



Diabetes – Inpatient Management Clinical Practice Standard

1. Purpose

The purpose of this document is to establish minimum practice standards for inpatient diabetes management throughout the WA Country Health Service (WACHS).

This Clinical Practice Standard does not include information on the management of diabetic ketoacidosis (DKA) or hyperosmolar hyperglycaemic state (HHS). For management of these diabetic emergencies refer to specific regional/site instructions.

For the management of obstetric, paediatric and neonate patients refer to [King Edward Memorial Hospital](#) resources and [Princess Margaret Hospital](#) Guidelines endorsed for use in clinical practice, including:

- § Women and Newborn Health Service Obstetric and Gynaecology Clinical Guidelines:
 - [Diabetes in Pregnancy](#)
 - [Diabetes Postnatal Care](#)
- § Women and Newborn Health Service Neonatal Directorate, King Edward Memorial Hospital Post Natal Wards:
 - [Hypoglycaemia](#)
- § Perth Children's Hospital Clinical Practice Manual
 - [Diabetic Ketoacidosis – Assessment and Management](#)
 - [Diabetes Hypoglycaemia Management](#)
- § Kids Health WA PMH Emergency Department [Diabetic Ketoacidosis, Hypoglycaemia](#) Guidelines

The information in this policy should not replace advice / instructions from senior clinicians.

2. Scope

All medical, nursing, midwifery and allied health staff employed within the WACHS.

All health care professionals are to work within their scope of practice appropriate to their level of training and responsibility.

Further information may be found via [HealthPoint](#) and/ or the [Australian Health Practitioner Regulation Agency](#).

3. General Information

Effective blood glucose level (BGL) management is essential to guide appropriate patient care and reduce acute or chronic related consequences¹.

Involving patients (and/or their carers) in the management of their diabetes whilst in hospital through informing, discussion, and shared decision making affirms a patient-centred approach to diabetes management. Where clinically appropriate, patients should be encouraged to continue to self-administer insulin whilst in hospital.

Recommended glycaemic targets in hospitalised patients

The Australian Diabetes Society recommends:

- most patients in general hospital wards with hyperglycaemia should be treated to achieve and maintain glucose levels less than 10mmol/ L
- hypoglycaemia must be avoided and treatment avoided which lowers the glucose level below 5mmol/L.²

Less stringent targets may be appropriate in elderly patients or those with severe co morbidities.

Key factors influencing glycaemia

- Diabetes.
- Changes to body mass index (BMI) (e.g. bariatric surgery) and dietary intake.
- Confusion and altered conscious state.
- Alcohol intoxication.
- Stress response to pain, anxiety, infection and illness.³
- Disturbance in glucose metabolism resulting from some malignant tumours.
- Use of corticosteroids and other diabetogenic medications.
- Metabolic derangement including renal and hepatic dysfunction.
- Self-management choices of patients.
- Changes in social circumstances e.g. death of a partner, moving home.

4. Patient Monitoring

Urine testing

- All new patient admissions.
- Acutely ill patients.
- Urine does not normally contain detectable glucose or ketone, and the presence of either warrants further review. If glycosuria is present in the absence of known diabetes consider the need for diabetes screening.
- If urinary ketones are present, inform the ward shift coordinator and patients' medical officer for further clinical management, and:
- Perform blood ketone testing (discontinue urine ketone testing) and inform Medical Officer (MO) and shift coordinator of positive blood ketones (>0.6mmol/L) for further clinical management.

Frequency of Blood Glucose Monitoring

When indicated, the frequency of BGL monitoring is to be documented by the patient's MO / treating team in the patient's medical record on admission.^{1,2}

Guidance on monitoring frequency is described in the table below, however monitoring should be individualised, based upon:

- goals of care
- target BGL
- modifications to treatment (e.g. medications, life style, diet)
- individual risk for hypoglycaemia or hyperglycaemia.

Patients with poorly controlled BGL's will require more frequent monitoring than those with stable BGL's. Similarly, if a patients target BGL is consistently achieved a reduction in monitoring frequency may be appropriate^{1,4} Inform the patients' medical team and/or diabetic educators (where available) if there is difficulty achieving a target BGL range. Refer to [Appendix 2](#) Performing a Blood Glucose or Ketone Test.

Guidance to frequency of BGL Monitoring

Patient Status	Frequency of BGL Monitoring
Not diagnosed with diabetes (elevated BGL can occur in people without diabetes)	<ul style="list-style-type: none"> · Individualised, based upon the reason for hospitalisation and treatment (for example, commencing steroid therapy, acute stroke management). · Liaise with MO responsible for patient to determine monitoring regime and target BGL. (It is possible that no testing is required).
Type 2 diabetes – diet controlled	<ul style="list-style-type: none"> · Before each main meal (not snack) and again at 21:00 hrs (QID) for first 24 hours. · If within parameters then reduce to twice daily (BD) - fasting and two (2) hours post lunch.
Type 1 or type 2 diabetes requiring insulin	<ul style="list-style-type: none"> · Times specified may vary: <ul style="list-style-type: none"> § Typically before each main meal (not snack) and at 21:00 hrs. § Consider 02:00 hrs BGL if clinically unstable.
IV Insulin Infusion	<ul style="list-style-type: none"> · At the commencement of the infusion and then two (2) hourly, or more frequently as directed by a MO. · If BGL <4, stop infusion, inform MO, and increase monitoring to 15 minutely. See Management of Hypoglycaemia, section 6.
Long term Care/ Rehabilitation	<ul style="list-style-type: none"> · Monitoring frequency to be individualised and based on collaborative discussion with the patient and their goals of care.

Definition of Monitoring Regimes

Fasting	After an overnight fast of approximately 8 -12 hours.
Random	At any time.
Pre Prandial	Within 15 minutes before commencing a meal.
Post Prandial	Two (2) hours after a meal.

It is essential that the time the patient's blood glucose level was checked is documented.

5. Management of Hyperglycaemia

Patients with a known history of diabetes commonly have hyperglycaemia in hospital, but patients without a history of diabetes may also be found to have elevated blood glucose levels. Hyperglycaemia in patients not known to have diabetes may be secondary to stress or to undiagnosed diabetes.²

Risk factors

- Acute medical/ surgical condition.
- Impaired myocardial function.
- Stroke.
- Trauma.
- Enteral and parenteral nutrition.
- Medications e.g. corticosteroids.
- Infection.

Management

Whilst in hospital, the management of a patient with hyperglycaemia or newly diagnosed diabetes should include referral to additional clinical resources including a Consultant Physician and WACHS Diabetic Educator (DE) where present / or other diabetes services (e.g. Diabetes Telehealth for Country WA).^{2,5,6}

All patients with abnormal glucose metabolism detected in hospital should have the findings communicated to the patient and their usual care practitioner.²

For patients with pre-existing diabetes, if blood glucose level (BGL) during admission is consistently between 10.1 – 15.9mmol/l - HbA1c review is required (to gain an indication of longer term blood glucose control):

- If HbA1c >7% (>53mmol/l). This is above target range. Act to provide diabetes education resources (e.g. National Diabetes Service Scheme, Diabetes WA resources) and refer for diabetes education to local DE or the Diabetes Telehealth for Country WA education service. Plus action any other appropriate medical or allied health referrals. Include this information in the discharge summary for General Practitioner (GP).
- If HbA1c is ≤7% (<53mmol/l). This is the target range. Reinforce the benefits of this result and the need for ongoing follow up with GP and DE as part of standard diabetes management practice.^{7,8}

6. Management of Hypoglycaemia

General Information

Hypoglycaemia is defined as a blood glucose level below 4mmol/l, which can produce a variety of symptoms and effects. The level of blood glucose low enough to experience the effects of hypoglycaemia may be different for individuals in different circumstances.

For patients with diabetes, hypoglycaemia is often the result of the person administering insulin or another oral therapy that stimulates the pancreas to increase insulin production and lower blood glucose levels.

To prevent hypoglycaemic events, health professionals need to recognise precipitating risk factors, provide appropriate nutritional requirements, understand the actions of the diabetes medications and monitor blood glucose accordingly ⁵.

It is important to note that some patients may not demonstrate any signs or symptoms of hypoglycaemia, or be unable to describe clearly the symptoms they are experiencing (e.g. cognitively or intellectually impaired patients, or patients where English is the second language).

The Escalation Protocol of the [MR140A WACHS Adult Observation and Response Chart](#) identifies that a medical review is required for patients with a BGL <3 or >19, (taking into consideration any modifications that are documented on the ORC).

Risk Factors

- renal and hepatic failure
- reduced oral intake
- unexpected activity
- emesis
- fasting
- diabetic medications (e.g. timing and dose)
- interruption of infusions of dextrose and/ or enteral feedings
- bariatric surgery
- control of infection
- reduced hypoglycaemic sensations

Signs and symptoms

- sweating
- hunger
- double vision
- behavioural changes
- shaking
- headache
- pins and needles
- dizziness
- palpitations
- drowsiness
- coma

Management

Interventions for unconscious or uncooperative hypoglycaemic patient

1. ACTIVATE Medical Emergency Response (MER) / CODE BLUE.
2. Position patient in coma position.
3. Assess AIRWAY, BREATHING and CIRCULATION and intervene as necessary.
4. Re-check BGL to confirm hypoglycaemia.
5. Do not give any oral treatment.
6. Prepare to obtain IV access.
7. Prepare 50% glucose 20 mL or 10% dextrose 100 mL - to be given by MO via intravenous access.
8. If the medical officer is not immediately available, a phone order for 1mg IM/SC Glucagon may be received. Prepare and give Glucagon injection as ordered.

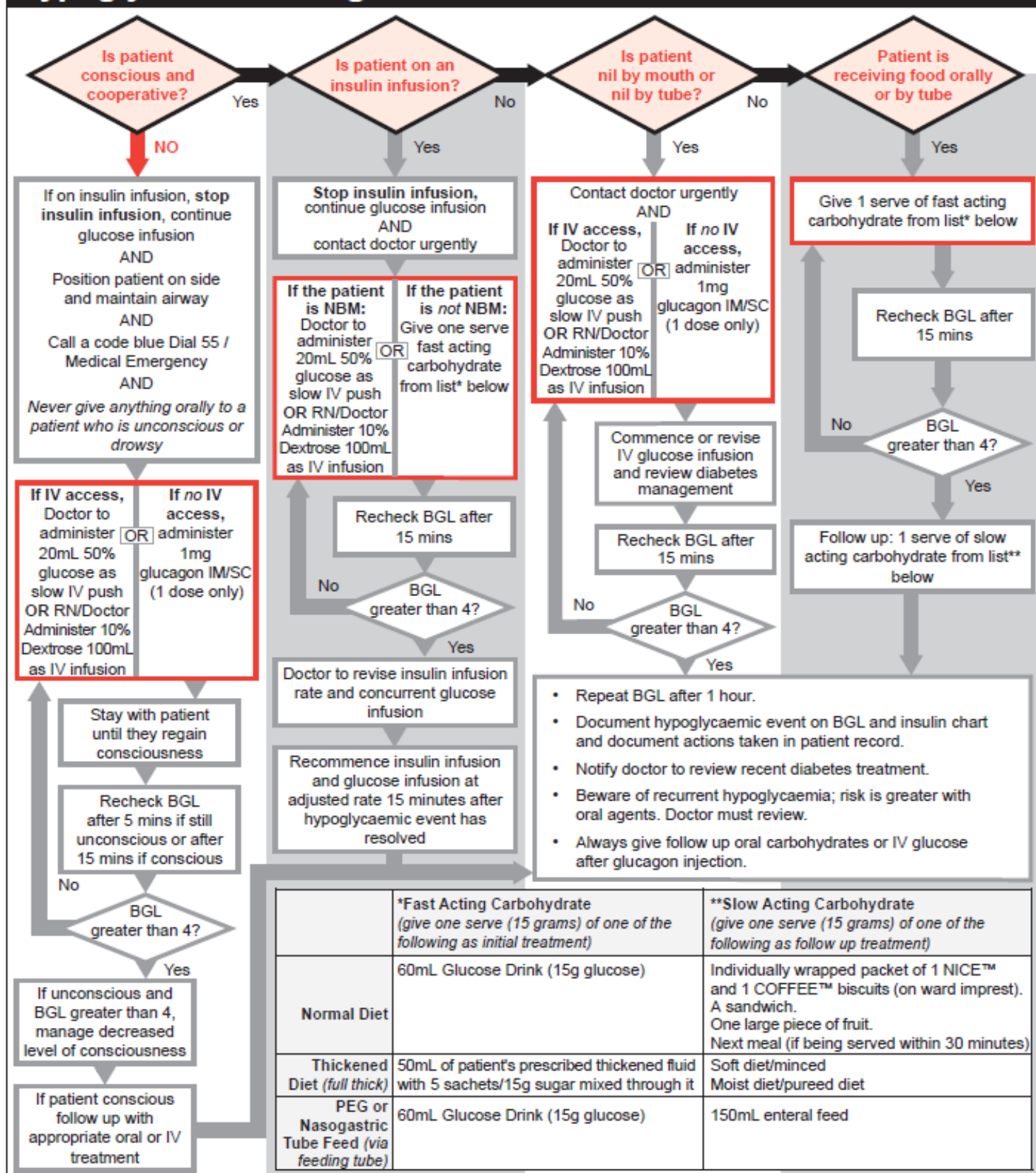
The [Hypoglycaemia management flowchart \(Patients on Sulfonylureas or Insulin\)](#) on page 6 has been designed to standardise the management of hypoglycaemia in adults treated in the hospital setting.

The flowchart has four treatment pathway options based on the patient's current condition, treatment and dietary status. These are determined by whether the patient is:

- conscious and cooperative
- receiving insulin via an intravenous infusion
- nil by mouth or nil by tube
- receiving food orally or by tube.⁹

Hypoglycaemia Management Flowchart (Patients on Sulfonylureas or Insulin)

Hypoglycaemia Management in Diabetes: BGL Less than 4mmol/L



	*Fast Acting Carbohydrate (give one serve (15 grams) of one of the following as initial treatment)	**Slow Acting Carbohydrate (give one serve (15 grams) of one of the following as follow up treatment)
Normal Diet	60mL Glucose Drink (15g glucose)	Individually wrapped packet of 1 NICE™ and 1 COFFEE™ biscuits (on ward imprest). A sandwich. One large piece of fruit. Next meal (if being served within 30 minutes)
Thickened Diet (full thick)	50mL of patient's prescribed thickened fluid with 5 sachets/15g sugar mixed through it	Soft diet/minced Moist diet/pureed diet
PEG or Nasogastric Tube Feed (via feeding tube)	60mL Glucose Drink (15g glucose)	150mL enteral feed

Australian Commission on Safety and Quality in Healthcare (2012) User guide to National Insulin Subcutaneous Order and Blood Glucose Record: Adult. ACSQHC, Sydney.

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Always source the current version from WACHS HealthPoint Policies.

7. Subcutaneous Insulin Administration

Insulin is recognised as a high risk medication, with errors in therapy having the potential to cause serious harm. Insulin is a Schedule 4 medication, and as per the WACHS [Medication Administration Policy](#) requires two medication competent nurse/ midwives to adhere to the six (6) principles of medication administration:

1. Right patient.
2. Right medication.
3. Right dose.
4. Right time.
5. Right route.
6. Right documentation.

Medication errors (prescribing, dispensing and administering) may occur because of sound-a-like brand names (e.g. Humalog and Humulin, Novorapid and Novomix), complicated generic names and the multiple types of insulins that are available.

Refer to [Appendix 3](#) for information regarding Continuous Subcutaneous Insulin Infusion (CSII) therapy.

General Information

- All insulin preparations are for single patient use only.
- Unregulated Health Workers are not permitted to dial up or inject insulin for patients.
- Label all insulin vials with the patient's identification sticker, date and time of opening.
- Label the patients insulin pen device with the patient's identification sticker.
- Insulin to be transferred with patient Intra /inter hospital transfer.
- Long acting analogue insulins must not be mixed with other insulin.

Prescribing Insulin

Where a subcutaneous insulin chart is in use, insulin orders should be prescribed on the chart **and** cross-referenced on the patient's National Inpatient Medicine Chart (NIMC), by ticking the appropriate additional charts box for the insulin chart. Where a subcutaneous insulin chart is not in use, insulin should be prescribed on the NIMC. Care must be taken to ensure that the insulin type is fully documented:

- Full trade name/ brand name (e.g. Humulin 30/70 , not just Humulin, Humalog Mix 50 , not just Humalog Mix) can be used and is a noted exception for generic prescribing.
- Device (vial/Cartridge/disposable pen).
- Specify the time of administration but also the additional administration requirements such as immediately before meals or a specific time to be given in respect to food.
- Dose – ensure that the words 'units' is written in full to avoid confusion, and the order is signed and dated.

Storage of Insulin

- Insulin vials/cartridges / prefilled pens must be for individual patient use only.
- When the insulin is used for the first time, ensure a label is used to note the date and time of opening and the patient’s details.
- Unopened vials/cartridges / prefilled pens must be stored in a fridge used to store medication.
- Do not place insulin in or close to the freezer compartment as it should not be frozen.
- Insulin in use can be stored at room temperature (below 25 Degrees Celsius) for up to 28 days.
- In use insulin cartridges/ prefilled pens (individual patient use) should be stored at room temperature. They should not be returned to the fridge and should be discarded on patient discharge or at 28 days whichever is shortest.
- Do not expose vials, cartridges or prefilled pens to sunlight or high temperatures.
- Do not use insulin if it has expired (always check the pack for the expiry date).

Timing of Injections

- Rapid acting insulin to be injected 0-15 minutes prior to the meal unless otherwise instructed.
- Short acting insulin to be injected 20-30 minutes prior to the meal unless otherwise instructed.
- Timing of mixed insulin depends on the rapid or short acting component in the insulin.
- Intermediate and long acting insulins to be given at the same time each day (usually given at night.)

Type	Relative duration of action	Generic name	Brand name(s)
basal	long-acting ⁱ	detemir	Levemir
		glargine	Lantus
	Intermediate acting ⁱⁱ	isophane (protamine suspension)	Humulin NPH, Protaphane
			Hypurin Isophane
bolus	very-short-acting (rapid)	aspart	NovoRapid
		glulisine	Apidra
		lispro	Humalog
	short-acting	neutral	Actrapid, Humulin R [NB4]
		neutral	Hypurin Neutral
combination (biphasic premixed) ⁱⁱⁱ	intermediate acting	neutral / isophane	Humulin 30/70 Mixtard 30/70
		neutral / isophane	Mixtard 50/50
		lispro / lispro protamine	Humalog Mix25 Humalog Mix50
		aspart / aspart protamine	NovoMix 30

i: Long-acting insulin is generally administered once daily, but sometimes required twice daily.

ii: Intermediate-acting insulin is generally administered twice daily.

iii: Combination (biphasic premixed) insulins have varying ratios of short- or very-short-acting insulin to intermediate-acting insulin. ¹⁰

8. Subcutaneous Insulin (and Glucagon like peptide-1 agonists (GLP-1)) Injection Technique

The Australian Diabetes Educators Association (ADEA) 2017 publication “Clinical Guiding Principles for Subcutaneous Injection Technique” is acknowledged in relation to injection technique information.

Correct subcutaneous administration of diabetes injectable medications requires consideration of injection site, needle length, use of a lifted skinfold, and angle of injection.

Injection site

- The preferred site for insulin injections is the abdomen (avoid peri-umbilical area) Injection sites should be rotated to prevent lipohypertrophy or lipoatrophy. ¹¹
- Recommended injection sites for GLP-1s are the abdomen, thigh or upper arm.
- Swabbing the injection site with an alcohol wipe is not recommended. Cleaning of the injection site may be necessary for patients with poor personal hygiene. Soap and water suitable.

Needle Length

Shorter length pen needles (4 and 5mm) are recommended for the initiation of SC injectable medicines in children, adolescents and adults of all sizes. There is no medical rationale for use of longer needles for subcutaneous diabetes medications.

Administering Insulin Procedure

Equipment

- Sharps disposal container.
- Insulin cartridge/vial.
- Insulin prefilled device to be used by nursing staff with a retractable safety needle.
- Subcutaneous insulin syringe with needle of appropriate length and smallest syringe that will accommodate dose. Safety syringes are available in all WACHS regions and are to be used.

Insulin Pens and Other Devices

- Nurses/midwives are **not** to use patients own insulin pens/devices so as to protect staff from needle stick injuries, unless retractable insulin pen needles are approved and available at the given hospital site.
- Unregulated health workers are not permitted to use/ assist with insulin pens and other devices. Patients new to insulin therapy must have appropriate education from qualified staff prior to using a prefilled or other insulin device. ⁵
- Where appropriate patients who normally self-administer insulin should be encouraged to continue using their normal device whilst in hospital. A patient identification sticker must be attached to the insulin device. A medication competent nurse/midwife is responsible for ensuring the patient is aware of adjustments in prescribed insulin

Procedure – Insulin Pen

- Nurse/ midwife to confirm insulin prescription and check expiry date with the patient.
- Gently roll the prefilled device between palms of hands or gently tip or invert.
- Attach pen needle.
- Prime the device by dialling up 2 units, press plunger, ensure insulin is expelled through needle.
- Patient to confirm with the nurse / midwife, prescribed dose has been accurately dialled up prior to administration.
- Administer insulin
- Count to ten (10).
- If patient self-injecting instruct him/ her to hold needle securely between finger and thumb, and turn device to remove the needle.
- Discard used equipment appropriately.

Documentation

- Document drug name, dose, route, time of administration and nurse / midwife initials on Medication Chart.
- When patient is self-administering insulin the nurse / midwife to:
 - observe the administration of the dose
 - document as 'S' on Medication Chart
 - initial the 'S' to confirm dose administered
 - record an assessment of technique in the patients' medical record.

Procedure – Administration

- Confirm insulin prescription, adhering to the 6 principles of medication administration.
- Check the expiry date on insulin cartridge/vial/ prefilled pen.
- Gently roll the insulin cartridge / vial back and forth between the palms of the hands 10 times to mix insulin.
- Swab top of cartridge vial with an isopropyl alcohol wipe and allow air dry.
- If patient unable to or unwilling to perform insulin injection, the nurse/midwife performs the injection.
- For Premixed insulin (e.g. NovoMix or Humalog Mix), resuspend insulin by rolling the prefilled device horizontally between palms of hands or gently move the pen up and down until the insulin appears uniformly white and cloudy.

Insulin in 3mL cartridge

- **Do not** inject air into the cartridge as it contains a movable rubber piston.
- Insert the needle vertically through the rubber stopper.

Insulin in 10mL vial

- Push plunger completely in and withdraw back the volume of air equivalent to the prescribed dose of insulin to be drawn up
- Insert the needle vertically through the rubber stopper of the insulin vial and push the plunger completely in expelling the air into the vial
- Turn the insulin device / vial upside down and pull the syringe plunger back gently, drawing in the prescribed dose of insulin
- Remove the needle from the device / vial and expel any air bubbles from syringe
- Staff and self-administering patients to safely dispose of used equipment in the sharps receptacle ¹¹

9. Continuous Subcutaneous Insulin Infusion (CSII) Pump Therapy

General Information

A CSII is an insulin pump worn 24 hours a day, 7 days a week by patients with Type I diabetes. It delivers rapid acting insulin through a flexible tube with cannula inserted subcutaneously, (usually near the abdomen ¹).

Patients using CSII pump therapy may also present with a Continuous Glucose Monitoring (CGM) system, which is a separate sensor to the pump, inserted under the skin that measures the level of glucose in the interstitial fluid.



Functions

The CSII pump has three functions:

- To deliver 24 hour continuous basal insulin flow (this replaces long acting insulin)
- Patient initiates bolus dose to cover the meal time rise in BGL (ideally calculated on the carbohydrate count ingested at meal times)
- Patient initiates correction doses to cover variations in BGL ¹.

Insulin pumps require:

- Operational knowledge for effective use
- Knowledge of carbohydrate counting to calculate insulin dose required
- Frequent monitoring of BGL ^{1,27}

All patients using a CSII pump are under the specialised care of either an Endocrinologist /Tertiary Diabetes Centre /PMH or Private Diabetes Educator (DE) and it is ESSENTIAL that the specialist team is contacted as soon as possible once the patient is admitted^{1,2}. This will enable a safe management plan to be formalised for ongoing care. CSII care is extremely individualised and often patients when unwell are unable to manage the required insulin adjustments using their pump therapy.

A video conference or phone link up with the DE/specialist team/ admitting team and patient managing the pump therapy is recommended during admission and prior to discharge. The patient will be responsible (in consultation with the team) for setting basal rates, determining bolus doses administered with meals or to correct elevated glucose levels and for set changes. The MO is responsible for the prescription and management of insulin therapy for the duration of the hospital stay. The patients' ability to self-manage is to be assessed and documented daily^{1,14}

Any changes to the pump insulin delivery settings should be clearly documented at the time they are implemented^{1,27}

General Management of Continuous Subcutaneous Insulin Infusion (CSII) Pumps

- Ensure patient has sufficient equipment and consumables²⁷
- Utilise hospital BGM as these are checked daily
- Patient is responsible for pump settings following predetermined algorithms²⁷

Baseline Prescription and Documentation

- Pump therapy to be prescribed on Medication Chart by MO
- Pump name and model, insulin delivery parameters including basal rates, insulin to carbohydrate ratios, correction factors, duration of insulin action and glucose targets²⁷
- Any changes to the pump insulin delivery settings must be conveyed to the patient¹

Adjusting Therapy

- Insulin prescribed on Medication Chart by MO
- Medication competent nurse / midwife to record the dose administered by the patient
- Document as ('s') on medication chart nurse / midwife to initial dose administered¹

Troubleshooting for Hyperglycaemia

It is important to ensure that it is not the pump, reservoir/cartridge, infusion set or insulin that is the source of the problem¹. The following table is a checklist to assist in troubleshooting.

Patient Troubleshooting Checklist

Infusion set	<p>Check tubing for air bubbles/spaces, blood and kinks Is there any insulin in the reservoir/cartridge? Is the tubing connected to the reservoir/cartridge? Has the set and insulin been changed in the last 72 hours? Check that insulin is clear, not crystallised or cloudy</p>
Infusion site	<p>Check the site for redness, lumps, swelling, tenderness, or discharge? Has the site been changed in the last 72 hours? Is the taping secure? Is there any smell of insulin, leakage or moisture at the site?</p>
Pump	<p>Is the time of day set correctly? Is it in the right basal program? Are the basal rates correct? (as documented on the medication chart) What was the last bolus amount and time delivered? Was the pump disconnected for any procedure? Is the pump in alert mode? (Suspend, low battery, low reservoir)</p>

Site Management

- Consult MO responsible for patient, and diabetes education if available if unsure of management ^{1,5}
- Patient to re site cannula and change line every 2-3 days (rotate insertion site)
- Avoid changing cannula late in evening (i.e. < 3 hours prior to sleep) unless there is a problem with the set
- Nurse / midwife to assess and document insertion site for inflammation and signs of infection each shift

Temporary Discontinuation of CSII

- Discontinuation will be determined on an individual basis, and may be required during a number of circumstances such as:
 - § Radiological investigation (e.g. CT or MRI scan)
 - § Physiotherapy
 - § Hydrotherapy
 - § Surgical procedure/ delivery
- If discontinuation of CSII is expected to exceed 30 minutes consider subcutaneous insulin prescription to cover short term requirements
- Reconnect the pump immediately post procedure / therapy to avoid prolonged disruption of therapy

Removal/ Disconnection of CSII Pump

- If the patient is unable to self-manage, liaise with MO to initiate alternative therapy prior to discontinuing pump
- Inform patient of procedure and obtain consent as appropriate
- Initiate alternative therapy as prescribed by MO and then cease the CSII

Procedure

- Lift tapes securing cannula off skin
- Gently remove subcutaneous cannula from patient skin.
- Clean site with isopropyl alcohol 70% impregnated wipes or betadine swabs (check for allergies)
- Disconnect tubing from pump and dispose of tubing and cannula appropriately
- Return pump to relative / significant other to take home or lock in patients medication drawer
- Document removal of device in the patient's medical notes

Contraindications to continued CSII Therapy

The following circumstances (a non-exhaustive list) may require CSII therapy to be substituted with either a subcutaneous insulin regimen or an intravenous insulin infusion:

- The patient is unable to operate the insulin pump ²⁷
- Impaired or fluctuating conscious state ²⁷
- Major psychiatric disorder
- Severe acute illness (e.g. diabetic ketoacidosis) requiring an insulin infusion
- Lack of supplies (e.g. infusion sets, batteries and other equipment)
- Lack of available cannula sites
- Concerns regarding technical malfunction of the pump
- Patient undergoing lengthy or complicated surgery, or serious medical illness likely to be accompanied by significant metabolic disturbance
- A procedure or investigation is planned potentially rendering CSII therapy ineffective, or the anaesthetic staff are not confident regarding the management of the pump.¹

BGL Monitoring Regimen

- If consistently meets individualised target parameters, monitor before each meal and at 2100hrs (i.e. 4-6 times/day)
- If BGL outside individualised target parameters monitor before meals and again two hours after meals
- Consider need for overnight monitoring for hypo/ hyper glycaemia e.g. performed at 0200hrs
- Two (2) hours after re-siting cannula patient is to perform BGL and report result to nursing staff who will document in patient records

10. Discharging a Patient Requiring Insulin

Prior to discharging a patient who is using insulin:

- Check that the patient is registered with the [NDSS \(National Diabetes Services Scheme\)](#), which entitles the patient to subsidised costs of blood glucose strips, and free insulin pens and needles.
- For newly diagnosed patients a MO or credentialed Diabetes Educator are required to sign the [NDSS registration form](#). For registered patients who have commenced insulin therapy a [NDSS Medication Change form](#) requires completion. Patients are required to provide completed forms to the NDSS, with many WA Pharmacies acting as NDSS agencies. (Pharmacies that are NDSS agencies can be located on the [NDSS web page](#)).
- Confirm the patient has a blood glucose meter and in date test strips.
- Check the injection technique and advise patient to obtain 4mm or 5mm insulin pen needles from their preferred NDSS agency Pharmacy.
- Check that the patient is familiar with their blood glucose monitoring times and is encouraged to discuss results with their GP or Diabetes Educator.
- Confirm the patient has a plan for the necessary insulin prescription. The labelled prefilled insulin pen that was in use whilst an inpatient can be taken by the patient on discharge.
- Check the patient understands the insulin dosage instructions and has a written list of all discharge medications.
- Check for patient understanding of insulin action, onset, peak, storage, disposal of sharps, expiry date, hypoglycaemia signs and symptoms and treatment.
- Check the patient has a follow up appointment with either GP, Diabetes Educator, or refer to [Diabetes WA Telehealth](#).

The main hazard for those who take insulin or glucose lowering medications is the unexpected occurrence of hypoglycaemia (a hypo). All people with diabetes must be provided with information on the risks associated with driving. Provide newly diagnosed diabetic patients with the [NDSS Diabetes and Driving – Above 5 to Drive](#) resource prior to discharge.

11. Fasting/ Procedure Care

General Information

Patients with diabetes who are required to fast for investigation/procedures must have their medication reviewed pre-emptively² Individualised, good blood glucose control throughout the perioperative period will improve patient recovery, reduce mortality and lead to early discharge.¹²

Patients normally controlled on oral hypoglycaemic medication or diet alone may need insulin during and immediately after surgery¹². Patients with diabetes requiring insulin may need an insulin infusion during fasting or may continue basal insulin. If required, insulin infusion should be commenced prior to procedure to allow BGL to stabilise. Refer to [Appendix 1](#) Intravenous Insulin Infusion Guidelines.

- All patients with diabetes are to be medically assessed prior to surgery or procedures that require fasting.¹³
- Medications to manage diabetes are to be reviewed.¹³
- Consideration to postpone elective surgery should occur when glycaemic control is poor.
- All patients treated with insulin should be managed in the same way, irrespective of the type of diabetes.¹⁴
- Morning procedures are preferable to avoid the need for prolonged fasting and minimize the risk of unstable BGL.¹³
- The need for alternate therapy should be considered by the treating team of Type 1 patients with a Continuous Subcutaneous Insulin Infusion (CSII) Pump.¹³
- Nursing staff to notify MO / Anaesthetist and shift coordinator if BGL outside of target range for individual.
- Patients undergoing surgery, bowel investigation, radiological and other imaging procedures that involve a period of fasting or the administration of radio – contrast, should be given pre and post-operative advice concerning their diabetes management. Patients undergoing bowel investigations or bowel surgery are usually required to drink clear fluids prior to the procedure and are at risk of hypoglycaemia. The patients' medical team should seek further guidance (e.g. from a regional physician) if unsure of management.¹⁴

Pre Procedure

- Assess recent blood glucose level, reason for fasting and current medications to guide the frequency of BGL monitoring.
- The patients' MO to document medication 'withheld' on the patients medication chart or adjust dose as appropriate to clinical circumstances.
- All prescribed oral medications should be given with approximately 30mL water during the fasting period unless advised by anaesthetist or MO.
- Normal site fasting guidelines apply, unless otherwise advised by anaesthetist or MO.
- Patients with diabetes who are fasting should have a BGL assessed and documented at 6 hours after commencement of fasting and then every 2 hours prior to procedure/surgery. Increase frequency of BGL monitoring as appropriate to clinical condition.
- Notify MO/anaesthetist and shift coordinator if BGL outside of target range for individual.

Intra-Procedure Key Principles

Good intraoperative BGL management is imperative to reduce the risk of adverse outcome. During the procedure, avoid insulin deficiency and anticipate the need for increased insulin requirements¹⁴. Intraoperative management may be dependent upon the patients' clinical condition, co morbidities, procedure and procedure length and therefore requires close communication between the anaesthetist, MO, nursing staff and patient.

- Aim to ensure optimum glycaemic control throughout the procedure.¹³
- Ensure normal electrolyte concentrations where possible.¹³
- Maintain stable intra – operative cardiovascular and renal function.¹³
- Provide sufficient antiemetic to enable an early return to a normal diet and usual diabetes regimen.¹³
- Care must be given to avoid pressure damage to feet during surgery.¹³
- Check the capillary blood glucose level prior to anaesthesia and the procedure¹³. Monitor the capillary blood glucose level regularly during the procedure (at least hourly – more frequently if readings outside the target range).¹³
- Correct a raised blood glucose using additional subcutaneous insulin or by introducing a variable rate intravenous insulin infusion. Avoid unnecessary use of variable rate intravenous insulin infusion and consider the most appropriate care on an individual basis.¹³
- Medical officer / Anaesthetist to prescribe fluid regimen as required.¹³
- Document the capillary blood glucose level, insulin infusion rate and substrate infusion on the anaesthetic chart.¹³
- Ensure arrangements are in place to admit high risk patients to critical care if needed¹.
- Maintain intravenous insulin infusion if prescribed.
- Monitor BGL hourly for 4 hours, then 2 hourly unless otherwise prescribed (refer to guidelines on Intravenous Infusions).
- Most medications can be recommenced once patient is tolerating diet (unless otherwise instructed).
- Recommence oral hypoglycaemic as per medical prescription.
- Subcutaneous insulin therapy may be required post operatively.

12. Glycaemic management in specific cases/situations

Glucocorticoid Therapy

- Steroids can affect blood glucose levels in people with and without diabetes.¹⁵
- Patients without diabetes commencing glucocorticoid steroid therapy should have their BGL monitored regularly (i.e. four times daily) to assess for the development of hyperglycaemia. The duration of BGL monitoring will vary depending on individual progress, results and as determined by the MO.^{2,16}
- Insulin is considered to be the agent of choice for the management of steroid induced hyperglycaemia in hospital.¹⁶
- Patients already on insulin will require daily dose review.^{2,16}

Enteral or Parenteral Nutrition

Enteral or parenteral feeding is used for patients where adequate nutritional intake cannot be achieved orally.

- Close liaison between the various clinical teams managing enteral or parenteral nutrition of the patient is critical ², including liaison with dietitian to determine nutrient requirements and feeding regime.
- Individualised nutritional plans (including the decision to use standard or diabetic enteral formulas) should be provided as insulin therapy will depend on the nature of the feeding cycle. ²
- Insulin therapy should include regular basal insulin (intermediate or long acting insulin) with prandial and correctional insulin if required. ²
- Sliding scale insulin infusions are not recommended. ²
- Patients with unstable metabolic control or variable parenteral feeding may benefit from intravenous insulin infusion therapy. ²
- Liaise with MO to determine frequency of BGL management for individual patient. With bolus enteral or parenteral nutrition perform BGL testing before each bolus is given. ²

Acute Stroke

Hyperglycaemia fluctuates in the first 72 hours post-acute stroke in both non diabetic and diabetic patients.

The Department of Health Stroke Services Project, which includes dedicated metropolitan-regional acute stroke pathways and tele-stroke service, provides timely specialist support regarding clinical care for stroke patients.

The Stroke Foundation Clinical Guidelines for Stroke Management (2010)¹⁷ recommend:

- On admission, all patients should have their blood glucose level monitored and appropriate glycaemic therapy instituted to ensure euglycaemia, especially if the patient is diabetic.
- An early intensive approach to the maintenance of euglycaemia is currently **not** recommended.

Palliative Care

An individualised degree of BGL management may benefit palliative care patients in hospital dependent upon their end of life phase and other clinical or situational influencing factors. The patients clinical team will determine the most appropriate degree of BGL management.^{2, 5}

Phase	Diabetes Management
Stable	<ul style="list-style-type: none"> • BGL management to be individualised.²
Unstable	<ul style="list-style-type: none"> • BGL management to be individualised.¹⁸ • If planned discharge, review and simplify BGL management and insulin regimen.¹⁸ • Individualised relaxation of diet restrictions.²
Deteriorating	<ul style="list-style-type: none"> • At admission review continued requirement for oral hypoglycaemic agents. • Review insulin regimen, consider altered nutritional intake.¹⁸ • A minimal insulin regimen to be considered if symptomatic hyperglycaemia. • Insulin should be continued unless otherwise requested by the patient or family. • BGL monitoring to be minimised (1-2 per day). Alternative Ketone checks are recommended for patient comfort. • BGL parameter 5.0-15.0 mmol/L (symptom control). • Remove diet restrictions. • Consider requirement for non-diabetes medications that exacerbate hyperglycaemia or hypoglycaemia. • Prior to any planned discharge, review and simplify BGL management and/or insulin regimen.²
Terminal	<ul style="list-style-type: none"> • The preferences of the individual or carer are priority.¹⁸ • Priority must be given to the individuals comfort.¹⁹ • A single daily injection of basal insulin administration may be required to maintain comfort by addressing severe hyperglycaemia and to prevent frank ketoacidosis. • Consider minimising/ceasing all glucose and ketone monitoring after the appropriate discussion with the patient or their carer.²

13. Compliance Monitoring

Evaluation, audit and feedback processes are to be in place to monitor compliance.

Failure to comply with this policy may constitute a breach of the WA Health Code of Conduct (Code). The Code is part of the [Employment Policy Framework](#) issued pursuant to section 26 of the [Health Services Act 2016](#) (HSA) and is binding on all WACHS staff which for this purpose includes trainees, students, volunteers, researchers, contractors for service (including all visiting health professionals and agency staff) and persons delivering training or education within WACHS.

WACHS staff are reminded that compliance with all policies is mandatory.

14. Legislation

Health Practitioner Regulation National Law (WA) Act 2010

Medicines and Poisons Act 2014

Medicines and Poisons Regulations 2016

Occupational Safety and Health Act 1984

Occupational Safety and Health Regulations 1996

Pharmacy Act 2010

State Records Act 2000

15. Standards

[National Safety and Quality Health Services \(NSQHS\) Standards, Version 1](#)

- NSQHS Standard 1: Governance
- NSQHS Standard 4: Medication Safety

[National Safety and Quality Health Services \(NSQHS\) Standards, Version 2](#)

- Clinical Governance for Health service Organisations Standard
- Medication Safety Standard
- Recognising and Responding to Acute Deterioration Standard

16. Related Forms

[MR157A WACHS Insulin Infusion Order Chart](#)

[MR140A WACHS Adult Observation and Response Chart](#)

17. Related Policy Documents

WACHS [King Edward Memorial Hospital \(KEMH\) Resources - Endorsed for Use in Clinical Practice Policy](#)

WACHS [Princess Margaret Hospital \(PMH\) Guidelines - Endorsed for Use in Clinical Practice](#)

WACHS [Medication Administration Policy](#)

WACHS [High Risk Medications Procedure](#)

18. Related WA Health Policies

[MP 0086/18 Recognising and Responding to Acute Deterioration Policy](#)

[OD 0651/16 Clinical and Related Waste Management Policy](#)

[OD 0484/14 Clinical Handover Policy](#)

[OD 0611/15 Clinical Incident Management Policy](#)

[OD 0657/16 Consent to Treatment Policy](#)

[MP 0084/18 Credentialing and Defining Scope of Clinical Practice Policy](#)

[OD 0486/14 Western Australian Patient Identification Policy 2014](#)

[OD 0561/14 WA High Risk Medication Policy](#)

19. WA Health Policy Framework

[Clinical Governance Safety and Quality Policy Framework](#)

20. Acknowledgement

Acknowledgement is made to the previous SMHS/WACHS site endorsed work used to compile this standard.

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22. Definitions

Term	Definition
Diabetes Mellitus	A chronic disease that occurs either when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose. Over time, failure to achieve optimal glycaemic control can cause macrovascular and microvascular damage in both type 1 and type 2 diabetes ^{1,20}
Pre-Diabetes Impaired Glucose Tolerance (IGT) and Impaired Fasting Glycaemia (IFG)	Are intermediate conditions in the transition between normality and diabetes. People with IGT or IFG are 10-20 times more likely to progress to type 2 diabetes within five years. Approximately 16% of the adult population could be considered in this category.
Hyperglycaemia	Raised blood glucose level is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. Also common among acutely ill patients due to stress-induced hyperglycaemia or therapies that increase BGL (e.g. TPN, steroids) ²¹

Hypoglycaemia	Is a condition in which the blood glucose level drops below the normal range due to an imbalance in glucose supply, glucose utilisation & insulin levels. ^{1,20}
Diabetic Ketoacidosis	Occurs when the body is producing large quantities of ketone bodies via the metabolism of fatty acids (ketosis) and the body is producing insufficient insulin to slow this production. Ketoacidosis is most common in untreated type 1 diabetes mellitus and can occur in people with type 2 diabetes, although this is uncommon. It is a life-threatening complication and accounts for up to 8-29% of all diabetes-related hospital admissions. It is characterised by a triad of: hyperglycaemia, ketosis and acidaemia. Ketoacidosis may result in increasing hyperglycaemia, polyuria, dehydration, hypovolaemia, electrolyte imbalance, confusion, coma and death ^{1,20,21}
Hyperosmolar Hyperglycaemic State (HHS)	is characterized by hyperglycaemia, hyperosmolarity and dehydration without significant ketoacidosis. Most patients are older and present with severe dehydration, focal or global neurologic deficits which can rapidly lead to mortality ^{20,22} Management priorities include rehydration, thromboprophylaxis and treatment of the precipitating cause ^{1,20,21}

American Diabetes Association (ADA) Etiologic Classification of Diabetes Mellitus

Type 1 diabetes (β -cell destruction, usually leading to absolute insulin deficiency)	Affects approximately 10% of people with diabetes and is characterised by a lack of insulin production. It requires daily administration of insulin. Onset is more common in children and young adults but can occur at any age ^{1,20,21}
Type 2 diabetes (ranging from predominantly insulin resistance with relative insulin deficiency to predominantly an insulin secretory defect with insulin resistance)	Affects approximately 90% of people with diabetes. The body often produces enough insulin but it is ineffective. In some situations less insulin may be produced over time leading to a situation where there is insufficient insulin which is also less effective. Type 2 diabetes was seen only in adults but it is now occurring in children ^{1,20,21}
Other Specific Types	The ADA recognises greater than 56 other specific types of diabetes reflecting approximately 2% of all diabetes cases, that arise as the consequence of some other well defined disease or predisposing factor. ²³
Gestational Diabetes Mellitus	Gestational diabetes mellitus (sometimes referred to as GDM) is a form of diabetes that occurs during pregnancy and usually goes away after the baby is born. It is diagnosed when higher than normal blood glucose levels first appear during pregnancy. ²⁴

Carer	Carers provide unpaid care and support to family members and friends who have a disability, mental illness, chronic condition, terminal illness, an alcohol or other drug issue or who are frail aged (Carers Australia, 2015)
Consumer	A person who uses, or may potentially use, health services. Depending on the nature of the health service organisation, this person may be referred to as a patient, a client, a consumer, a customer or some other term. Consumers also include families, carers, friends and other support people, as well as representatives of consumer groups
Direct supervision	Direct supervision is considered to be in the company of a registered nurse (RN) (OD 0376/12) or medical practitioner or visually via an emergency tele-health service

23. Appendices

[Appendix 1](#): Intravenous Insulin Infusion Guidelines.

[Appendix 2](#): Performing a Blood Glucose or Ketone test.

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Directorate:	Medical Services	TRIM Record #	ED-CO-15-66673
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Appendix 1: Intravenous Insulin Infusion Guidelines

The WACHS Medication Safety Committee notes the WA Health Medication Safety Group (WAMSG) intention to develop an Intravenous Insulin Infusion Chart and associated guidelines, at which time use of the WACHS MR157A Insulin Infusion Order Chart and associated guidelines will be reviewed.

An intravenous insulin infusion is recommended in the following situations:

- To manage poorly controlled type 1 and type 2 diabetic patients.
- For fasting, pre and post procedure type 1 and type 2 diabetic patients.

The WACHS MR157A Insulin Infusion Order Chart is used to document the prescribed insulin infusion regime, and is **NOT** recommended:

- For the management of diabetic emergencies diabetic ketoacidosis (DKA) or hyperosmolar hyperglycaemic state (HHS). Refer to regional guidance for the management of these emergencies
- In the management of children < 16 yrs
- For use in the management of patients receiving total parenteral nutrition (TPN)

Insulin infusion orders must be reviewed daily, and once the patient has resumed normal diet, transitioned to subcutaneous insulin.

Intravenous Insulin Infusion Guidelines

Independent double check of the concentration and the infusion rate against the prescription needs to occur to ensure the correct dose is administered to the patient. Intravenous insulin is lethal if given in substantially excessive doses or in place of other medications (insulin and heparin are often mistaken for one another since both are ordered in units). Medical officers will need to complete:

- the Insulin Infusion Order Chart
- Fluid Order Chart:
 - § with glucose containing fluid specified
 - § the required rate of infusion noted
 - § the insulin in saline (1 unit insulin/1 mL saline) prescription
 - § additional fluid orders if required. These should be infused through a second IV line.

Nursing/ midwifery staff will need to:

- sign and check orders on the Fluid Order Chart
- complete the reverse side of the Insulin Infusion Order Chart after each glucose reading.

People with diabetes mellitus Type 1 and Type 2 requiring insulin must have twenty-four hour insulin coverage.

Insulin

The following regimen is recommended as a guideline but insulin resistant patients may require higher infusion ratios and patients sensitive to insulin may require lower ratio.

- Using the concentration of one (1) unit/mL the usual rate of insulin administered is 2 – 6 units/hour i.e.: 2 – 6 mL/hour.
- If the patient to commence an insulin infusion is currently on sub cutaneous insulin, sum the total of units/ day, and divide by 24 to obtain the hourly rate. Infection, surgery, stress and insulin resistance usually increases the requirements.

Sample regimen:

Blood Glucose Level (BGL) (mmol/L)	Infusion Rate (Units/hr)
≤ 4	0 Stop infusion
4.1 - 8.0	2
8.1 - 12	3
12.1 - 16	4
≥ 16.1	6 Notify medical officer

When transitioning a patient back to subcutaneous insulin, insulin should be administered at least 60 minutes before the insulin infusion is discontinued. (the half-life of IV Actrapid insulin is less than 5 minutes.) Refer to transitioning to insulin page ²⁴.

Glucose

All patients (including fasting patients) on an IV insulin infusion must have a continuous IV glucose infusion. Recommendations regarding glucose infusion/rate:

- Fasting -Glucose 5% 10- 80mL/hr.
- Normal diet - Glucose 5% 10-40 mL/hr.
- Fluid restricted - 10% Glucose 20-40mL/hr.

Delivery Device and Preparation

A syringe pump with a 50 millilitre (mL) syringe is the recommended delivery device.

- Take a 50 mL leur lock plastic syringe and draw up to 60 mL 0.9% Normal Saline.
- Then using an INSULIN SYRINGE draw up 60 units of Actrapid insulin.
- Inject the insulin into the 50mL syringe.
- Gently mix.
- Connect the 50 mL syringe, which now contains the infusion mixture delivering to the extension tube.
- Ensure the correct brand of syringe e.g. Terumo or BD is programmed appropriately from the syringe driver menu.

- It is **essential** to flush through the first 10 mL to saturate the plastic tubing with insulin.
- Dial up infusion rate setting on the syringe pump (1mL = 1 unit of insulin).
- Note the rate setting must be checked with another nurse / midwife or a medical officer.
- All insulin infusions should be managed via a syringe pump.

Patient Monitoring and Management

- Blood Glucose Levels will be monitored at start of infusion, then two hourly unless ordered differently by a medical officer.
- Monitor the BGL hourly for two hours after ceasing the infusion and then as per routine protocol
- Electrolyte monitoring will occur as directed by the medical officer.
- Refer to the Hypoglycaemia management flowchart (Patients on Sulfonylureas or Insulin) regarding the management of patients on insulin infusions who present with low BGLs.

Line Changes

Infusion lines must be labelled appropriately and changed once every 24 hours.

Transitioning from an intravenous insulin infusion to Subcutaneous (subcut) Insulin

- If transitioning a patient back to a Continuous Subcutaneous Insulin Infusion (CSII) pump, WACHS staff must seek guidance from the patients Endocrinologist/ Tertiary Centre/ Pump Diabetic Educator.
- If transitioning to a long acting insulin, administer subcut insulin and continue infusion for a further two hours.
- If transitioning to a short/rapid acting insulin, administer subcut insulin and continue infusion for a further 60 minutes.
- An overlap with subcut insulin is required to maintain stable blood glucose levels.
- Can extrapolate the 24 hour requirements from an eight hour observation period.
- Give half the dose as long/intermediate acting insulin and half as rapid acting prandial insulin divided into three doses (for each meal).
- **ALL Type 1 patients** must have a basal (background) insulin along with the bolus (short acting) insulin.
- Preferably give subcut long acting insulin the night before ceasing insulin infusion.
- For patients with Type 1 diabetes who normally have their long acting (background) insulin at night, a stat order for 1/3 (one third) to 1/2 (one half) of their normal dose should be ordered if ceasing the infusion earlier during the day. The regular dose can then be administered that evening, with an extra BGL check to be performed at 02:00hrs.

Appendix 2: Performing a Blood Glucose or Ketone test.

Equipment

- Blood Glucose Meter (BGM) & test strips (A hospital blood glucose meter must be used and not the patients, as these are checked daily using control solutions).
- Lancets device.
- Cotton ball/ cloth.
- Sharps container.
- Gloves (non-sterile).

To reduce the transmission of transient microorganisms, take the BGM out of its storage container before entering the patients room/bed area, and limit the number of consumables taken to the patients room/bed area.

Procedure

- **Perform hand hygiene**
- Insert the test strip into the BGM. Check the expiry date and lot number of strip matches that displayed on the monitor. If numbers do not correlate open a new box of test strips and calibrate the meter.
- Clean area prior to testing and dry thoroughly (do not use an alcohol wipe as it may affect the result).
- **Put on non-sterile gloves**
- Place lancet firmly onto selected side, press firing button.
- Needle retracts into device immediately after firing.
- Dispose lancet into sharps container.
- Massage finger to assist blood flow, starting at the base of the finger.
- Hold sensor strip to blood sample and blood will be drawn into the strip.

Performing a Blood Glucose or Blood Ketone Test



- 1. Open the foil test strip packet at the notch and tear down to remove the test strip.**
- 2. Insert the test strip into the meter until it stops. This will turn on the meter.**
Notes:
 - Be sure to check that your meter screen is working properly each time you turn your meter on. If you see any white segments in the black off screen, or any black segments in the white test screen, there may be a problem with the meter. (See Section 5, Getting to Know Your Meter, for more details)
 - The meter turns off after 3 minutes of inactivity. Remove and reinsert the unused test strip to restart the meter.

The  blinks, indicating the meter is ready for you to apply a sample to the test strip.

Note: *KET* will appear on the screen if you have inserted a purple blood ketone strip.
- 3. Obtain a blood sample.**
 Use the lancing device to obtain a blood sample. (See lancing device instructions for use for more information.)
- 4. Apply blood to the test strip.**
 Bring the blood drop to the white area at the end of the test strip. The blood is drawn into the test strip. **Hold** blood to test strip until you see 3 short lines on the meter screen. This means you have applied enough blood.
Notes:
 - If you are testing blood glucose, you will see a 5-second countdown. If you are testing blood ketone, you will see a 30-second countdown.
 - Do **not** remove the test strip from the meter during the countdown.
 - If the countdown does not start, you may not have applied enough blood to the test strip. See test strip instructions for use for re-application instructions. If the countdown still does not start, remove the used strip and discard it correctly. Start a new test with a new test strip.

Post Procedure

- Apply gentle pressure using cotton ball/ tissue to puncture site. Hold until bleeding stops (patient may assist as appropriate).
- Dispose of cotton ball/tissue and gloves. **Perform hand hygiene.**
- Wipe over BGM after use with large isopropyl 70% alcohol wipes, ensuring moisture does not enter the strip port.²⁵
- If the test result is inconsistent with clinical condition of the patient:
 - Perform a control test.
 - If result is still inconsistent liaise with MO who may perform arterial / venous blood gas or full blood picture to evaluate BGL.
- If BGL is outside of individualised target range, inform MO and shift coordinator for further management plan. Document actions undertaken and outcome in the patients' medical record.



(Source: Abbott FreeStyle Optium Neo Blood Glucose and Ketone Monitoring System Owners Setup Guide. https://freestylediabetes.ie/images/uploads/products/Neo_manual.pdf Accessed 1 August 2016.)

Quality Control testing of Blood Glucose Meters

Clinical staff are to ensure equipment is calibrated according to manufacturer's instructions and the site quality control check log is maintained daily²⁶ to ensure the equipment meet the pre-set standards of performance. It is the nurse / midwives responsibility to ensure it is in working order and any faults reported. For guidance on performing clinical control testing refer to the operator manual accompanying the BGL equipment.