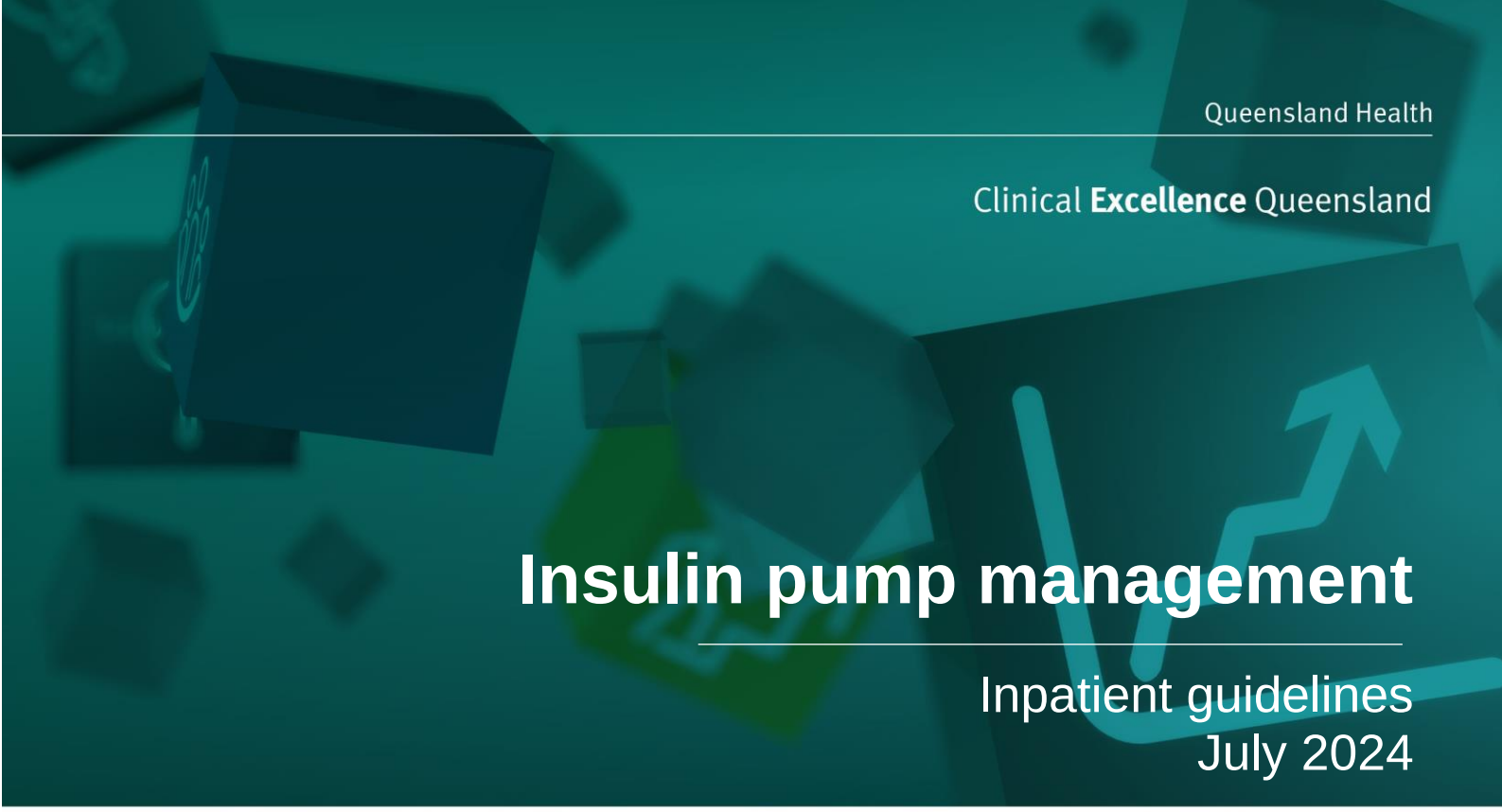

Queensland Health

Clinical **Excellence** Queensland

Insulin pump management

Inpatient guidelines
July 2024

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Queensland Government

Insulin pump management: Inpatient guidelines

Published by the State of Queensland (Queensland Health), July 2024
IBNN or ISBN if needed

For more information contact:
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An electronic version of this document is available at https://clinicalexcellence.qld.gov.au/priority-areas/clinician-engagement/queensland-clinical-networks/diabetes/diabetes-network

Contents

Purpose

These guidelines have been developed to provide evidence-based guidance to Queensland Health personnel regarding the use of insulin pumps during hospital admissions. Despite the effectiveness of insulin pumps in managing Type 1 Diabetes Mellitus (T1D), healthcare professionals may lack familiarity with their operation. These guidelines support uninterrupted pump use throughout hospitalisation, enabling individuals living with T1D to self-manage their pumps post-assessment of their capability. They offer a structured approach for evaluating pump users, documenting proficiency, and making discontinuation recommendations when necessary.

Background

An insulin pump is a compact, computerised device that continuously delivers rapid acting insulin via a subcutaneously inserted infusion set. Programmed with individualised settings, the pump delivers continuous basal insulin, along with bolus doses at mealtimes or to correct hyperglycaemia, negating the need for multiple daily injections. It relies quires on glucose level and carbohydrate intake data to calculate insulin dose, with some pumps using mobile phone apps for this purpose. Insulin pumps are worn 24 hours a day, however they can be disconnected or removed for up to 2 hours for activities such as showering.

The use of diabetes technology to manage T1D is increasing, however non-specialised health professionals may lack detailed knowledge of specific insulin pump details and function. Many current insulin pumps interact with Continuous Glucose Monitoring Systems (CGMS) to form a hybrid closed loop system. A Hybrid closed loop system uses CGMS feedback to predict glucose trends and adjust insulin delivery by reducing, suspending or increasing insulin delivery. In the absence of CGMS feedback, basal insulin is delivered at the pre-set rates, and users manually deliver bolus insulin for carbohydrate (CHO) and glucose corrections via the pump and/or phone app. In the absence of a linked CGMS, basal insulin is delivered at pre-set rates, and users manually deliver bolus insulin for carbohydrates and glucose corrections through the pump.

What are the components of an insulin pump?

There are two primary components to an insulin pump:

1. Insulin Pump
    - Delivers programmed insulin doses.
    - Contains a reservoir for holding rapid acting insulin.
    - The reservoir is typically replaced after 2-6 days depending on the manufacture's recommendations and individual insulin use.
2. Infusion Set and Cannula
    - Infusion set connects to the insulin pump, and the other end attaches to a plastic or steel cannula.
    - The cannula is inserted into subcutaneous tissue and held in place by an adhesive dressing.
    - Typically, the cannula is sited in the abdomen, legs or buttocks.
    - Both the infusion set, and cannula are replaced every 2 - 3 days depending on the manufacture's recommendations.

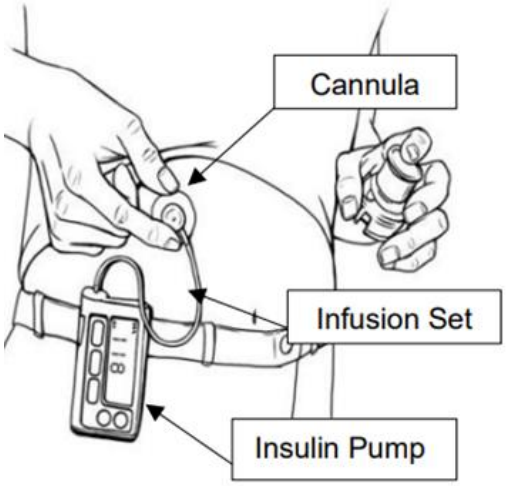


Figure 1 Primary components to an insulin pump

An alternative to traditional insulin pumps is a patch pump, a tubeless insulin delivery system such as the Omnipod Dash. Inserted into the subcutaneous tissue, the Omnipod Dash provides rapid acting insulin for up to 72 hrs and is controlled via a Personal Diabetes Manager device, similar to a mobile phone. The device can be worn on the arm, buttock, leg or stomach.

Figure 2 Ominpod Dash patch insulin pump (external and internal)

Unlike multiple daily injection (MDI) therapy, which utilises both long acting basal and rapid acting bolus insulin, an insulin pump exclusively administers rapid acting insulin. Consequently, the sudden cessation or failure of an insulin pump can result in rapid increase in blood glucose levels (BGL) and onset of ketosis within 4- 6 hrs, posing a significant risk of severe hyperglycaemia and diabetic ketoacidosis (DKA) in individuals living with T1D. In such cases, immediate initiation of alternative insulin therapy, such as intermittent subcutaneous injections or second option an IV infusion is crucial.

During hospitalisation, it should be assumed, unless otherwise instructed, that only the individual with T1D or, in the case of children or cognitively impaired, their designated caregiver (parent/guardian/partner/carer), can manage the pump. Any changes to insulin administration will need to be made by the individual or their care provider who possesses the necessary skills to operate the pump. If concern arises regarding the use of an insulin pump, the inpatient Endocrinology/ Diabetes team should be promptly notified.

Assessment

Upon admission or presentation to an emergency department (ED), individuals living with T1D using an insulin pump must undergo an assessment by a healthcare professional to evaluate their ability to manage their insulin pump during their hospitalisation. Ideally, this assessment should be conducted by a Credentialled Diabetes Educator (CDE), Diabetes Clinical Nurse, Endocrinology team or a designated diabetes resource person for the hospital. However, any healthcare professional can perform the assessment if necessary. The *Insulin Pump Management Checklist* (Appendix 1) should be utilised as a tool to guide this assessment process.

Assessment involves the following criteria:

- Ability to navigate the pump menu or access the appropriate applications on the individual's phone.
- Demonstration of adjusting both basal rates and bolus settings or relevant HCL settings/modes
- Understanding of how to refill their insulin reservoir/cartridge and re-site their pump cannula
- Troubleshooting and managing cannula site and infusion line issues
- Ability in problem-solving actions in response to BGLs deviating from target range.
- Availability of an adequate supplies of infusion sets, reservoirs, spare batteries, charging cable, and rapid acting insulin for the anticipated duration of the admission.
- Understanding of the insulin pump failure plan in the event of pump malfunction during hospitalisation.

Following the above assessment, healthcare professionals should notify a CDE, diabetes Clinical Nurse or designated diabetes resource person upon admission of an individual living with T1D using an insulin pump. These professionals can provide guidance or address any concerns, enabling the patient to continue insulin pump therapy. The assessment should be reassessed daily to ensure continued eligibility for self-management. If the patient or caregiver can no longer meet criteria for self-management at any point, insulin pump therapy should be discontinued, and an alternative insulin regimen initiated.

Situations where an insulin pump is not advised

1. Altered level of consciousness.
2. Critically ill requiring stabilisation in the Intensive Care Unit.
3. Serious mental health conditions where the individual is at risk of self-injury or suicide.
4. Diabetic Ketoacidosis (DKA).
5. Impaired judgement.
6. Any other intercurrent illness affecting their ability to use the insulin pump.
7. Individual living with T1D or caregiver refuses or is otherwise unable to participate in care.
8. Lack of insulin pump consumables such as infusion sets, cartridges and other required equipment.
9. Lengthy and/or complicated surgery.
10. Upon assessment, they are unable to use the insulin pump.
11. Any other medical circumstance deemed unsuitable by the supervising medical officer.

If any of the above situations arise, urgent discussion of the individual's condition and management with the Endocrinology/Diabetes team or designated diabetes resource person should be considered.

If the individual presents with any of above points, the insulin pump must be discontinued, and the pump managed according to the hospital's policy for storage of patient valuables. This must be documented. When storing the pump, be sure to remove the battery or power down the pump to prevent ongoing pump alarms, as required. Alternatively, ask a relative to take the insulin pump home for safekeeping.

To minimise risk of DKA, the individual should be immediately commenced on subcutaneous injections or an IV insulin infusion during their inpatient admission. If the individual living with T1D is hypoglycaemic (BGL under 4 mmol/L), they require immediate treatment with fast acting carbohydrate according to hospital policy. Once BGL is 4 mmol/L or higher, insulin can then be commenced.

Documentation

Upon admission of an individual living with T1D using an insulin pump, the admitting medical officer (MO) holds responsibility for coordinating various aspects of care. This includes consultation with the individual's diabetes specialist (e.g. Endocrinologist), CDE experienced in insulin pump management, and dietitian whenever possible to optimise individual management. In Queensland Health facilities, documentation should be completed using an *Insulin Patient's Own Pump Powerplan* in ieMR. Alternatively, if ieMR is unavailable, the insulin pump (inpatient) insulin order form can be accessed from the clinical forms catalogue. It is imperative to note that primary documentation of the insulin pump should be performed by a registered nurse (RN), ensuring accurate and comprehensive record-keeping throughout the individual's hospitalisation.

Table 1 below outlines the documentation requirements necessary for managing individuals with T1D using insulin pumps during hospital admission, along with the corresponding responsibilities of the healthcare professionals involved.

Table 1 Documentation requirements and responsibilities

Documentation Requirement	Responsible clinician
Assessment and approval of insulin pump use	Admitting MO
Prescribing insulin for the insulin pump	Admitting MO
Frequency of blood glucose and ketone monitoring	Admitting MO
Emergency management and escalation plans	Admitting MO
Insulin pump failure plan for multiple daily injections	Admitting MO
Recording brand name and model of pump	Admitting MO
Explanation of inpatient management	Admitting MO
Daily review of pump settings and documentation	Admitting MO, RN
Documentation of cannula, tubing, and insulin changes	Admitting MO, RN
Prescribing alternative insulin	Admitting MO

Consultation with diabetes specialist, CDE, dietitian	Admitting MO
Documentation in ieMR or clinical forms catalogue	Admitting MO, RN

Daily management

Only individuals with T1D or their caregivers who have undergone assessment may manage the insulin pump during hospitalisation. Upon admission of an individual living with T1D using an insulin pump, nurses must adhere to the following guidelines:

Communication

- Communicate during handover that the individual/carer is self-managing their insulin pump.
- Utilise a daily form/checklist for documentation purposes (see Appendix 1).

Notification

- Notify the Endocrinology or Medical Team if the patient is required to fast or if there are significant changes in the individual's condition that may require their input.
- If Endocrinology is not available, ensure appropriate communication channels are established with the responsible healthcare team.

Monitoring

- Monitor blood glucose levels and ketones using a hospital point-of-care (POC) blood glucose machine.

Documentation

- Document carbohydrate intake in grams, as advised by the individual or caregiver. Alternatively, reference hospital menus for carbohydrate content, if available.
- Document basal rates (units/hr) as per insulin pump, unless using a hybrid closed-loop insulin pump, each time a blood glucose level is entered and/or with every bolus delivered.
- Witness and document insulin boluses administered for a meal, snack, or correction.
- Document all changes to insulin delivery, including temporary basal rates, suspension of insulin pump, or if the insulin pump is disconnected. If using a HCL pump to document any temporary targets used by the pump/phone app.
- Check the cannula insertion site each shift for redness or swelling and escalate concerns to the Endocrinology team. Document findings in ieMR under "iView: Subcutaneous Line/Subcutaneous site condition".
- Document insulin pump cannula, tubing, and insulin changes, which are required every 2-3 days or as per insulin pump company recommendations. Ensure cannula sites are rotated appropriately to avoid lipohypertrophy or infection.

Further Information

- If ieMR is unavailable, the insulin pump (inpatient) blood glucose record form can be found on the clinical forms catalogue.

Consultations

When managing individuals living with T1D using insulin pumps, consultation with the following healthcare professionals is essential to optimise insulin pump therapy and improve outcomes:

Endocrinologist, Nurse Practitioner or Physician with interest in diabetes

Provides comprehensive management of diabetes, including insulin therapy optimisation and

management of comorbidities.

CDE or diabetes resource person trained in insulin pump management

Offers expertise in fine-tuning insulin pump settings, troubleshooting issues, and providing patient education on insulin pump therapy.

Additional multidisciplinary team members

Depending on the individual needs, consider consulting with dietitians for carbohydrate management or mental health professionals for addressing psychological aspects of diabetes care.

Blood glucose monitoring

Individuals using an insulin pump should perform a minimum of four blood glucose level checks per day (unless using a CGMS). These should be performed before each main meal and at bedtime.

For individuals living with T1D with blood glucose levels outside of their target range, six checks per day are recommended. This entails one check before and two hours after each of the three main meals, with an overnight blood glucose check (e.g. 0200hrs) also recommended.

Additional blood glucose level checks may be undertaken at any time by the individual as needed or if low glucose is suspected. Additionally, medical officers or nursing staff may also request extra checks when clinically indicated.

The frequency of glucose level checks performed each day can only be modified under medical officer orders and can never be reduced to less than four checks daily. This ensures diligent monitoring tailored to individual needs while upholding safety and efficacy standards in diabetes management.

Continuous glucose monitoring systems (CGMS)

CGMS measure level of glucose in interstitial fluid and readings are provided continuously. It consists of a sensor inserted under the skin, which interprets glucose levels in a transmitter and transmits this data to a receiver. The receiver may be a specific device, insulin pump or a smartphone, depending on the make / model of the transmitter.

The disposable CGMS sensor should be replaced according to manufacturer recommendations, typically every 7-14 days. Calibration may be necessary for accuracy and is achieved with a capillary blood glucose check. It is important to note that transmitters are not to be discarded if applicable to that particular system or if the system has a separate component. They are reusable with varying lifespans from 3 months to 12 months depending on the brand.

During hospital admissions, particularly in critical conditions when glucose levels are rapidly changing or in episodes of DKA, CGMS should not be used for diabetes management and POC capillary blood glucose checks should be implemented. Please refer to the Inpatient use of Continuous Glucose Monitors CGMS guidelines for further information.

Insulin pump management

The individual or caregiver is responsible for:

- Ensuring the correct operation of the insulin pump.
- Rotating the infusion set consistent with the recommendations for the device. Every two days for a steel cannula, every three days for a plastic cannula, or every seven days for an Extended® infusion set.
- Adjusting the insulin pump settings.
- Administer all bolus doses.

If the individual living with T1D is unable to perform these actions, the insulin pump must be discontinued.

Operations and procedures

The use of insulin pumps in operating theatres and procedure rooms is feasible however requires careful consideration. Decision making regarding their use should involve collaboration between the anaesthetist, surgeon, physician, CDE and the individual or caregiver. The outcomes of these discussions should be documented in the *Insulin Pump Management Checklist* (Appendix 1) and in the individual's chart.

Insulin pumps operating in basal infusion mode, offer the advantage of delivering stable and consistent insulin administration over extended periods, aiding in maintaining blood glucose levels within target ranges during procedures.

For individuals living with T1D who are unconscious during surgery, vigilant monitoring is necessary throughout and post-procedure. Blood glucose levels should be frequently monitored (1-2 hourly) while their conscious state is impaired.

However, the use of insulin pumps in major procedures is not recommended due to the potential need for insulin therapy adjustments during the prolonged peri-operative period. Additionally, insulin pump therapy with a metal canula is contraindicated during procedures involving diathermy, magnetic resonance imaging (MRI), computed tomography (CT) scan or procedures that require medical imaging. In such cases, discontinuation of the insulin pump and initiation of intravenous (IV) insulin infusion are recommended to ensure optimal management.

Individuals continuing an insulin pump peri-operatively

The individual or legal caregiver **must consent** to continuing insulin pump therapy peri-operatively. Individuals should bring with them a printed record of their latest pump download including pump settings, recent glucose levels and continuous glucose monitoring device reports.

The infusion set should be changed within 24 hours before surgery with the infusion site placed at a distant site from proposed surgical site. The patient must confirm that the new site is working properly.

Below are key considerations and guidelines to follow regarding insulin pump management in the peri-operative setting:

- Change infusion set within 24 hours before surgery, positioning the infusion site away from the proposed surgical site. Verify proper functionality of the new site.

- Ensure insulin pump and IV insulin therapy do not run concurrently.
- If using the pump during surgery, replace metal cannulas with plastic insertion cannulas before any procedures involving diathermy and medical imaging.
- Place the infusion site away from the operation site, considering diathermy pad placement.
- Attach an identification tag stating the individual's insulin pump usage in a visible position suitable for the procedure. Ensure the anaesthetist has access to the pump during surgery for necessary adjustments or disconnection.
- Maintain usual basal rates during fasting, continuing pre-set basal infusion rates throughout surgery.
- For individuals with tight glycaemic targets (HbA1c <6.5% or fasting BGL trends <5mmol), consider a temporary basal of 80% (20% reduction).
- Monitor blood glucose levels hourly peri-operatively until the individual regains consciousness and can manage their insulin pump.
- If blood glucose levels become unfavourable, initiate an IV insulin infusion and turn off or disconnect the pump.
- In case of hypoglycaemia (BGL <4mmol/L) peri-operatively, turn off or disconnect the insulin pump and treat hypoglycaemia with IV glucose until euglycemia is restored.

Once euglycemia is restored, there are three choices regarding recommencement of the Insulin pump.

1. Recommence the pump at a lower insulin infusion rate. Consider the use of a temporary basal rate for flexibility and to avoid confusion.
2. Recommence the pump at the usual basal rate with a higher IV glucose infusion rate to prevent further hypoglycaemia episodes.
3. Keep the pump off and commence an IV insulin infusion to manage the individual’s BGLs.

Major Procedures

In major procedures, the use of insulin pumps should be only considered in exceptional circumstances due to the high likelihood of necessitating adjustments to insulin therapy throughout the prolonged peri-operative period. It is recommended to cease the insulin pump and initiate IV insulin therapy.

Individuals living with T1D whose insulin pump is discontinued prior to surgery will require either intravenous insulin infusion or subcutaneous therapy according to the hospital’s peri- operative type 1 diabetes management guidelines. Discontinuing the insulin pump without an alternative source of insulin, even for brief intervals, will result in the rapid onset of hyperglycaemia.

Recommencement of the insulin pump is feasible under the following conditions:

1. The individual has regained full consciousness.
2. Medical appropriateness has been determined.

Insulin pump management for pregnancy and birth

Insulin pump management during pregnancy, labour and childbirth is deemed safe, provided the woman is competent in the insulin pump operation and are under the care of a multidisciplinary team experienced in the managing pre-existing diabetes in pregnancy. This team typically includes an endocrinologist, obstetric physician, obstetrician and CDE.

Prior to labour (whether spontaneous or induced) or caesarean section, a plan for peripartum management of the pump should be documented. Local policies should be followed due to variations in clinical practice. Clinicians unfamiliar with managing women with pre-existing diabetes during the peripartum period should seek advice from a specialist.

For women undergoing an elective caesarean section, the infusion set should be changed the day before the procedure, allowing sufficient time for verification of correct functionality. Additionally, the infusion set and CGMS (if applicable) should be positioned well away from the surgical field. For safety during diathermy, a Teflon cannula (instead of metal) is required. Alternatively, IV insulin and glucose infusions can be considered.

More detailed guidance on managing pre-existing diabetes in pregnancy can be found in the Australasian Diabetes in Pregnancy (ADIPS) guideline, accessible via this link: https://obgyn.onlinelibrary.wiley.com/doi/full/10.1111/ajo.13265

Paediatrics

The decision to use an insulin pump in a paediatric case should be made in consultation with the medical team, ideally involving the paediatric endocrine team if available. The caregiver is responsible for managing the insulin pump and must continuously accompany their child throughout the hospital admission. They must ensure compliance with all criteria outlined in this document. If the specified criteria cannot be met, the insulin pump should be discontinued, and multiple daily insulin injections should be initiated.

When should an insulin pump be disconnected

Temporary disconnection of the insulin pump halts all insulin delivery, including both basal and bolus delivery. It is important not to disconnect during bolus delivering, as it will not resume the remaining bolus delivery. Reasons to temporarily disconnect from the insulin pump include:

- Showering
- Radiological investigations (pump must be removed)
- CT scans (pump must be removed)
- MRI scan (pump must be removed, including metal cannula)
- Physiotherapy (depending on the therapy, CGMS can remain)
- Hydrotherapy (even if the pump is labelled as waterproof, CGMS can remain).

The quick disconnection device allows the individual living with T1D to disconnect the pump and tubing without removing the entire infusion set. This is not applicable if wearing an Omnipod pump.

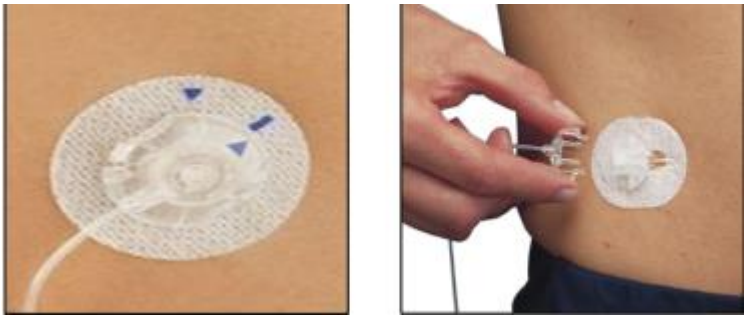


Figure 3 Examples of how to disconnect a pump

In cases where the individual living with T1D requires disconnection of their insulin pump for longer than two hours, consider subcutaneous short-acting insulin injections, such as Humalog, Novorapid or Apidra, to cover their short-term requirements.

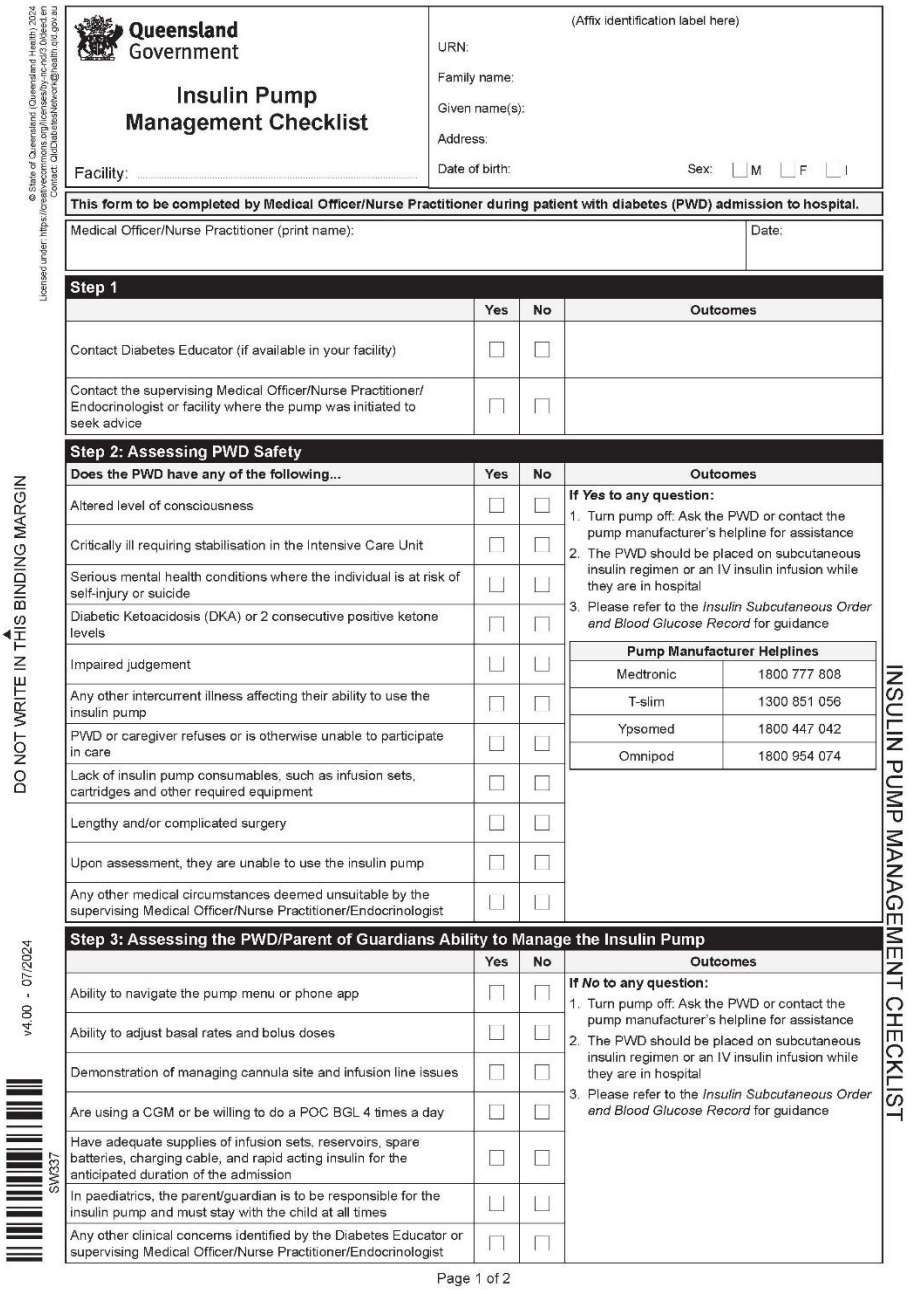
Alternatively, if the individual is clinically stable and BGLs are regularly monitored, the pump can be discontinued for up to two hours at the discretion of the treating doctor. Upon resuming pump use, BGLs should be rechecked, and if necessary, a correction bolus can be administered.

For individuals who require frequent disconnection from their insulin pump, transitioning to multiple daily injections may be appropriate.

Appendices

Appendix 1

Insulin Pump Management Checklist



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Insulin Pump Management Checklist

Facility: .....

(Affix identification label here)

URN:

Family name:

Given name(s):

Address:

Date of birth: Sex: ☐ M ☐ F ☐ I

This form to be completed by Medical Officer/Nurse Practitioner during patient with diabetes (PWD) admission to hospital.

Medical Officer/Nurse Practitioner (print name):	Date:

Step 1

	Yes	No	Outcomes
Contact Diabetes Educator (if available in your facility)	☐	☐	
Contact the supervising Medical Officer/Nurse Practitioner/ Endocrinologist or facility where the pump was initiated to seek advice	☐	☐	

Step 2: Assessing PWD Safety

Does the PWD have any of the following...	Yes	No	Outcomes
Altered level of consciousness	☐	☐	**If *Yes* to any question:** 1. Turn pump off: Ask the PWD or contact the pump manufacturer's helpline for assistance 2. The PWD should be placed on subcutaneous insulin regimen or an IV insulin infusion while they are in hospital 3. Please refer to the *Insulin Subcutaneous Order and Blood Glucose Record* for guidance
Critically ill requiring stabilisation in the Intensive Care Unit	☐	☐	
Serious mental health conditions where the individual is at risk of self-injury or suicide	☐	☐	
Diabetic Ketoacidosis (DKA) or 2 consecutive positive ketone levels	☐	☐	
Impaired judgement	☐	☐	
Any other intercurrent illness affecting their ability to use the insulin pump	☐	☐	
PWD or caregiver refuses or is otherwise unable to participate in care	☐	☐	
Lack of insulin pump consumables, such as infusion sets, cartridges and other required equipment	☐	☐	
Lengthy and/or complicated surgery	☐	☐	
Upon assessment, they are unable to use the insulin pump	☐	☐	
Any other medical circumstances deemed unsuitable by the supervising Medical Officer/Nurse Practitioner/Endocrinologist	☐	☐	

Pump Manufacturer Helplines	
Medtronic	1800 777 808
T-slim	1300 851 056
Ypsomed	1800 447 042
Omnipod	1800 954 074

Step 3: Assessing the PWD/Parent of Guardians Ability to Manage the Insulin Pump

	Yes	No	Outcomes
Ability to navigate the pump menu or phone app	☐	☐	**If *No* to any question:** 1. Turn pump off: Ask the PWD or contact the pump manufacturer's helpline for assistance 2. The PWD should be placed on subcutaneous insulin regimen or an IV insulin infusion while they are in hospital 3. Please refer to the *Insulin Subcutaneous Order and Blood Glucose Record* for guidance
Ability to adjust basal rates and bolus doses	☐	☐	
Demonstration of managing cannula site and infusion line issues	☐	☐	
Are using a CGM or be willing to do a POC BGL 4 times a day	☐	☐	
Have adequate supplies of infusion sets, reservoirs, spare batteries, charging cable, and rapid acting insulin for the anticipated duration of the admission	☐	☐	
In paediatrics, the parent/guardian is to be responsible for the insulin pump and must stay with the child at all times	☐	☐	
Any other clinical concerns identified by the Diabetes Educator or supervising Medical Officer/Nurse Practitioner/Endocrinologist	☐	☐	

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INSULIN PUMP MANAGEMENT CHECKLIST

Queensland Government

Insulin Pump Management Checklist

(Affix identification label here)

URN:

Family name:

Given name(s):

Address:

Date of birth: Sex: ☐ M ☐ F ☐ I

Step 4: Operations and Procedures

Discuss use of insulin pump in operating theatre and procedure room with...	Yes	No	N/A	Outcomes
Anaesthetist	☐	☐	☐	
Surgeon	☐	☐	☐	
Physician/Endocrinologist/Nurse Practitioner	☐	☐	☐	
Diabetes Educator	☐	☐	☐	
PWD	☐	☐	☐	

Step 5: Documentation

Before the PWD continues on the insulin pump as an inpatient, the following must be documented in the PWD's chart and the *Blood Glucose Monitoring* form:

1. Place a sticker on the inside of the medical record in the alerts section and on the *Insulin Subcutaneous Order and Blood Glucose Record* stating
   a. brand name and model of insulin pump;
   b. manual pump or automated insulin delivery (AID) system (a pump that delivers auto corrections);
   c. type of insulin used;
   d. current basal and bolus doses;
   e. target BGLs;
   f. insulin : carbohydrate ratio;
   g. CGM brand/model;
   h. correction factor (insulin sensitivity).
2. Any changes to the insulin regimen recommended by medical staff during this admission are documented in the medical record and confirmed by the PWD at the time of implementation.
3. Complete *Insulin Subcutaneous Order and Blood Glucose Record* stating that the PWD is self-managing and the frequency of BGLs. Initial BGL frequency is standard if BGLs stable. If BGLs unstable frequency is standard plus 2 hours post-meals and 02:00 hours.

Comments:

Clinician (print name):	Designation:	Signature:	Date:

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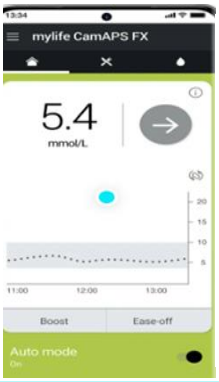
Appendix 2

Insulin pumps and technical support contacts

Medtronic 780g with Smartguard	Tandem T slim with Basal or Control IQ
	
Medtronic 24/7 Technical support **Phone no. 1800 777 808**	**AMSL 24/7 Technical Support** **Phone no.1300 851 05**
CGMS: Guardian 3 or Guardian 4 Medtronic 780G options: *Manual mode* – uses pre-set manual pump settings, with CGMS suspends insulin to prevent hypoglycaemia. Can set temporary basal rates. *Smartguard* - advanced hybrid closed loop technology. Smartguard glucose target options 5.5mmol/L, 6.1mmol/L or 6.7mmol/L. A Temporary target (Temp Target) of 8.3mmol/L can be used to prevent hypoglycaemia with activity.	CGMS: Dexcom G6 Tandem T slim options: *Basal IQ* – uses pre-set manual pump settings, with CGMS suspends insulin to prevent hypoglycaemia only, or *Control IQ* - hybrid closed loop, adjusts insulin delivery from pre-set pump settings for both high and low glucose levels. Option for exercise mode activation to reduce insulin delivery.
Reservoir capacity: 300 units. Uses 1 x AA battery. Waterproof IpX8	Reservoir capacity: 300 units. No battery, T slim pumps needs to be recharged every day.
Infusion sets: **Quickset.** Teflon 6mm or 9 mm cannula **Silhouette.** (angled) Teflon 13mm or 17 mm cannula. **Mio.** Teflon 6mm or 9 mm cannula **Sure-T Steel**. 6mm, 8mm or 10mm Steel cannula.	Infusion sets: **Autosoft**. 6mm or 9 mm Teflon cannula **Autosoft 30** (angled) 13mm Teflon Cannula **Varisoft** (angled) 13mm or 17 mm teflon tubing **TruSteel** 6mm or 8mm Steel cannula
Minimum basal 0.025units/hr. Basal increments 0.025units/hr. Bolus Increments 0.025 units	Minimum basal 0.1 units/hr (or 0units/hr). Basal Increments 0.001units/hr Bolus increments 0.01units

Data can be viewed via Care Link: https://carelink.medtronic.eu/login	Data can be viewed via Glooko https://glooko.com/
Ypso Pump with Cam APS FX app	**Omnipod Dash**
 	
YpsoMed Australia **24/7 Technical Support** **Phone no.1800 447 042**	**Insulet Customer Care** **24/7 Technical Support** **Phone no. 1800 954 074**
CGMS: Dexcom G6 Ypso pump options: *Manual mode* – uses pre-set manual pump settings when no CGMS or mobile phone app available, can set temporary basal rates. *Cam APS FX* app - hybrid closed loop insulin delivery automated via the Cam APS FX android mobile phone app using CGMS. Basal rates are set in the pump. Optional features “Ease off” reduces insulin delivery or “Boost” increases insulin delivery.	The pod is a small tubeless device, filled with insulin and worn attached to the body. Insulin is delivery is programmed and delivered using a Personal Diabetes Manager (PDM), similar to a mobile phone. The pod communicates wirelessly with the Omnipod PDM. There is no hybrid closed loop system. Can set temporary basal rates to increase or decrease insulin delivery. However, some people may use an open-source app to automate insulin delivery.
Reservoir capacity: 160 units Uses 1xAAA battery. Waterproof IPX8.	Reservoir capacity: 200 units Integrated 3 day battery. PDM needs to recharge the daily. Waterproof IP28=7.6mm for 60 minutes.
Infusion sets: **Orbit Micro** 01 and 02 Teflon 5.5mm or 8.5 mm Steel cannula **Orbit soft** Teflon 6mm or 9 mm cannula. **Inset** Teflon 6mm or 9 mm cannula.	Patch pump no infusion sets needed. Uses a 50-degree Teflon cannula, 6,5mm only all in one with reservoir. The pod needs replacing after 3 days.
Minimum basal 0.02units/hr. Basal increments 0.01unit/hr. Bolus Increments 0.01unit.	Minimum basal 0.05 unit/hr (or 0 unit/hr). Basal Increments 0.05unit/hr. Bolus increments 0.05unit.

Data can be viewed on Glooko.
https://glooko.com/

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Abbreviations

Abbreviation	Description
ADEA	Australian Diabetes Educator Association
BGL	blood glucose level
CDE	ADEA Credentialled Diabetes Educator
CGMS	continuous glucose monitoring system/s
CHO	carbohydrate
CT	computed tomography
DKA	diabetic Ketoacidosis
ieMR	integrated electronic Medical Record
IV	intravenous
MDI	multiple daily injections
MRI	magnetic resonance imaging
MO	medical officer
POC	point of care
RN	registered nurse
T1D	type 1 diabetes mellitus

References

Craig ME TS, Donaghue KC, Cheung NW, Cameron FJ, Conn J, Jenkins AJ, Silink M, for the Australian Type 1 Diabetes Guidelines Expert Advisory Group. National evidence-based clinical care guidelines for type 1 diabetes in children, adolescents and adults. Canberra 2011. Available from: https://www.diabetessociety.com.au/documents/Type1guidelines14Nov2011.pdf.

Dhatariya K, Dhesi J, Selwyn D, Dileep L, Agnes G, Mike G. Guideline for perioperative care for people with diabetes mellitus undergoing elective and emergency surgery. London: Centre for Perioperative Care (CPOC) [Internet]. 2021 03 Dec 2023]. Available from: https://www.cpoc.org.uk/sites/cpoc/files/documents/2021-03/CPOC-Guideline%20for%20Perioperative%20Care%20for%20People%20with%20Diabetes%20Mellitus%20Undergoing%20Elective%20and%20Emergency%20Surgery.pdf.

Jendle J, Reznik Y. Use of insulin pumps and closed-loop systems among people living with diabetes: A narrative review of clinical and cost-effectiveness to enable access to technology and meet the needs of payers. Diabetes, Obesity and Metabolism [Internet]. 2023 03 Dec 2023]; 25:[21-32 pp.]. Available from: https://dom-pubs.onlinelibrary.wiley.com/doi/full/10.1111/dom.15087.

Pelkey MN, Boyle ME, Long A, Castro JC, Cook CB, Thompson B. Hybrid closed-loop insulin pump technology can be safely used in the inpatient setting. Endocrine Practice [Internet]. 2023 03 Dec 2023]; 29(1):[24-8 pp.]. Available from: https://www.sciencedirect.com/science/article/abs/pii/S1530891X22008667.

Ross G SS, Lee T, Traill R, Story , D DNeaAD, New SAaAa, Anaesthetists ZCo, (ANZCA). ADS-ANZCA Perioperative Diabetes and Hyperglycaemia Guidelines (Adults) {Internet}2022 2023 Dec 3]. Available from: https://www.diabetessociety.com.au/guideline/ads-anzca-perioperative-diabetes-and-hyperglycaemia-guidelines-adults-november-2022/.

Rudland VL, Price SAL, Hughes R, Barrett HL, Lagstrom J, Porter C, et al. ADIPS 2020 guideline for pre-existing diabetes and pregnancy. Aust N Z J Obstet Gynaecol [Internet]. 2020 01 Jan 2024]; 60(6):[E18-E52 pp.]. Available from: https://obgyn.onlinelibrary.wiley.com/doi/10.1111/ajo.13265.

Rural Support Service, Diabetes Service. Continuous Subcutaneous Insulin Infusion (CSII) in People with Diabetes in the Inpatient Setting2022 03 Dec 2023]. Available from: https://www.chsa-diabetes.org.au/clinicalpractice/Regional%20LHN%20Prot%20CLINICAL%20Continuous%20Subcutaneous%20Insulin%20Infusion%20CSII%20Protocol.pdf.

Sherr JL, Schoelwer M, Dos Santos TJ, Reddy L, Biester T, Galderisi A, et al. ISPAD clinical practice consensus guidelines 2022: diabetes technologies: insulin delivery. Pediatric diabetes [Internet]. 2022 03 Dec 2023]; 23(8):[1406-31 pp.]. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1111/pedi.13421.

Sora ND, Shashpal F, Bond EA, Jenkins AJ. Insulin pumps: review of technological advancement in diabetes management. The American journal of the medical sciences [Internet]. 2019 03 Dec 2023]; 358(5):[326-31 pp.]. Available from: https://www.sciencedirect.com/science/article/abs/pii/S0002962919303167.

Umpierrez GE, Klonoff DC. Diabetes technology update: use of insulin pumps and continuous glucose monitoring in the hospital. Diabetes care [Internet]. 2018 03 Dec 2023]; 41(8):[1579-89 pp.]. Available from: https://diabetesjournals.org/care/article/41/8/1579/36389/Diabetes-Technology-Update-Use-of-Insulin-Pumps.

United Kingdom Clinical Pharmacy Association. The Handbook of Perioperative Medicines: UKCPA; 2021 [cited 2023 03 December]. Available from: https://periop-handbook.ukclinicalpharmacy.org/drug/insulin-

continuous-subcutaneous-insulin-infusion-csii-insulin-pump/.

Yeh T, Yeung M, Mendelsohn Curanaj FA. Managing patients with insulin pumps and continuous glucose monitors in the hospital: to wear or not to wear. Current diabetes reports [Internet]. 2021 03 Dec 2023]; 21:[1-11 pp.]. Available from: https://link.springer.com/article/10.1007/s11892-021-01375-7.