Pump failure guidelines

Planning ahead

All technology, including pumps, can fail occasionally, even within their warranty period. It is important to be able to independently initiate injection treatment if required. The aim of this guide is to assist you in this process.

Remember: More than two hours without insulin delivery can lead to Diabetic Ketoacidosis (DKA).

Be prepared - All families on pump therapy should ensure they have:
- Novorapid or Humalog pens with penfill cartridges or disposable pens
- Pen needle tips
- A prescription (in date) for long-acting insulin (i.e. Lantus)
- A plan of how to calculate doses if you need to revert back to injections.

To be able to calculate doses you will need to refer to the pump's programmed settings. The best way to ensure you have your child's latest data is to **upload the pump regularly**. There is one page which gives you all the settings you will need.

Medtronic Carelink Professional settings page (below)

Basal

Maximum Basal Rate 1.80 U/Hr

Basal 1 (active)

24-Hour Total 30.900 U

Time	U/Hr
0:00	1.20
6:00	1.30
12:00	1.30
21:00	1.40

Day Off

24-Hour Total –

Time	U/Hr
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Workday

24-Hour Total –

Time	U/Hr
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Bolus

Bolus Wizard	On	Easy Bolus	Off
Units	g, mmol/L	Bolus Increment	0.1 U
Active Insulin Time (h:mm)	3:00	Bolus Speed	Quick
Maximum Bolus	25.0 U	Dual/Square	On/Off

Carbohydrate Ratio (g/U)

Time	Ratio
0:00	7.0
17:30	7.0

Insulin Sensitivity (mmol/L per U)

Time	Sensitivity
0:00	1.5
5:00	1.3
17:30	1.3
21:00	1.5

Blood Glucose Target (mmol/L)

Time	Low	High
0:00	5.0	5.5

Preset Bolus

Name	Normal	Square
Bolus 1		
Breakfast		
Dinner		
Lunch		
Snack		
Bolus 2		
Bolus 3		
Bolus 4		

Preset Temp

Name	Rate	Duration
High Activity		
Moderate Activity		

Name	Rate	Duration
Temp 1		
Temp 2		

Sensor

Sensor Off

High Alerts Off (Snooze 1:00)

Start Time	High (mmol/L)	Alert On High	Alert Before High	Rise Alert Limit (mmol/L)

Low Alerts Off (Snooze 0:20)

Start Time	Low (mmol/L)	Suspend	Alert On Low	Alert Before Low	Resume Basal Alert

Auto Calibration	Off
Calibration Reminder	On
Calibration Reminder Time	1:00

Notes

Animas settings/rates page (below)

Insulin: Pump settings

Insulin pump settings for serial number 04-13982-16 (Animas Vibe). Upload date: 18/01/2016 02:28 (Australia/Perth)

Bolus

Setting	Value
Audio Bolus Enable	Disabled
Audio Bolus Stepsize per program keypress	1.0 U
Advanced Bolus Options enable	Enabled
Bolus Reminder Options enable	Enabled
Bolus Delivery Speed	Slow
Max Bolus	14 U

Basal

Setting	Value
Max Basal	5 U/h
Max Total Daily Dose	29 U
Active basal program	1

General

Setting	Value
Language Selection Index	English
Last Keypress to display timeout	60 s
Auto-Off Enable	Disabled
Auto-Off Timeout	12 h
Max 2-Hr limit	12 U
Occlusion Sensitivity Level	High
Insulin-On-Board	Enabled
Insulin-On-Board Duration	3 h
Sick days, BG over limit	15 mmol/L
Sick days, check ketones	2 h
Sick days, check BG	2 h
Low Cartridge Warning Level	20 U
Time format	24 h
BG unit	mmol/L

I:C ratio settings

	Start	I: U: [g]
1	00:00:00	6
2	10:00:00	11
3	11:30:00	12
4	15:30:00	12
5	18:00:00	12

ISF programs

	Start	ISF [mmol/L]
1	00:00:00	9
2	08:30:00	7
3	21:00:00	8

BG target range settings

	Start	Target [mmol/L]	Range [mmol/L]
1	00:00:00	5.5	+/- 0.5

Basal profiles

Program 1

	Start	Rate
1	00:00:00	0.300
2	02:00:00	0.300
3	08:00:00	0.375
4	11:00:00	0.350
5	12:00:00	0.350
6	13:00:00	0.325
7	15:00:00	0.350
8	19:00:00	0.350
9	21:00:00	0.300

Sum: 7.875 U

Program 2

	Start	Rate
1	00:00:00	0.000

Sum: 0.000 U

Program 3

	Start	Rate
1	00:00:00	0.000

Sum: 0.000 U

Program 4

	Start	Rate
1	00:00:00	0.000

Sum: 0.000 U

CGM Settings

Setting	Value
Transmitter Sound Level	High
Other Sound Level	High
Glucose High Alert Limit	11.1 mmol/L
Glucose Low Alert Limit	4.4 mmol/L
Glucose Rise Alert Limit	0.2 mmol/L
Glucose Fall Alert Limit	0.2 mmol/L
Glucose Low Alert Snooze Time	0 min
Glucose High Alert Snooze Time	0 min
Transmitter Out of Range Alert Snooze Time	30 min
Glucose Low Enable	Enabled
Glucose High Enable	Enabled
Glucose Rise Enable	Enabled
Glucose Fall Enable	Enabled
Transmitter Out of Range	Enabled

Settings will be required to be able to calculate injection doses, and to enter into a replacement pump if needed.

It is worth spending the time on the phone to the pump company's helpline to enable uploading of the pump.

The green circles highlight the ICR and ISF you can use for injection doses if the pump fails. The blue rectangles highlight additional settings required for when you need to reprogram a replacement pump.

You will need to know:

1. Current Insulin to Carbohydrate Ratio (**ICR**) – there may be multiple at different times of the day
2. Current Insulin Sensitivity Factor (**ISF**) – there may be multiple at different times of the day
3. 24 hour basal total dose.

Calculating your insulin dose:

- Your Lantus dose should be equal to your 24 hour basal total (round to the nearest whole number) and is to be given at the same time every day.
- If your pump screen is still working, you may be able to use it to calculate how much insulin to give as a rapid-acting insulin bolus by entering in the current Blood Glucose Level (BGL) and carbohydrate amount if eating, and giving the calculated dose via injection.
- If your pump screen is not working, doses can be manually calculated as below:

To calculate insulin dose for carbs	To calculate insulin dose for high BGL
1. Check to see what the ICR is set at for the current time of the day 2. Divide carbohydrate amount to be eaten by ICR *E.g. I am about to eat 50g of carbs for lunch. My ICR for lunch is 10g* *50 / 10 = 5 Units* *Therefore I will need 5 units of rapid acting insulin for my food*	1. Check to see what the ISF is set at for the current time of the day 2. Check BGL. We are aiming for a BGL = 5mmol/L when doing corrections 3. Minus 5 (target BGL) from the current BGL 4. Divide the result by the ISF *E.g. My pre-lunch BGL = 10mmol/L. My ISF for lunch is 5mmol/L* *10mmol/L (current BGL) – 5mmol/L (target BGL) = 5mmol/L* *5 / 5 (ISF) = 1 Unit* *Therefore I will need 1 unit for my elevated BGL*
Add the results together and round to the nearest whole or half number (depending if you have a half or full unit pen) to determine dose *5 Units + 1 Unit = 6 Units* *To give 6 units of rapid acting insulin pre-meal via injection*	

*Remember there must be a two hour gap between rapid-acting insulin injections to avoid insulin stacking.

What if you haven't done a recent pump upload?

It is strongly recommended you use Appendix A to record rates at least once per month, and when changes are made to rates.

Use the pump history and record the Total Daily Dose (TDD) for the past five days.

Add the five days together and divide by five to get an average TDD .

Insulin to Carbohydrate Ratio (ICR)

Under 5 years
To get a general idea of what the ICR should be, use the 300 RULE:
- Divide 300 by the average amount of insulin given over the last 5 days (average TDD)
- This gives you the carbohydrate part of the ratio
- For example, if the average daily dose of insulin over the last 5 days is 15 units, the calculation is 300 /15 = 20 and the ICR is 1:20.

≥ 5 years
To get a general idea of what the ICR should be, use the 500 RULE:
- Divide 500 by the average amount of insulin given over the last 5 days
- This gives you the carbohydrate part of the ratio

For example:
- If the average daily dose of insulin over the last 5 days is 50 units:
- Calculation is therefore 500 divided by 50 units, the calculation is 500 / 50 = ICR of 10.

Insulin Sensitivity Factor (ISF)

To get a general idea of what the ISF should be, use the 100 RULE:
- Divide 100 by the average daily amount of insulin given over the last 5 days
- For example, If the average daily dose of insulin over the last 5 days is 20 units, the calculation is 100/20 = 5 (1 unit lowers the blood glucose level by 5 mmol/L).

The total basal dose on the pump will give you a good guide of how much Lantus you child will require. If you are not sure what the total basal dose is, give 40% of the average TDD.

Pump failure checklist and plan

Action if the pump fails:

Checklist:
- ☐ Novorapid or Humalog penfill cartridges
- ☐ Pen needle tips
- ☐ Intermediate or long-acting insulin or an in-date prescription (e.g.Levemir,Lantus)

Action if your pump fails:

1. Test BGL

2. Test ketones if BGL > 15 mmol/l

3. Give insulin if needed

4. Give <u>long-acting</u> insulin via injection – either total basal daily dose, or if not sure what this is, give 40% of total daily dose

5. Give <u>short-acting</u> insulin via injection before meals

6. Call the pump company helpline or representative

   Medtronic: 1800 777 808 (24 hour global helpline)

   Animas: 1300 851 056 (technical support)

   Accu-chek Roche: 1800 633 457 (pump hotline)

Note: in general a pump failure can be managed by the family at home and should not require a call to the emergency service.

If no long-acting insulin is immediately available, short-acting insulin will be required every 2-3 hours via injection.

Going back onto insulin pump therapy

After receiving a replacement pump, it is important to plan going back onto pump therapy.

The Lantus dose, this should be halved the night prior to going back onto the pump.

Appendix A

Insulin pump rates

Standard Basal Rate (s)

Time	Hourly Rate
24 Hour Total:	

Insulin / carb ratio(s)

Time	No. of grams covered by 1 unit of insulin

Total Daily Dose (last five days)

Date	Day	Total

Insulin sensitivity

Time	1 unit ↓BGL by (mmol)

Target BGLs

Time	Target Range