titrating Insulin

- Consider 'adding up' supplemental insulin given within 24-hour period and add to scheduled insulin.

Situation	Timing	Suggested action
Hyperglycaemia	Within 4 hours following a meal	>10 mmol/L increase that mealtime dose by 10% >15 mmol/L increase that mealtime dose by 20%
	Not within 4 hours following a meal (i.e. fasting/ overnight)	>10 mmol/L increase basal insulin by 10% >15 mmol/L increase basal insulin by 20%
Hypoglycaemia (<4 mmol/L) (not explained by obvious cause such as missed meal)	Within 4 hours following a meal	<4 mmol/L decrease that mealtime dose by 10% <3 mmol/L decrease that mealtime dose by 20%
	Not within 4 hours following a meal (i.e. fasting/ overnight)	<4 mmol/L decrease basal insulin by at least 10% <3 mmol/L decrease basal insulin by at least 20%

8.3.5 Adjustment of Insulin with Initiation of Dexamethasone

- Initiation of high-dose dexamethasone (>4 mg/day) treatment usually increases insulin requirement significantly (expected 40-80% increase).
- Consider proactively increasing insulin dose.
- Alternatively, insulin dose should be adjusted on the following day, based on extra supplemental insulin doses received in the preceding 24 hours.

8.3.6 Adjustment of Insulin with Cessation of Dexamethasone

- When dexamethasone treatment (for COVID19) is ceased, hyperglycaemic effect of dexamethasone will wane over 48 hours. Insulin requirements may return to pre-dexamethasone requirement levels.

- Therefore, moderate reduction in insulin dose at 24 hours and significant reduction in insulin dose at 48 hours is essential.

8.4 Disposition/Where to Next

Diabetes Management at discharge:

- Pre-existing diabetes:
  - Convert back to pre-admission glucose-lowering medications or insulin regimen.
  - Resume SGLT2 inhibitors at discharge only when patient has resumed normal caloric intake.
  - If admission HbA1c >9.0%, consider escalation in glucose-lowering medications or new insulin treatment.
  - Diabetes education service can assist with insulin initiation, titration and education. Refer according to usual process.
  - Follow-up with patient's usual diabetes treatment team (or refer to WH Diabetes clinic if required).
- Newly-detected hyperglycaemia:
  - If HbA1c <6.5% no further action required if BGL stabilised (<10 mmol/L upon cessation of dexamethasone).
  - If HbA1c 6.5-8.0% commence glucose-lowering medications and GP follow up.
  - If HbA1c >8.0% discuss with diabetes and endocrinology team treatment and follow-up plans.

Acknowledgement: This protocol is a modified version of an approved Melbourne Health protocol.

9. Document History

Number of previous revisions: new document

Previous issue dates: not applicable this version

10. References

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11. Sponsor

Head of Endocrinology and Diabetes

12. Authorisation Authority

Chief Medical Officer