The Leeds Teaching Hospitals NHS Trust

Exercise, Insulin Pumps and Basal Insulin Adjustment

Information for patients

Adult Therapies

How to use this leaflet

This leaflet is designed as a step by step approach to help you adjust your basal insulin when using an insulin pump for exercise. There are a number of factors that you need to consider and this leaflet will take you through each of these steps in turn.

This will help you to manage your blood glucose levels during exercise, reducing the risk of hypoglycaemia (low blood glucose levels) and hyperglycaemia (high blood glucose levels).

If you need further help and support, please contact your diabetes team. You may find the following websites useful: www.runsweet.com or www.excarbs.sansum.org

Factors to Consider

Before you start exercising, consider the following steps:

1. The type of exercise you are about to do:

Type of exercise	Effect on Blood Glucose Level
Cardiovascular (running, cycling, cross-trainer)	Fall in blood glucose 
Muscle strengthening and sharp bursts of intense (weights, squatting, sprinting) exercise	Rise in blood glucose 
Intermittent or mixed or start/stop exercise (circuit training, hockey, tennis, football) or mix of cardiovascular with muscle strengthening excercise in one session	Rise and fall in blood glucose 
Flexibility (Yoga, Pilates,Tai Chi)	Stable blood glucose
Day to day activities such as shopping, gardening and cleaning	Fall in blood glucose 

You may need to reduce your basal rate between 10 – 30% one hour before the activity and during the activity

2. How long and how intense the exercise will be:

- The longer the exercise goes on for and the more intense the exercise is, the more you will need to reduce your basal insulin before, during and after the exercise. Changes to your bolus insulin will also be important – please see the Nutrition and Diet Resources UK (NDR) Physical Activity Leaflet for more help with this
- You may also need to have more carbohydrate to fuel your exercise (please refer to the NDR Physical Activity leaflet)

3. The time of day that you exercise:

- Exercising earlier in the day may mean you need to make less changes to your basal rate as you will have lower levels of insulin in your system, particularly first thing on a morning. This is due to hormone changes early in the morning which often raise the blood glucose level at that time of day
- There will also be less "active insulin on board" 3 hours after a meal, meaning less insulin adjustment is needed for the meal before exercise. However, you may still need to reduce the bolus insulin for your next meal to prevent hypoglycaemia after the exercise
- You may also need less carbohydrate to fuel your exercise in the morning compared with afternoon or evening, which may be helpful if you are trying to manage your weight

4. Check how much "Active Insulin on Board" your pump is displaying:

- If you have "active insulin on board", your blood glucose level is more likely to fall quickly during exercise. Think about reducing your bolus insulin before exercising, using

the Nutrition and Diet Resources UK (NDR) leaflet as a guide and avoid using correction boluses, unless your blood glucose is 14mmol/l or above

- Aim for your blood glucose to be **6-10mmol/l** before you exercise
- Try to remember to reduce your basal rate before exercising (see table Adjusting Basal Insulin within this leaflet)
- Use the table below to guide you with blood glucose control before exercise:

Blood glucose level	Suggested action
Less than 5mmol/l before you exercise	You will need some carbohydrate before you exercise e.g. 3 Jaffa Cakes or 2-3 Jelly Babies or a small banana. Your choice of carbohydrate may depend on the type of exercise you are about to undertake to avoid unwanted stomach and bowel upsets during the exercise
Less than 4mmol/l	You must treat a low blood glucose level before you carry out any exercise, using 15-20g fast acting glucose
If your blood glucose is consistently 14mmol/l or above prior to doing exercise	You will need to check that you do not have ketones present (use your ketone meter to check this). You may need to use a small correction dose if you do not have insulin on board already (check your insulin pump for "insulin on board") to correct your blood glucose to approximately 10mmol/l before exercise
If you do not have ketones	You can carry out the exercise
If you do have ketones present	**Do not exercise**. Follow advice from your diabetes nurse on how to clear your ketones and correct your blood glucose level safely

5. Hypoglycaemia before and after exercise:

- If you have had a 'hypo' in the **24 hours** before your exercise, you are more at risk of hypos during and after exercise. These hypos may be more difficult to treat and may last longer than usual, as there will be less stored glucose (glycogen) in the liver
- Reduce your risk of hypoglycaemia with exercise by mixing up the type of activities you are doing e.g. cardiovascular activities (running, cycling or cross trainer) followed by muscle strengthening activities (weights or squatting) to help keep your blood glucose level within target range
- Do not exercise if you have had a severe hypo (a hypo requiring third party assistance i.e. you need someone else to treat the hypo for you) within 48 hours before your exercise
- You are more likely to have a hypo after exercise when the muscles are being recharged with glucose, especially overnight. You may need to consider a reduction to your basal rate overnight (20%) depending on what patterns your blood glucose levels are showing

Other points to consider

Some insulin pumps can be removed for **up to 1 hour** (for example, the Medtronic insulin pump available in Leeds Teaching Hospitals), which is useful for activities such as swimming, martial arts or contact sports (rugby).

Re-attach the pump before the hour is complete so that the pump can deliver the basal insulin again, otherwise there will be no insulin in your system.

In order to reduce your basal rate for exercise, you will need to use a **Temporary Basal Rate (TBR)**, usually up to one and a half hours before you start the exercise (if it is planned exercise). If you are unsure how to activate the TBR on your insulin pump, please contact your diabetes team, or look at your insulin pumps website which may guide you to videos on how to do this.

If you prefer not to make changes to your basal insulin, you will need to consume regular carbohydrate based snacks, which could be glucose based during the activity. Examples include Isotonic Sports drink, Jelly Babies or glucose gels containing 10-20g carbohydrate consumed every 20 minutes. You will also need to be checking your blood glucose levels carefully during and after the activity, including overnight.

Remember that prolonged aerobic exercise will increase your sensitivity to insulin, increasing your risk of a low blood glucose level up for up to 24 hours after exercising.

It is really important to keep checking your blood glucose levels before, during and after your exercise as this will help you to make the adjustments to your insulin that suit your body.

Snacks may still be required before, during and after the activity, depending on your blood glucose level at that time.

Look at the **patterns** in your blood glucose levels overnight to see if you need a reduction to your basal rate to lower your risk of a low blood glucose level overnight.

You may need to reduce your basal rate by 20%, but be prepared to reduce the basal rate by up to 50% if needed. Refer to the table on page 7 to help you with this.

Adjusting Basal Insulin:

You may use the table below as a guide on how to adjust your basal insulin for the exercise that you are doing.

	Approx. 30 minutes exercise	Approx. 60 minutes exercise	After Exercise (if exercise is longer than 2 hours or it is a new exercise routine or exercising after 4pm)
Aerobic exercise e.g. running, cycling, swimming, hiking, golf	50% basal reduction 1½ hours before exercise (or 100% reduction at start of exercise)	50 – 80% basal reduction 1½ hours before exercise (or 100% reduction at start of exercise)	20% basal reduction at bedtime for 6 hours (overnight)
Resistance training (anaerobic exercise) e.g. weight lifting, sprinting, squatting	No reduction	50% basal reduction 1½ hours before exercise	20% basal reduction at bedtime for 6 hours (overnight)
High intensity interval training (also anaerobic exercise)	No reduction	No reduction	20% basal reduction at bedtime for 6 hours (overnight)
Mixed exercise (aerobic and anaerobic exercises in one session)	100% basal reduction at start of exercise	50% basal reduction 1½ hours before exercise (or 100% reduction) then change to 20-30% reduction for anaerobic exercise	20% basal reduction at bedtime for 6 hours (overnight)
Flexibility exercises e.g. yoga, Pilates, Tai Chi	No reduction	No reduction	No reduction, but remain cautious over the next 12-24 hrs after the exercise

If you have any queries please contact the:

Diabetes careline contact number	0113 206 5068

For further information on managing exercise and your quick acting insulin, please refer to the following leaflet:

Physical Activity (NDR, UK)

What did you think of your care?

Scan the QR code or visit **bit.ly/nhsleedsfft**

Your views matter

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