Insulin Pump Therapy Guideline

for Children and Young People with Diabetes

Key Document code:	WAHT-TP-045	
Key Documents Owner:	Dr West	Consultant Paediatrician
Approved by:	Paediatric Quality Improvement meeting	
Date of Approval:	26th March 2021	
Date of review: **This is the most current version and should be used until a revised document is in place**	26th March 2024	

Key Amendments

Date	Amendment	Approved by
10th Dec 2019	New guideline written	Dr J West
26th March 2021	Document reviewed and approved for 3 years	Paediatric QIM

INTRODUCTION

Forty percent of Children and Young People (CYP) with Type 1 diabetes receiving care from the Worcestershire Paediatric Diabetes Team use continuous subcutaneous insulin infusion pump therapy (IPT). This guideline describes the indications and pathway for commencing and reviewing IPT and information for when patients are admitted to Riverbank Ward.

This guideline is supported by the document 'Insulin Pump Therapy on Riverbank Ward Staff Resource' pack which can be found on the intranet. This pack has basic information on IPT as well as links to user guides for the different pumps.

THIS GUIDELINE IS FOR USE BY THE FOLLOWING STAFF GROUPS:

Paediatric Diabetes Team
Medical and nursing staff on Riverbank Ward.

Contents

Indications for commencing insulin pump therapy

Continuous subcutaneous insulin infusion pump therapy is offered to all CYP with type 1 diabetes managed by the Worcestershire Paediatric Diabetes Team who fulfil the NICE Technology Appraisal (TA151) criteria as an alternative to multiple daily injections:

> 'Continuous subcutaneous insulin infusion (CSII or 'insulin pump') therapy is recommended as a treatment option for children 12 years and older with type 1 diabetes mellitus provided that:
>
> - attempts to achieve target haemoglobin A1c (HbA1c) levels with multiple daily injections (MDIs) result in the person experiencing disabling hypoglycaemia (disabling hypoglycaemia is defined as the repeated and unpredictable occurrence of hypoglycaemia that results in persistent anxiety about recurrence and is associated with a significant adverse effect on quality of life)
>
> or
>
> - HbA1c levels have remained high (≥69 mmol/mol) on MDI therapy despite a high level of care.
>
> CSII therapy is recommended as a treatment option for children younger than 12 years with type 1 diabetes mellitus provided that:
>
> - MDI therapy is considered to be impractical or inappropriate, and
> - children on insulin pumps would be expected to undergo a trial of MDI therapy between the ages of 12 and 18 years.

Currently we do not routinely start newly diagnosed CYP on IPT.

Paediatric diabetes insulin pump pathway

The pathway on the following pages describes the patient journey from assessment to initiating IPT and follow up.

Prior to commencing insulin pump therapy

- patients/parents will be offered an additional appointment with a dietitian to optimise their carbohydrate counting skills (they should be at least level 3 competent i.e. insulin bolus doses are adjusted depending on the carbohydrate content of a meal or snack).
- patients/parents will be offered an appointment with a clinical psychologist if required.
- baseline assessment tools will be completed on HbA1c, hypo awareness and fear of hypos.
- goals and continuation criteria will be agreed and documented for the first 6 months depending on the indication for initiation i.e. HbA1c target, reduction in hypoglycaemic score, quality of life.
- the expectations of the diabetes team will be explained to patients and their parents/carers i.e. engagement with the diabetes team and attendance at follow-up appointments.

Commencing insulin pump therapy

- Following consultation with the patient and their parents/carers, the diabetes team will decide the appropriate choice of insulin pump based on the clinical circumstances, cost-effectiveness and ability to link to real time continuous glucose monitoring (rtCGM).
- Patients and their parents/carers will attend two structured education sessions with a PDSN when IPT is commenced (see appendix 1 for a summary of topics covered); a rep from the pump company will be present for the first of these.
- Patients/parents will be informed of the increased risk of DKA.
- They will also be asked to sign an agreement (appendix 2) about pump withdrawal when the Paediatric Diabetes Team deem it to be ineffective or unsafe.

Reviewing effectiveness of insulin pump therapy

The effectiveness of insulin pump therapy is assessed at the patient's MDT clinic appointments 3 and 6 months' after initiation. Their HbA1c, hypo awareness and quality of life will be compared to their baseline measurements. Other factors that will be taken into account include:

a. evidence of:
   i. regular attendance at review appointments (and an annual education event, the initiation session counts for year 1)

b. maintaining optimum use of IPT involving:
   - blood glucose testing/checking:
     - at least 5 times per day (pre-meals, pre-bedtime, pre-driving and if hypoglycaemia suspected)
     - 10-15 minutes after hypoglycaemia (< 4 mmol/L) treatment
     - correct management of hyperglycaemia when glucose level 14 mmol/l or above
   - inputting carbohydrate intake to IPT bolus adviser
   - delivery of an insulin bolus dose 10-15 minutes before carbohydrate is eaten
   - changing cannula every 2-3 days as indicated by specific cannula (with site rotation to facilitate insulin absorption)
   - not over-riding IPT bolus advice

c. improved self-management evidenced by the following:

   i. stable or improved HbA1c
   ii. reduced hypoglycaemic events (< 4 mmol/l)

iii. no diabetes related admissions with clinically avoidable hyperglycaemia/diabetic ketoacidosis in the last 12 months
iv. reduced diabetes related admissions/A&E attendances for hypoglycaemia in the last 12 months

If the patient has met their goal they will be allowed to continue pump therapy. If not, they will either be given a time extension to achieve their goals, a pump holiday for 2 weeks to reassess or they will return to injections. Eligibility for ongoing use will be assessed annually thereafter.

A copy of the signed pump agreement form will be forwarded to the adult diabetes team on transfer of a young person to their care prior to the patient' reassessment for continuation at 6 months following transfer.

Insulin pumps are replaced prior to the end of their 4-year warranty. 24-hour technological (non-clinical) support is available from:

- **Medtronic** Customer Services: Tel no 01923 205167 (America after 5pm at local UK land line rate).
- **Accu-Chek/Roche** Customer Services: Tel no 0800 731 2291
- **Omnipod** Customer Care: Tel no 0800 011 6132

Paediatric diabetes insulin pump pathway

Does the patient meet any of the three NICE (2008, TA151) criteria?

1: Attempts to reach target HbA1c of ≤58mmol/mol leads to disabling hypoglycaemia (see below).

2: HbA1c 69mmol/mol or above with MDI treatment despite the person carefully trying to manage their diabetes.

3: If treatment with multiple daily injections is not practical or not considered appropriate.

Disabling hypoglycaemia (TA151):

Disabling hypoglycaemia is when hypoglycaemic episodes occur frequently or without warning so that the person is constantly anxious about another episode occurring, which has a negative impact on their quality of life.

Impaired hypoglycaemia awareness (Clarke 1995)

Hypoglycaemia Fear Survey – Worry subscale (Cox et al, 1987).

Initial assessment

1 Baseline information collection

- HbA1c
- Hypo awareness questionnaire
- Fear of hypo questionnaire
- Document why they meet NICE TA151 criteria

2 Agree and document goals for 6 months

- HbA1c target
- Reduction in hypoglycaemic score if appropriate
- Quality of Life

3 Outline team expectations of patients and families when going on a pump

4 Family/CYP to complete dietetic review/further input by dietitian on carbohydrate counting if required

5 Two dates for pump training agreed in a group or an individual basis if circumstances dictate, together with a date for supporting first set change.

Group or Individual start preparation

1 Order pump via diabetes lead nurse for group and set up patient account

2 Send GP letter informing of pump start and to obtain prescription for:

- Ketone strips
- 10ml vial of chosen insulin
- Contour test strips (Medtronic)
- Quick acting pen
- Long acting pen

3 Send patient letter detailing dates of education, pick up prescription and advise on what to do with background insulin dose prior to start.

4 Work out settings via starting dose calculator

Group or individual session 1

1. Complete audit tool and pump agreement
2. Principles of pump therapy and functionality of pump
3. How the pump works and setting up insulin pump with personalised settings
4. Infusion site management
5. Hyperglycaemia and Ketone Management and conversion back to MDI in emergencies
6. Setting up Care Link account (Medtronic), pump data downloading (other pumps)
7. Hypoglycaemia management
8. Arrange a download and follow up phone/visit for titration and first set change

Group or individual session (2 -4 weeks post start)

Download pump to assess progress and titrate doses

Education on:

- Advanced bolus options
- Travel and safety information
- Basic guide to exercise
- Arrange download and phone follow up
- How to assess and make changes at home by interpreting reports on data available
- How to manage alcohol on pump therapy
- Testing and modifying basal rates
- Testing and modifying carbohydrate ratios
- Arrange further download and follow up

→

3 month assessment

Download pump at clinic, or families to do before if able.

Repeat baseline measurement and complete audit tool

- HbA1c
- Hypo awareness questionnaire

Have goals been met?

Yes - continue with pump therapy
(must attend a structured education event once a year)

No consider:

1. Time extension to achieve goals
2. Pump holiday for 2 weeks and reassess
3. Return to injections

Insulin pump therapy during admission to Riverbank Ward

Patients should continue using IPT when they are admitted to Riverbank Ward providing either they or their parent/carer are able to self-manage the pump. If this isn't possible the patient should be converted to insulin via pen injections (see Appendix 3). For patients requiring surgery please see guideline 'WHAT-TP-045 Management of Children and Adolescents with Diabetes Requiring Surgery'.

Other applicable guidelines include:

- WAHT-PAE-039 Sick day rules
- WAHT-PAE-083 Care of children and young people with hypoglycaemia

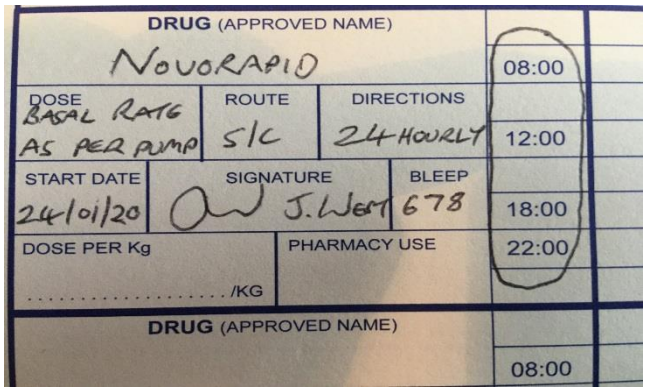
It is extremely important to change the pump cannula and infusion site every 2-3 days (depending on infusion set used). The insulin vial and tubing should be changed every 3-6 days depending on the pump. **Never** change the pump cannula, infusion site or insulin vial and tubing before bed. Please see the 'Insulin Pump Therapy on Riverbank Ward Staff Resource' pack for further information.

Please note: An insulin pump should not be worn whilst X rays, CT or MRI scanning investigations are being performed.

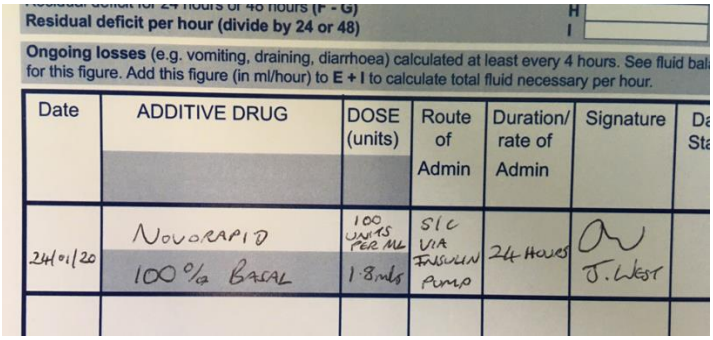
Prescribing insulin for patients on pump therapy

Patients on pump therapy should have their insulin prescribed as per the following:

- Basal insulin – this is prescribed in the 'Regular Drugs' section on a standard prescription chart .....



... and on a prescription sheet for infusions:



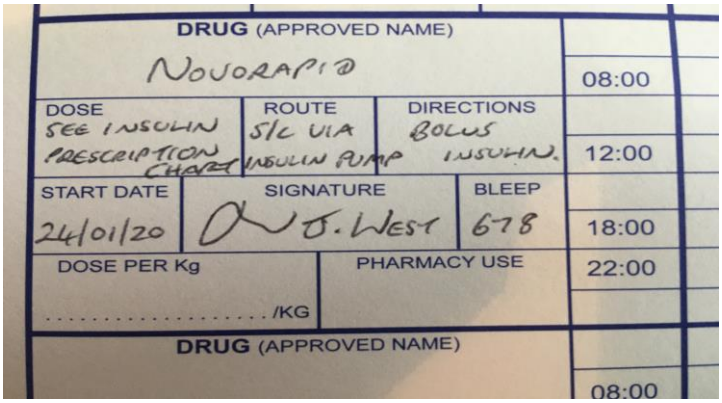
Residual deficit per hour (divide by 24 or 48) H / I

Ongoing losses (e.g. vomiting, draining, diarrhoea) calculated at least every 4 hours. See fluid bal for this figure. Add this figure (in ml/hour) to E + I to calculate total fluid necessary per hour.

Date	ADDITIVE DRUG	DOSE (units)	Route of Admin	Duration/ rate of Admin	Signature	Da Sta
24/01/20	NOVORAPID 100% BASAL	100 UNITS PER ML 1.8mls	S/C VIA INSULIN PUMP	24 HOURS	J. West	

NB: CYP fill their pump cartridges with 1.8 mls or 3 mls of rapid acting insulin (the CYP/carer should know which) with a concentration of 100 units per ml.

- Bolus insulin – this is also prescribed in the 'Regular Drugs' section on a standard prescription chart .....



DRUG (APPROVED NAME): NOVORAPID

DOSE: SEE INSULIN PRESCRIPTION CHART | ROUTE: S/C VIA INSULIN PUMP | DIRECTIONS: BOLUS INSULIN.

START DATE: 24/01/20 | SIGNATURE: J. West | BLEEP: 678

DOSE PER Kg: ...../KG | PHARMACY USE

DRUG (APPROVED NAME)

08:00 12:00 18:00 22:00 08:00

.... with mealtime boluses prescribed on an insulin prescription chart and correction doses prescribed on the front of the prescription chart in the 'Once only' section.

Appendix 1: Structured education for pump starts

Session 1

Insulin Pump Agreement

Key contacts

Infusion site management

Tops tips and School – Planning for emergencies

Hyperglycaemia, Ketones and Sick day rules

SUMMARY SHEET - HYPERGLYCAEMIA / KETONE MANAGEMENT

Converting back to multiple daily injections

Starting back on the pump

Treating hypoglycaemia on a pump

Homework for Week 1

Basal Rate testing sheet

Education Session 2

Multiwave /Dualwave and Extended/Square Wave Boluses

Activity and Activity Planning

Travel and Safety Information

Testing and adjusting basal rates

Testing and adjusting carbohydrate ratios

Alcohol

Homework for Week 2

Appendix 2: Insulin pump therapy agreement

Insulin pump therapy (IPT) is a method of insulin delivery for people with Type 1 diabetes and has been shown to be successful in improving blood glucose control and reducing episodes of hypoglycaemia. IPT is more expensive than multiple injection therapy and is only beneficial if the pump is used to its full potential. Learning how to use the pump requires your participation in structured education and blood glucose testing at least 5 times per day. To get the benefit of IPT and for it to be a cost-effective treatment you must agree:

Group Education

To attend training sessions as agreed with your health care team, including starting on a pump and also refreshers when organised.

Monitoring and testing:

Minimum of 5 blood glucose test per day; on waking, pre meals, before bed and at other times as the training will identify.

Using the pump;

Upload your pump data for your healthcare professional to review using the given software/advice for Roche/Omnipod pumps or via setting up a Care Link account for Medtronic pumps:

1. Every week for the first month
2. Every two weeks thereafter
3. Before every clinic visit
4. Before any planned phone/email conversation
5. Attend usual 3 monthly clinics

Patients will be reviewed in clinic every 3 months to see whether ongoing insulin pump treatment is appropriate.

Insurance

Ensure the insulin pump is a listed item for £3000 on your household insurance

I……agree to/agree to my child/young person to adhere to the above requirements for IPT. I accept that if I do not adhere to the requirements it may result in a discussion about IPT being withdrawn.

NAME (PRINT) SIGNATURE
NAME (PRINT) SIGNATURE

DATE……

Complete 2 copies, one for young person and one to file in record

Appendix 3: Converting from pump therapy to multiple daily injections

To convert back safely follow these steps:

1. Work out the total **daily basal** insulin by adding up the basal insulin doses for the last 7 days, then divide by 7.

   Day 1…..units + Day 2……units + Day 3…..units + Day 4 ……units

   Day 5…..units + Day 6……units + Day 7…..units

   =…….. total daily basal units then divide by 7 = ……..units/day

2. **To find daily basal insulin:**

   Medtronic 640G Pump: Menu – History – Summary - 7 days – press back button to find basal amount for last 7 days as above.

   Accu-Chek/Roche PUMP: Menu choose pump – pump data – daily totals – read off daily basal insulin amount for each day

   Omnipod Pump: Menu – My Records – Insulin delivery – total daily basal, scroll back to look at last 7 days

   The average pump basal insulin is…….....units

3. **Now multiply the average basal insulin dose by 1.25 = …… units**
   This is the long acting insulin dose (Levemir/Lantus/Tresiba) whilst on injections

All rapid/food/meal insulin should be calculated using the same insulin:carbohydrate ratios and correction doses that are set up on the pump.

Appendix 4: Converting from multiple daily injections to pump therapy

When patients start back on their pump after using MDI they need **to plan**, taking into account their background insulin and the possible need for a temporary basal rate.

ALWAYS START PATIENTS BACK ON THEIR PUMP IN THE MORNING

If they need to troubleshoot or test more often, they will find this easier to perform during the day.

What is their background insulin delivery time(s)?

Lantus or Levemir once per day:

If they usually inject in the morning:

- Miss out/do not give the morning background insulin.
- Have the usual rapid acting insulin for the carbohydrates and any corrections needed.
- NO temporary basal rate is required.

If they usually inject at night:

- Reduce the total dose of long acting injected insulin by 50% the night before.
- Have the usual rapid acting insulin for carbohydrates and any corrections needed.
- Put a temporary basal rate of 50% on for the first 8 hours.

Lantus or Levemir twice per day:

- Reduce night time dose by 25% the night before.
- Miss out/do not give the morning background insulin and start the pump.
- Have rapid acting insulin for carbohydrate and any corrections needed
- Put a temporary basal rate of 50% on for the first 8 hours.

Monitoring Tool

How will monitoring be carried out?

Who will monitor compliance with the guideline? Paediatric Clinical Governance Committee
Paediatric Diabetes Team

STANDARDS	%	CLINICAL EXCEPTIONS
Compliance with these guidelines	100%	

Supporting Document 1 – Checklist for review and approval of key documents

This checklist is designed to be completed whilst a key document is being developed / reviewed.

A completed checklist will need to be returned with the document before it can be published on the intranet.

For documents that are being reviewed and reissued without change, this checklist will still need to be completed, to ensure that the document is in the correct format, has any new documentation included.

1	Type of document	Guideline
2	Title of document	Insulin Pump Therapy Children Guideline for Children and Young People with Diabetes
3	Is this a new document?	Yes ☒ No ☐ If no, what is the reference number?
4	For existing documents, have you included and completed the key amendments box?	Yes ☐ No ☐
5	Owning department	Paediatrics
6	Clinical lead/s	Dr James West
7	Pharmacist name (required if medication is involved)	Sarah Scott
8	Has all mandatory content been included (see relevant document template)	Yes ☒ No ☐
9	If this is a new document have properly completed Equality Impact and Financial Assessments been included?	Yes ☒ No ☐
10	Please describe the consultation that has been carried out for this document	Agreed by members of the Paediatric Diabetes MDT and Paediatric Quality Improvement Group
11	Please state how you want the title of this document to appear on the intranet, for search purposes and which specialty this document relates to.	Insulin Pump Therapy Children Guideline for Children and Young People with Diabetes
Once the document has been developed and is ready for approval, send to the Clinical Governance Department, along with this partially completed checklist, for them to check format, mandatory content etc. Once checked, the document and checklist will be submitted to relevant committee for approval.		

Implementation

Briefly describe the steps that will be taken to ensure that this key document is implemented

Action	Person responsible	Timescale
To be circulated to Quality Improvement Meeting for approval.	Dr J West	

Plan for dissemination

Disseminated to	Date
To be highlighted in Riverbank Ward's newsletter, nursing huddles and junior doctors teaching.	

1	**Step 1 To be completed by Clinical Governance Department** Is the document in the correct format? Has all mandatory content been included? Date form returned	 Yes ☒ No ☐ Yes ☒ No ☐
2	Name of the approving body (person or committee/s)	Paediatric Quality improvement Committee
	Step 2 To be completed by Committee Chair/ Accountable Director	
3	Approved by (Name of Chair/ Accountable Director):	
4	Approval date	

Please return an electronic version of the approved document and completed checklist to the Clinical Governance Department, and ensure that a copy of the committee minutes is also provided (or approval email from accountable director in the case of minor amendments).

Office use only	Reference Number	Date form received	Date document published	Version No.