Mersey and West Lancashire Teaching Hospitals NHS Trust

MWL – Guideline for the management of Insulin Pumps, Hybrid Closed Loop Systems, and Continuous Glucose Monitoring in Hospital Inpatients with Diabetes (Whiston and St Helens sites)

Version No: 1

Document Summary:
This guideline is to advise on the management of continuous subcutaneous insulin infusion (CSII; insulin pumps), hybrid closed-loop (HCL) systems, and Continuous Glucose Monitors (CGM) in adult inpatients (aged 18 and over) with diabetes. This guideline does not cover pregnant patients.

Document status	Approved	
Document type	Guideline	**local**
Document number	PD2680	
Approving body	MWL Clinical Effectiveness Council	
Date approved	09/06/2025	
Date implemented	25/06/2025	
Review date	***3 years from approval date** **09/06/2028**	
Accountable Director	Medical Director	
Policy Author	Consultant	
Target audience	Clinical staff	

The intranet version of this document is the only version that is maintained. Any printed copies should therefore be viewed as "uncontrolled", as they may not contain the latest updates and amendments

Document Control

[Author to complete all sections apart from Section 4 & 5]

Section 1 – Document Information	
Title	Management of Insulin Pumps and Hybrid Closed Loop Systems in Hospital Inpatients with Diabetes
Directorate	Medical
Brief Description of amendments	
New Document	
Does the document follow the Trust agreed format?	Yes
Are all mandatory headings complete?	Yes
Does the document outline clearly the monitoring compliance and performance management?	Yes
Equality Analysis completed?	Yes
Data Protection Impact Analysis completed?	Yes

Section 2 – Consultation Information* *Please remember to consult with all services provided by the Trust, including Community & Primary Care			
Consultation Completed	☑ Trust wide ☑ Local ☐ Specific staff group		
Consultation start date	11/06/2025	**Consultation end date**	25/06/2025

Section 3 – Version Control		
Version	**Date Approved**	**Brief Summary of Changes**
1	09/06/2025	New Document
	Click here to enter a date.	
	Click here to enter a date.	
	Click here to enter a date.	

Section 4 – Approval *– To be completed by Document Control*			
Document approved	☐ Approved ☐ Approved with minor amendments		
Assurance provided by author & Chair	☐ Minutes of meeting ☐ E-mail with Chair's approval		
Date approved	Click here to enter a date.	**Review date**	Click here to enter a date.

Section 5 – Withdrawal *– To be completed by Document Control*	
Reason for withdrawal	☐ No longer required ☐ Superseded
Assurance provided by author & Chair	☐ Minutes of meeting ☐ E-mail with Chair's approval
Date Withdrawn:	Click here to enter a date.

Quick Reference Guide

This document provides clear and safe guidance on the management of insulin pumps, hybrid closed loop systems and continuous glucose monitors in adult inpatients when well, when critically ill, unconscious or incapacitated, hyperglycaemic emergencies, radiology investigations, surgical procedures, and during cardiac arrest situations.

Contents

1. Scope

This document applies to all healthcare professionals working with adult in-patients in all directorates & divisions.

This guideline provides practitioners with clear and safe guidance on the management of insulin pumps, hybrid closed loop systems and continuous glucose monitors in adult inpatients when well, when critically ill, unconscious or incapacitated, hyperglycaemic emergencies, radiology investigations, surgical procedures, and during cardiac arrest situations.

2. Introduction

People with diabetes occupy about 17% of acute hospital beds (NDISA July 2022) and this approaches 20-25% for certain high-risk groups e.g. renal & cardiac disorders. Sixty percent of these patients are emergency admissions mostly 'with diabetes' rather than 'because of diabetes'. As diabetes prevalence increases, the proportion of hospital inpatients with diabetes will increase.

Inpatients with diabetes, especially those aged <60yr, have traditionally stayed in hospital longer and been less likely to have day-case treatment. Errors of insulin prescription and administration are among the most common and most serious medication safety errors.

In-patients with diabetes are commonly unhappy about the standard of diabetes care they receive in hospital, due to loss of control over their own self—management, discomfort from uncontrolled hyperglycaemia, anxiety about uncontrolled hyperglycaemia and poor levels of staff knowledge and competence (NaDIA 2019).

Continuous subcutaneous insulin infusion (CSII; insulin pumps) and hybrid closed-loop systems are being increasingly used in patients with Type 1 Diabetes as have been shown to reduce HbA1c as well as hypoglycaemia (Beato-Vibora et al, P Diab Med 2015). Safe continuation of use of CSII in hospital in those who can self-manage has been advocated by several professional societies, including JBDS-IP (JBDS Inpatient Care Group, Diab Med 2018), the Diabetes Technology Network (DTN, ABCD Best Practice Guides 2018), the American Diabetes Association (ADA Diab Care 2022), the American Association of Clinical Endocrinologists (Grunberger G; Endocr Pract. 2014) and the Endocrine Society (Korytkowski MT, JCEM 2022).

This guideline standardises the in-patient management of diabetes in patients using this technology. It aims to have a positive impact on safety, experience of care, morbidity, mortality and length of stay.

3. Statement of Intent

This guideline is to advise on the management of continuous subcutaneous insulin infusion (CSII; insulin pumps), hybrid closed loop (HCL) systems and continuous glucose monitors (CGMs) in adult inpatients (ages 18 years of age and older) with diabetes. Paediatric diabetes guidelines and referrals to the paediatric diabetes team should be sought for individuals under 18 years of age. This guideline does not include pregnant patients.

4. Definitions

Term	Definition/meaning
ACE	Angiotensin Converting Enzyme
ACR	Albumin:Creatinine Ratio
ALT	Alanine transferase
ARB	Angiotensin receptor blocker
ASAP	As soon as possible
BMI	Body Mass Index
BP	Blood Pressure
CAD	Coronary Artery Disease
CCB	Calcium Channel Blocker
CGM	Continuous Glucose Monitor
CKD	Chronic Kidney Disease
CSII	Continuous subcutaneous insulin infusion
CV	Cardiovasular
CVD	Cardiovascular Disease
DKA	Diabetic ketoacidosis
DVLA	Driver and Vehicle Licensing Agency
eGFR	Estimated glomerular filtration rate
FPG	Fasting Plasma Glucose
GKI	Glucose Potassium Insulin infusion
GLP-1	Glucagon-like peptide-1
HbA1c	Glycated haemoglobin
HCL	Hybrid Closed Loop
IP	inpatient
isCGM	Intermittently scanned continuous glucose monitor
IV	intravenous
LVH	Left Ventricular Hypertrophy
ml	Millilitres
mM	mmol/l
MWL	Mersey and West Lancashire Teaching Hospitals NHS Trust
NICE	National Institute for Health and Care Excellence
Non-HDL-C	Non-High Density Lipoprotein-Cholesterol
OP	outpatient
PAD	Peripheral Arterial Disease
RPG	Random Plasma Glucose
rtCGM	Real time continuous glucose monitor
Rx	Treatment
s.c.	Subcutaneous
st	Stone
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
Trigs	Triglycerides
ULN	Upper limit of normal (range)
VRII	Variable rate insulin infusion
wk	Week

5. Duties, Accountabilities and Responsibilities

5.1 Chief Executive

The Chief Executive has overall responsibility for the strategic and operational management of the Trust including and ensuring that this guideline complies with all legal, statutory and good practice guidance requirements and is implemented effectively and efficiently.

5.2 Medical Director

The Medical Director is the accountable director for this guideline.

5.3 Clinical Director for Diabetes and Endocrinology, Division Lead for Medical Care Group and the Diabetes Team

The Clinical Director and their team for the Whiston and St Helens Hospital sites are responsible to ensure the safety of patients with diabetes using diabetes technology such as insulin pumps and hybrid closed loop systems.

5.4 Clinical Director for Diabetes and Endocrinology

The Clinical Director for Diabetes and Endocrinology at the Whiston and St Helens Hospital sites is accountable to the Trust Board for assuring compliance with this guideline and ensuring that the guideline is reviewed and updated by the specified review dates. He/she will also ensure training of staff within the diabetes and endocrinology directorate to ensure staff are appropriately trained to manage diabetes technology.

5.5 Matron, lead nurses, ward managers

Within the medical care group will be responsible for ensuring that systems are in place at admission to identify patients with hyperglycaemia and ensure appropriate staff develop and maintain basic professional competence in using the policy (appropriate monitoring of blood glucose and preparation and administration of insulin).
Ensure staff develop and maintain an appropriate level of knowledge about the inpatient diabetes guidelines.
Ensure any policy deviations are reported via the adverse incident system.

5.6 Doctors treating patients with diabetes, Nursing Staff providing care for people with diabetes

All staff involved in looking after people with diabetes have the responsibility to adhere to the most recent published guidelines on the intranet. Deviation from the guidelines in exceptional cases may be allowed in consultation with a consultant or specialty doctor in diabetes or the inpatient diabetes specialist nurse team.

5.7 Pharmacy

Ensuring that all prescriptions of insulin are in accordance with the policy and ensuring that ward stock levels of appropriate insulins are maintained.

6. Guideline

This document should be used as a guide for non-experts managing patients using diabetes technology in the trust (St Helens and Whiston sites).

6.1 In-Hospital Use of Insulin Pumps: Introduction

Insulin pumps are wearable devices which deliver rapid-acting soluble insulin in two modes:
a. Programmed basal insulin (automatic delivery).
b. Patient-activated bolus insulin given at mealtimes.

The programmed basal insulin is delivered continuously over the 24 hours in place of the patient's long-acting basal injection. As insulin pumps only administer rapid-acting insulin (e.g., NovoRapid), discontinuation without alternative provision of insulin, can rapidly result in DKA. Inform the Diabetes Specialist Nurses if a patient using an insulin pump is admitted.

On admission to hospital, a considered decision should be made on an individual basis as to whether the person can continue to safely use their pump. **The insulin pump is often called a continuous subcutaneous insulin infusion (CSII) and the terms are used interchangeably**. They must be well enough to self-manage their diabetes and have no confusion/delirium (**see below for contraindications**). Unless incapacitated, most people admitted to hospital using CSII who are physically and mentally able to continue to use their pumps, are safer to remain on CSII. Always continue the programmed basal rate (i.e. let pump run). This is equivalent to continuing the long-acting basal insulin for patients who are on multiple injections. If the pump were to be disconnected and/or stopped there will be negligible residual insulin in <60mins which could lead to Diabetic Ketoacidosis (DKA). It is therefore **CRITICAL** to ensure that an alternative insulin regimen is prescribed and administered at least 30-60 minutes prior to stopping CSII to prevent metabolic decompensation. Patients who are well enough should be allowed to self-manage their pumps while an inpatient.

If the pump is removed, always ensure that it is safely stored and document in the medical notes where it is stored and/or who it has been given to (i.e. family member).

Contraindications to Insulin Pump Therapy in Hospital

- Impaired level of consciousness or confusion.
- Critical illness requiring intensive care/high-dependency care.
- Diabetic ketoacidosis, hyperosmolar hyperglycaemic state, repeated hypoglycaemia or severe hypoglycaemia (needing third party assistance).
- Psychiatric illness or suicidal ideation.
- Person unable to use hands and/or physically manipulate pump due to medical condition.
- Person unwilling to participate in diabetes self-management, or share pump management decisions with hospital clinical staff.
- Lack of pump supplies or mechanical pump malfunction.
- Medical team decision for health and safety of the person.
- Patient receiving enteral nutrition via nasogastric tube, percutaneous endoscopic gastrostomy, or parenteral nutrition.
- Patient commencing on steroids.
- Nausea and vomiting.

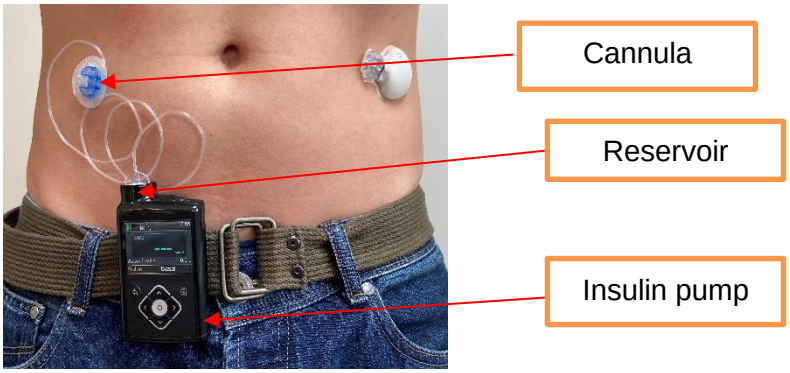
6.2 Admitting a patient on an insulin pump

If the patient is safe to remain on their insulin pump, the admitting team should document that they can self-manage their diabetes in hospital in the medical notes and:

1. Prescribe insulin pump and type of insulin used in pump on EPMA (e.g., NovoRapid insulin aspart (via pump)).
2. Always continue the programmed basal rate (i.e. let pump run).
3. If patient unwell & hyperglycaemic prescribe a variable rate insulin infusion (VRII - see MWL adult diabetes guidelines) alongside insulin pump (in manual mode – see section 6.6) and check ketones to ensure patient is not developing DKA.
4. Inform the Diabetes Specialist Nurses (refer to the Diabetes Specialist Nurses [DSNs] on Careflow) who will liaise with the diabetes technology team.
5. Allow patient to self-manage their pump. Refer to DSN for further review if the blood glucose goes out of target during the hospital admission (see MWL adult diabetes guidelines, Topic 18a).
6. All patients on insulin pumps in hospital should receive 1 pen each of a long acting ***basal*** insulin (Toujeo) and a rapid acting ***bolus*** insulin (NovoRapid, Trurapi, Apidra etc) to keep with them in their locker for use in an emergency situation if their pump stops working.

MWL Adult Inpatient Diabetes Guidelines

MWL Adult Diabetes Guidelines 2023-28



If the patient is hyperglycaemic and is unable to self-manage their insulin pump due to illness:

1. Remove Pump & URGENTLY commence VRII. Check ketones and treat DKA if diagnosed.
2. IMMEDIATELY administer a stat dose of the patient's usual long-acting basal insulin alongside VRII. Patients are made aware of their backup insulin pen doses on a regular basis. If unsure of dose required commence Toujeo (300 units/mL) insulin, 0.25 units/kg.

3. Refer to DSN for review if patient unable to self-manage pump and/or develops DKA on pump.

If the pump is faulty but the patient remains well and able to self-manage their diabetes:

1. Remove Pump & and prescribe subcutaneous insulin injections:
    - If patient is able to obtain their total daily dose (TDD) from the pump: Add on 20% to TDD then divide by 2 to give total amount of background insulin. Prescribe as Toujeo insulin (300 units/mL) sc as a stat IMMEDIATELY and once daily thereafter. (eg: Pump TDD 40units +20% = 48units in total. Therefore total background dose = 24 units prescribed as Toujeo 24 units sc od). Prescribe insulin Trurapi at mealtimes providing a range according to patient's usual doses (eg: 2-8 units) as a note on EPMA.
    - If unable to obtain TDD prescribe insulin Toujeo 0.25 units/kg stat dose IMMEDIATELY and once daily sc thereafter + insulin Trurapi with each meal sc (0.25units/kg split across the day, prescribe a range eg: 2-8units according to blood glucose/carbohydrate amount).
2. Refer to DSN for review.

6.3 Insulin Pump Therapy in DKA

Diagnosis

Typically polyuria, polydipsia, thirst, weight loss, vomiting, dehydration, abdominal pain, and hyperventilation. Usually alert. PLUS:

AND

pH < 7.3 or HCO_3 < 18 mM + ketonaemia ≥ 3 mM + any BG

Management

See MWL Adult Diabetes Guidelines 2023-28, Topic 26

AND

Accompanying Adult Diabetic Ketoacidosis (DKA) Management Pathway

What to do with the pump in DKA?

In patients with DKA, altered tissue perfusion may affect insulin absorption making CSII unreliable, therefore:

1. pump therapy should be temporarily discontinued: **remove the pump.**
2. Ensure that the pump is safely stored with the patients and labelled with the patient details, documenting in the medical notes where it is stored.
3. Follow the DKA management pathway and use the DKA booklet.
4. Remember to give a stat dose of long-acting insulin Toujeo 0.3 units/kg as per the DKA guidelines immediately and once daily thereafter.
5. Refer to the Diabetes Specialist Nurses for review.
6. The person may be transitioned back to CSII after resolution of DKA when they are well and able to self-manage (see section 6.7 on restarting the pump). They must have a new cannula, giving set and a refilled insulin reservoir.

6.4 Insulin pump therapy and radiological investigations

The pump should be suspended and removed and stored safely in the radiology control room or patient locker prior to the following radiological investigations:

Investigation	Before scan	After scan
Magnetic Resonance Imaging (MRI)	Pump **must** be removed and **must not** be taken into the scanning room. **Important:** if the pump cannula is metal, the subcutaneous cannula must also be removed	The patient should reconnect the pump immediately following the investigation.
Computed Tomography (CT)	Pump **must** be removed and **must not** be taken into the scanning room.	The patient should reconnect the pump immediately following the investigation.
X-ray	No need to remove the pump.	
Ultrasound	No need to remove the pump.	
Endoscopy	No need to remove the pump.	
Positron Emission Tomography	Pump **must** be removed 1 hour prior to the study, with no bolus insulin <4 hours prior.	The patient should reconnect the pump immediately following the investigation.
Cardiac catheterisation	Pump **must** be removed and **must not** be taken into the procedure room.	The patient should reconnect the pump immediately following the investigation.
Pacemaker insertion	Pump **must** be removed and **must not** be taken into the procedure room.	The patient should reconnect the pump immediately following the investigation.

In all cases, the pump can be safely removed for up to an hour without needing alternative insulin. **A correction bolus may be needed when reconnecting the pump.** Any procedure that takes longer than one hour will require additional insulin. Seek advice from the Diabetes Team.

6.5 Insulin pump therapy and surgical procedures

For patients receiving insulin pump therapy, a shared decision-making process should be undertaken. Where possible, insulin pump therapy may be continued–particularly when undergoing a short fasting period (no more than 1 missed meal). However, caution should be applied in the presence of diathermy or imaging devices (this is a perceived rather than actual risk) (CPOC 2023; JBDS 2024). Based on the knowledge of the team, the lead anaesthetist or surgeon may decide to use alternatives to pump therapy, such as a GKI (MWL Adult Diabetes Guidelines 2023-28, topic 20d).

If CSII is to be continued during surgery the following conditions should be met:

- The patient should be seen preoperatively by a registered health care practitioner who is knowledgeable about the perioperative use of CSII
- Document discussions and shared decisions made with patient.
- Short fasting period (no more than one missed meal).
- Elective or expedited surgery.
- Optimal HbA1c <69mmol/mol.
- Ability to position pump away from the proposed surgical site.
- Ability to avoid positioning pump in between earthing plate and diathermy.
- Use of a Teflon cannula and not a steel cannula.
- It is recommended that patient contacts their usual diabetes team to discuss a strategy for surgery.
- Ability to monitor CBG at least every 60 minutes during surgery.
- Ability to replace CSII with VRII if necessary

For patients who continue CSII through surgery:

- Check pre-operative glucose to ensure in the range 6-12 mmol/L.
- Check Teflon (**not** steel) cannula in place and sited appropriately for surgery.
- During surgery check blood glucose every 60 minutes to ensure in target range of 6-12 mmol/L.
- Maintain pump away from diathermy and not between diathermy and earthing plate.
- Ensure cannula site visible/accessible, and the pump is observable to ensure correct functioning.
- If blood glucose rises >12mmol/L consider pump failure as a cause. Check ketones, start VRII as per MWL Adult Diabetes Guidelines 2023-28, Topic 20c and remove CSII cannula.

Post surgery

- Check glucose in target range 6-12 mmol/L.
- Check capillary blood glucose every 60 minutes.
- Aim to get person with diabetes eating and drinking once able and self-managing insulin pump.

For patients where a decision is made to discontinue CSII therapy

- Revert back to a basal bolus regimen (as they would in cases of pump failure, see section 6.2).

For patients undergoing emergency major surgery (>1 missed meal)

- CSII should be stopped, the pump removed, and stored in a safe place.
- Administer a stat dose of long-acting basal insulin Toujeo, 0.25 units/kg.
- Follow MWL Adult Diabetes Guidelines 2023-28, Topic 21.

6.6 Insulin pump therapy: special circumstances

Insulin pump therapy during cardiac arrest

During a cardiac arrest, insulin pumps should ideally be removed for external direct-current (DC) cardioversion. This is due to potential steel cannula sets, which may act as a conductor, and therefore, there is a theoretical risk of energy being dispersed at the CSII site. **If it is not known whether the patient has an insulin pump in-situ resuscitation should not be delayed**, but where possible the device should be removed. If resuscitation is successful, remove the pump, start a GKI (VRII if hyperglycaemic) alongside Toujeo 0.25 units/kg sc stat and once daily thereafter, and refer to DSN.

In-hospital use of Continuous Glucose Monitoring (CGM) systems.

Continuous glucose monitoring (CGM) systems use a small sensor worn on the skin with a subcutaneous sensor that monitors interstitial glucose.

There is a notable lack of consensus amongst international diabetes organisations on the use of continuous glucose monitors in hospitalised inpatients (ADA 2023; Endocrine Soc 2022; AACE 2021; JBDS 2023). Research evidence is limited, and regulatory approval is needed.

A number of caveats exist when considering CGM use, including accuracy issues, issues around radiological procedures, tissue perfusion (hypotension, hypo/hyperthermia, volume depletion), and peri-operative considerations. All current guidance advocates that CGM readings are confirmed with POC capillary blood glucose (CBG) readings.

As such, we pragmatically suggest that if a patient wishes to use a CGM, they may continue to do so where safe, but POC CBG readings should continue as per hospital policy until further evidence and guidelines are available. If worn, CGM alarms should be used to trigger a POC CBG reading and/or consideration of intervention by the ward staff.

In-hospital use of Hybrid Closed Loop systems

Some insulin pumps can integrate with CGM to automatically adjust insulin doses according to glucose levels. This is called Hybrid Closed Loop (HCL).

If the patient is well and may be in hospital for a short elective procedure or investigation, it may be appropriate to let the hybrid closed-loop continue to control their glucose. Patients will have received education on their HCL system to follow sick-day rules and when/how to exit HCL.

If the patient is unwell and there are no contra-indications to continued use of the insulin pump, the closed-loop algorithms should be discontinued, and the system should be switched to "manual" control working as an insulin pump alone (insulin requirements can change rapidly from day to day) by the patient in liaison with the diabetes team. This allows the individual with support from their diabetes team to adjust insulin pump settings, including glucose target range, insulin sensitivity factor, and basal rates.

6.7 Stopping and restarting insulin pumps

Stopping:

The pump and tubing may be removed leaving only the subcutaneous canula in place. The subcutaneous canula may need to be removed in certain circumstances if it has a metal canula (see sections 6.4 & 6.5). NB: Some pumps have no external tubing (e.g. Omnipod) and the whole device would need to be removed when stopping the pump.

When removed, place the pump in a suitable container and do not attempt to turn off. Document in the patient notes where the pump is stored and label the pump with the patient's details.

The insulin in the pump is rapid acting, therefore **alternative insulin must be started within an hour to avoid the risk of ketoacidosis**.

Restarting:

The person with diabetes is best placed to restart their insulin pump as they will have been trained to do so.

If CBG >12 mmol/l, he/she should bolus a correction dose once the pump has been reconnected according to their personal correction ratio (insulin sensitivity factor).

If the patient is transferring from a GKI or IV insulin, they can do so at any time (there is no need to wait until a meal). Discontinue the GKI/IV insulin 30-60 minutes after recommencing their pump *and* a mealtime bolus has been given **(2 hour overlap post DKA)**.

6.8 Maintaining safety on insulin pumps

- **Education** – patients using insulin pumps are provided with intensive education and support from their specialist diabetes team. Only patients, or the specialist diabetes team, should make adjustments to the settings within the insulin pump.

- **Consumables** – The infusion set including the insulin reservoir, tubing and cannula (or the 'pod' in the case of the OmniPod system) must be changed every 2-3 days (sooner if a problem is suspected) to ensure that good delivery and absorption of insulin are maintained.
    - Patients must have ready access to spare supplies of consumables for continued use of their insulin pumps. This includes batteries, spare reservoirs, cannulae and tubing, along with insulin for use in the insulin pump and 'back-up' insulin in pen devices should they encounter a problem that necessitates a switch to multiple daily injections (e.g. pump failure). The patient should bring in their own consumables – there is no in-hospital stock.
    - Nursing staff should facilitate storage of patient consumables and insulin in a suitable location out of reach from other patients and provide access to a sharps box for appropriate disposable of sharps.

- **Back up insulin pens** – All patients on insulin pumps should have an alternative injectable insulin regimen, including doses, documented for use in the event of the insulin pump failure, or the patient no longer being suitable for insulin pump self-management. The alternative subcutaneous insulin regimen (typically basal-bolus therapy) should be documented in the patients notes by the admitting team, pharmacy medicines reconciliation or the diabetes specialist nurses on review.

- **Capillary blood glucose monitoring** – Regular blood glucose monitoring (not CGM), and where indicated ketone testing, are essential to guide insulin dosing and effective diabetes management. These processes should continue to be carried out as per hospital guidelines whether that patient wears a continuous glucose monitor or not.

- **Pump interruptions** – Short-term disconnection from an insulin pump (<1 hour) is permissible. If CSII is interrupted for >1 hour alternative arrangements for insulin therapy MUST be promptly initiated (e.g. IV insulin / GKI or multiple daily injections) to maintain glycaemic stability and prevent DKA.

- **HYPOGLYCAEMIA** – For patients able to self-manage, give 20g quick-acting carbohydrate orally. Follow-up with long-acting carbohydrate may not be needed, but infusion rates may need adjusting, particularly if hypoglycaemia is recurrent (contact the Diabetes Team for advice). For unconscious / incapacitated patients, use IV dextrose (ideally 100ml 20% dextrose over 15 mins). Remove the pump (follow section 6.7) if hypoglycaemia is persistent AND only restart insulin pump therapy when blood glucose has returned to normal and the patient is well and able to self-manage (see Topic 28 of MWL Adult Diabetes Guidelines 2023-28).

- Although some insulin pumps are 'waterproof' it is advisable to avoid immersing insulin pumps in water.

7. Training

All of those using the document are offered specific (specialist) training relating to use of the document – please contact Dr Westall's secretary on 01744-646758

What aspect/s of this policy will require staff training?	Which staff groups require this training?	Is this training covered in the Trust's Statutory & Mandatory Training Policy?	If no, how will the training be delivered?	Who will deliver the training?	How often will staff require training	Who will ensure and monitor that staff have this training
Specialist use of this guideline in clinical practice	Clinicians in diabetes and endocrinology and diabetes specialist nurses	No	Internal departmental training.	Industry partners and the diabetes technology MDT.	When joining the department and periodically afterwards	Diabetes Technology Specialist nursing team
General use of this guideline	All clinical staff	No.	All of those using the document are offered specific (specialist) training relating to use of the document – please contact Dr Westall's secretary on 01744-646758	-	-	All of those using the document are offered specific (specialist) training relating to use of the document – please contact Dr Westall's secretary on 01744-646758

8. Monitoring Compliance

8.1 Key Performance Indicators (KPIs) of the Policy

No	Key Performance Indicators (KPIs) Expected Outcomes
1.	National Diabetes Inpatient Safety Audit
2.	Keeping documents in date
3.	Report any adverse events or deviations resulting in harm through the DATIX system
4.	National Diabetes Audit
5.	Compliance in the use of these guidelines within the St Helens and Whiston Hospital sites of MWL Trust

8.2 Performance Management of the Policy

Minimum Requirement to be Monitored	Lead(s)	Tool	Frequency	Reporting Arrangements	Lead(s) for acting on Recommendations
95% of procedural documents on the intranet are within review date	Quality & Risk Office Manager / Assistant Director of Governance	Monthly report to be submitted to Policy Governance Group showing compliance	Monthly	Policy Governance Group and Quality Committee (annually)	Author(s) Policy Governance Group Members Lead Executive Director(s)
Compliance in the use of the Management of Insulin Pumps, Hybrid Closed Loop Systems, and Continuous Glucose Monitoring in Hospital Inpatients with Diabetes (Whiston and St Helens sites) Guidelines	Sam Westall, Consultant Physician and Endocrinologist Amy Strong, Specialist Diabetes Nurse (Diabetes Technology)	Ongoing review of Datix at monthly diabetes safety MDT	Monthly	Diabetes Safety MDT to review and feedback to full MDT and Care Group Governance meeting (and thus CEC or PEC) as appropriate.	Lead consultant for diabetes technology and diabetes technology specialist nursing team.

9. References/Bibliography/Relevant Legislation/National Guidelines

No	Reference
1.	**National Diabetes Inpatient Safety Audit 2018-2021**
2.	**National Diabetes Inpatient Audit England, 2019**
3.	**Beato-Vibora P, Yeoh E, Rogers H, Hopkins D, Amiel SA, Choudhary P.Sustained benefit of continuous subcutaneous insulin infusion on glycaemic control and hypoglycaemia in adults with Type 1 diabetes. Diabet Med.**
4.	**Flanagan D, Dhatariya K, Kilvert A; Joint British Diabetes Societies (JBDS) for Inpatient Care group and Guidelines writing group. Self-management of diabetes in hospital: a guideline from the Joint British Diabetes Societies for Inpatient Care group. Diabet Med.**

5.	**DTN. Clinical guideline: guidelines for managing continuous subcutaneous insulin infusion (CSII, or 'insulin pump') therapy in hospitalised patients. Assoc Br Clin Diabetol.2018. https://abcd.care/dtn/best-practice-guides**
6.	**Perioperative care of people with diabetes undergoing surgery centre for perioperative care. 2023. https://www.cpoc.org.uk/guidelines-resources/guideline-diabetes**
7.	**Avari P, Lumb A, Flanagan D, Rayman G, Misra S, Choudhary P, Dhatariya K. Insulin Pumps and Hybrid Close Loop Systems Within Hospital: A Scoping Review and Practical Guidance From the Joint British Diabetes Societies for Inpatient Care. J Diabetes Sci Technol. 2023 May;17(3):625-634. doi: 10.1177/19322968221137335. Epub 2022 Dec 2. PMID: 36458697; PMCID: PMC10210119.**
8.	**Practical Guidance From the Joint British Diabetes Societies for Inpatient Care. J Diabetes Sci Technol. 2023 May; 17(3): 625-634**
9.	**Zelada H, Perez-Guzman MC, Chernavvsky DR, Galindo RJ. Continuous glucose monitoring for inpatient diabetes management: an update on current evidence and practice. Endocr Connect. 2023 Sep 25;12(10):e230180. doi: 10.1530/EC-23-0180. PMID: 37578799; PMCID: PMC10563639.**
10.	**Galindo RJ, Umpierrez GE, Rushakoff RJ, Basu A, Lohnes S, Nichols JH, Spanakis EK, Espinoza J, Palermo NE, Awadjie DG, Bak L, Buckingham B, Cook CB, Freckmann G, Heinemann L, Hovorka R, Mathioudakis N, Newman T, O'Neal DN, Rickert M, Sacks DB, Seley JJ, Wallia A, Shang T, Zhang JY, Han J, Klonoff DC. Continuous Glucose Monitors and Automated Insulin Dosing Systems in the Hospital Consensus Guideline. J Diabetes Sci Technol. 2020 Nov;14(6):1035-1064. doi: 10.1177/1932296820954163. Epub 2020 Sep 28. PMID: 32985262; PMCID: PMC7645140.**
11.	**ElSayed NA, Aleppo G, Aroda VR, Bannuru RR, Brown FM, Bruemmer D, Collins BS, Hilliard ME, Isaacs D, Johnson EL, Kahan S, Khunti K, Leon J, Lyons SK, Perry ML, Prahalad P, Pratley RE, Seley JJ, Stanton RC, Gabbay RA, on behalf of the American Diabetes Association. 16. Diabetes Care in the Hospital: Standards of Care in Diabetes-2023. Diabetes Care. 2023 Jan 1;46(Suppl 1):S267-S278. doi: 10.2337/dc23-S016. PMID: 36507644; PMCID: PMC9810470.**
12.	**Grunberger G, Sherr J, Allende M, Blevins T, Bode B, Handelsman Y, Hellman R, Lajara R, Roberts VL, Rodbard D, Stec C, Unger J. American Association of Clinical Endocrinology Clinical Practice Guideline: The Use of Advanced Technology in the Management of Persons With Diabetes Mellitus. Endocr Pract. 2021 Jun;27(6):505-537. doi: 10.1016/j.eprac.2021.04.008. PMID: 34116789.**
13.	**Avari P, Lumb A, Flanagan D, Rayman G, Misra S, Dhatariya K, Choudhary P. Continuous Glucose Monitoring Within Hospital: A Scoping Review and Summary of Guidelines From the Joint British Diabetes Societies for Inpatient Care. J**

	Diabetes Sci Technol. 2023 May;17(3):611-624. doi: 10.1177/19322968221137338. Epub 2022 Nov 28. PMID: 36444418; PMCID: PMC10210120.
14.	**Korytkowski MT, Muniyappa R, Antinori-Lent K, Donihi AC, Drincic AT, Hirsch IB, Luger A, McDonnell ME, Murad MH, Nielsen C, Pegg C, Rushakoff RJ, Santesso N, Umpierrez GE. Management of Hyperglycemia in Hospitalized Adult Patients in Non-Critical Care Settings: An Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab. 2022 Jul 14;107(8):2101-2128. doi: 10.1210/clinem/dgac278. PMID: 35690958; PMCID: PMC9653018.**

10. Related Trust Documents

[List any procedural documents which are referenced within the text.]

No	Related Document
1.	MWL Adult Diabetes Guidelines 2023-28
2.	Adult Diabetic Ketoacidosis (DKA) Management Pathway
3.	
4.	
5.	

11. Equality Impact Assessment (EIA) Screening Tool

The EIA screening must be carried out on all policies, procedures, organisational changes, service changes, cost improvement programmes and transformation projects at the beginning of the planning stage of any change process. Where the screening identifies that a full EIA needs to be completed, please use the full EIA template.

The completed EIA screening form must be attached to all procedural documents prior to their submission to the appropriate approving body. A separate copy of the assessment must be forwarded to PatientEDI@sthk.nhs.uk for monitoring purpose for EIAs carried out on patient related functions.
If the assessment is related to workforce a copy should be sent to workforceedi@sthk.nhs.uk

If this screening assessment indicates that discrimination could potentially be introduced, then seek advice from the Head of Patient Experience and Inclusion via cheryl.farmer@sthk.nhs.uk for patient related functions or Head of Workforce Equality Diversity and Inclusion via darren.mooney@sthk.nhs.uk for workforce related functions.

A full equality impact assessment must be considered on any cost improvement schemes, organisational changes or service changes that could have an impact on patients or staff.

Title of function	Guideline for the management of Insulin Pumps, Hybrid Closed Loop Systems, and Continuous Glucose Monitoring in Hospital Inpatients with Diabetes (Whiston and St Helens sites)
Brief description of function to be assessed	
Date of assessment	
Lead Executive Director	
Name of assessor	
Job title of assessor	

1. Equality, Diversity & Inclusion

Does the policy/proposal:

1) Have the potential to discriminate against equality groups or people in inclusion health groups
2) Promote equality of opportunity, or foster good relations between those who share a protected characteristic and those who don't?
3 Where there is potential unlawful discrimination, is this justifiable?
Please tick the relevant box

	Positive impact	Negative impact	No impact	Justification/ evidence
Age		x		Not intended for patients below the age of 18 years. References the Adult Diabetes guidelines.
Disability			x	Patient with learning disability/confusion/delirium/cognitive impairment may lack capacity to use diabetes technology as an inpatient. This has been considered and mitigated in the policy
Gender reassignment			x	
Pregnancy or maternity			x	
Race			x	
Religion or belief			x	
Sex			x	
Sexual orientation			x	

2. Human Rights

Does the policy/proposal breach the Human Rights of individuals or groups?

	Yes	No	Justification/ evidence
Right to life		x	
Inhumane treatment		x	
Liberty		x	
Privacy/family life, home and correspondence		x	
Thought/conscience		x	
Freedom of expression		x	
Right to a fair trial		x	

3. Health Inequalities

Is there potential that the policy/proposal could have a negative impact on inclusion health groups?

Is the policy/proposal addressing health inequalities? Where there are potential unlawful impacts are they justifiable.

	Positive Impact	Negative Impact	No impact	Justification/ evidence and data source
Deprived Populations			x	
Inclusion health groups			x	

4. Sign off

Name of approving manager	
Job title of approving manager	
Date approved	

5. EIA Action Plan

Recommendations	Actions Required	Resources required /costs	Timeframe	Lead officer responsible
n/a				

Please forward an electronic copy of this action plan with the completed assessment to , Cheryl.farmer@sthk.nhs.uk for patient related assessments or equality&diversity@sthk.nhs.uk for workforce related assessments for monitoring purposes.

12. Data Protection Impact Assessment Screening Tool

If you answer **YES or UNSURE** to any of the questions below a full Data Protection Impact Assessment will need to be completed in line with Trust policy.

	Yes	No	Unsure	**Comments -** *Document initial comments on the issue and the privacy impacts or clarification why it is not an issue*
Is the information about individuals likely to raise privacy concerns or expectations e.g. health records, criminal records or other information people would consider particularly private?		x		
Will the procedural document lead to the collection of new information about individuals?		x		
Are you using information about individuals for a purpose it is not currently used for, or in a way it is not currently used?		x		
Will the implementation of the procedural document require you to contact individuals in ways which they may find intrusive?		x		
Will the information about individuals be disclosed to organisations or people who have not previously had routine access to the information?		x		
Does the procedural document involve you using new technology which might be perceived as being intrusive? e.g. biometrics or facial recognition		x		
Will the procedural document result in you making decisions or taking action against individuals in ways which can have a significant impact on them?		x		
Will the implementation of the procedural document compel individuals to provide information about themselves?		x		

Sign off if no requirement to continue with Data Protection Impact Assessment:
Confirmation that the responses to the above questions are all NO and therefore there is no requirement to continue with the Data Protection Impact Assessment

Policy author **S Westall** **Date** **5/2/25**