This Interactive booklet must be opened in Adobe Acrobat:
Click on the link to install Adobe for:
PC   Apple   Android

CGM Academy

Name

Weight in kg   **Low alert level**

                         High alert level

Contents

What the families who have graduated the CGM Academy have said:

"The Dexcom G6 has changed my life. Hardly a need for finger pricks, maybe once a week. Trend arrows help me prevent hypos. The alarms stop me going dangerously high or low. I can check as many times as I need, especially when playing football. I have finally mastered how much insulin I need to cover my Pepperoni Pizza."

"Don't be afraid to try some of the new skills. You will quickly learn what works for you."

"Go for it! And try things from the education sessions to see if they work."

"Parents and children should talk carefully, reasonably and frequently to nudge forward how they use the kit. "

"Take it slow. Don't try to do everything or take advantage of everything at once."

"I did not get everything straight away. At first all the information was a little bit overwhelming. The feeling of overwhelm went away once I realised I did not have to learn and do everything in the first week. My biggest piece of advice would be to not be afraid to try the new skills you get taught. Sometimes they will work. Sometimes they will not. I actually learned more from the mistakes than the successes. Good luck, and just give it a good go."

"to experiment with different foods/ exercise/ snacks etc and keep a record of absolutely everything! You can guarantee the one time you bolus/time perfectly for something you won't remember how to do it next time!"

"Get used to glancing at the phone and using dynamic glucose management skills."

Things you need to be ready for;   Watch me: DynamicGM

1. Learning CGM skills will not happen in the sessions. You will only get the information in the sessions. You will only truly learn when you try them out to find out what works for you. Every person with diabetes is unique, so the guides in this booklet will be a good starting point. **You will only develop the skills that work for you, by trial and error and making some mistakes.**

2. The change to **Dynmaic glucose managemnt (DynamicGM)** means you will be making more decisions on a daily basis. Most people make between 4-8 glucose management decisions when using finger pricks. When they change to CGM this increases to 15-25 decisions. Most of these decisions are simply to do nothing and check again in 30 minutes. Be prepared to interact more with your diabetes.

DynamicGM

Combining glucose and trend arrow information with proactive diabetes management strategies to maximise time in range.

Dexcom numbers and useful websites

Tech support number:
0800 0315763 Mon – Friday – 07:00-18:00hrs, Sat & Sun – 8:30- 16:30hrs

Replacement sensors online: www.dexcom.com/UKIETechsupport

Customer services –
0800 0315761 - Mon – Friday normal working hours
gb.sales@dexcom.com

Dexcom website:
https://www.dexcom.com/en-GB

Link to compatible devices for Dexcom:
https://www.dexcom.com/dexcom-international-compatibility

Dexcom weekly webinars:
https://dexcomuk.edudip.com/w/320410

Dexcom online training resources:
https://www.dexcom.com/en-GB/training-resources

What you will learn in each session

In session 1 you will become familiar with the foundations of CGM and put in the bumpers - the alarms:

1. Set clear expectations & goals on what's to be achieved for funding.
2. Understanding CGM & getting set up on your device with alarms set..
3. Knowing when you need to do finger pricks.
4. Understanding what the trend arrows mean.
5. Connecting your CGM to download systems and other devices.
6. Learn how to prevent hypoglycaemia using **DynamicGM**
7. Learn how to use CGM to improve exercise management.
8. Set a plan with your teachers for CGM usage in school.

In session 2 you will develop your skills and review your progress and plan for CGM in school. You will start to use your funnel - the trend arrows:

1. Reviewing the first week: the ups and downs.
2. Review download information and make insulin or behaviour changes.
3. Learn how to prevent after meal spikes in glucose using **DynamicGM**

Session 3 will be focussed on fine tuning your skills. You will perfect using the funnel and learn more DynamicGM (Dynamic Glucose Management) strategies:

1. How to look at downloads and make changes.
2. Review download information and make insulin or behaviour changes.
3. Learn how to change food choices prevent glucose spikes using **DynamicGM**
4. Learn how to use short bouts of exercise to prevent or bring down high glucose levels between meals.

The advanced session teaches extra DynamicGM tools to fine tune glucose control.

Finger prick blood glucose
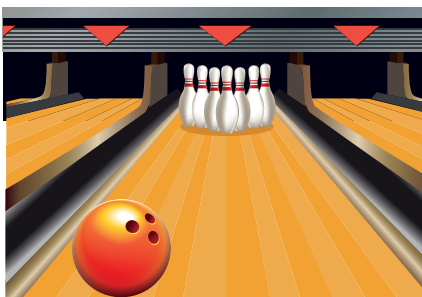
CGM with alarms
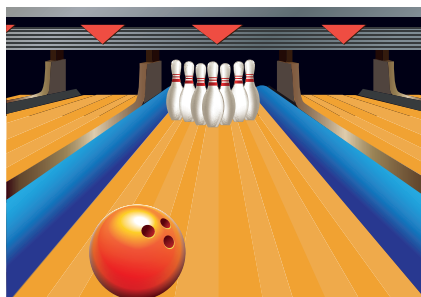
CGM with alarms and DynamicGM

CGM Academy Session 1
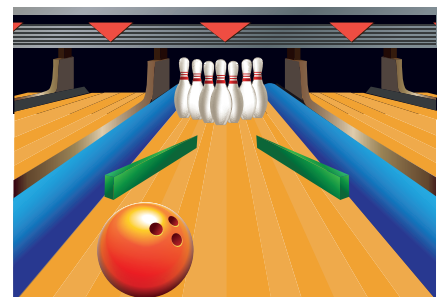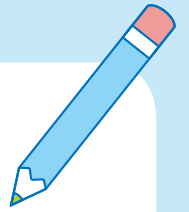
Setting expectations

Young person's expectation of CGM and the CGM Academy

1.

2.

3.

Parent/guardian expectation of CGM and the CGM Academy

1.

2.

3.

Diabetes Team Expectations

1. Attend all sessions and bring this workbook.
2. Be on time and be ready to learn.
3. Ask questions if you do not understand.
4. Set up account for downloading CGM information.
5. Contact Dexcom if technical issues – not the Diabetes Team.
6. Share your experience during the sessions.
7. Be prepared to try new **DynamicGM** strategies.
8. We expect you to make some mistakes and learn from them. We know everything will not perfectly first time.

Setting goals for CGM continuation

Outcome goals to be achieved at 6 months:

• Reduction in hypoglycaemia:

      o Target % less than 4.0mmol/l =

• HbA1c goal:

      o Current HbA1c mmol/mol =

      o Target HbA1c mmol/mol =

Finger Prick or CGM Average Glucose mmol/l	HbA1c mmol/mol Clinic 3 month new measurement	HbA1c % Clinic 3 month old measurement	Diabetes effect on energy & mood	Diabetes effect on future health
6.0	37	5.5%	☺☺☺☺	☺☺☺☺
7.0	42	6.0%	☺☺☺	☺☺☺
8.0	48	6.5%	☺☺	☺☺
9.5	58	7.5%	☺	☺
10.0	64	8.0%	☺	☺
11.0	70	8.5%	☹	☹
12.5	80	9.5%	☹☹	☹☹
14.0	91	10.5%	☹☹☹	☹☹☹
>16.0	>102	>11.5%	☹☹☹☹	☹☹☹☹

Process goals to be achieved at all times:

1. Have data capture of more than 70% (more than5 days a week).

2. Test blood glucose if feel symptomatically different to CGM reading.

3. Respond appropriately to high and low glucose alerts.

4. Keep a record of insulin doses administered and carbohydrate eaten in the EVENTS of the G6 APP.

5. Review download information and make proactive adjustments to therapy every two weeks.

6. Try new **DynamicGM** skills and learn from real life practice and making mistakes.

Setting up the alerts and alarms
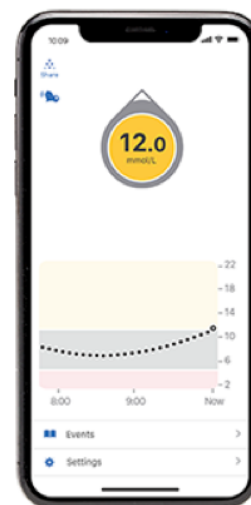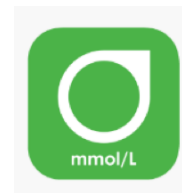
Check phone compatibility:
http://www.dexcom.com/compatibility

Create a Dexcom account:
https://www.dexcom.com/en-GB

Install Dexcom APP: Dexcom G6 mmol/L **Watch me: Setup**

Setting up the Dexcom G6 APP

- iPhone: Settings app/ General / Software Update / Automatic updates / Off.
- Urgent Low Soon = On.
- Low Alert =   mmol/ll.
- Low Repeat = 30 minutes (It often takes 5-10 minutes from alarm to taking the glucose).
- Higher Alert =   mmol/l.
- High Repeat = 90 minutes.
- Signal loss = 20 minutes.

Setting up the Dexcom G6 receiver

- Create a Dexcom account: https://www.dexcom.com/en-GB
- Urgent Low Soon = On.
- Low Alert =   mmol/l.
- Low Repeat = 30 minutes (It often takes 5-10 minutes from alarm to taking the glucose).
- Higher Alert =   mmol/l.
- High Repeat = 90 minutes.
- Signal loss = 20 minutes.

**The families of Birmingham Top Tips for CGM success**
Practical tips

- Carry a mobile charging device that fits your phone/receiver at all times, especially at school
- Put the phone/receiver on charge each night.
- Set APP limits via Screen Time (iPhone) or Google garage (Android).
    - o Block all APPs except Dexcom G6 during the school day.
    - o Set a limit on the amount of internet time each day – 2 hours is researched to be safe
    - o Review internet usage on a weekly basis.
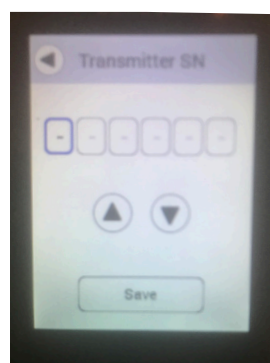
Getting ready for the sensor

1. You will enter a new sensor code every 10 days when you change the sensor.
2. You will only enter the transmitter code every three months when you get a new transmitter.
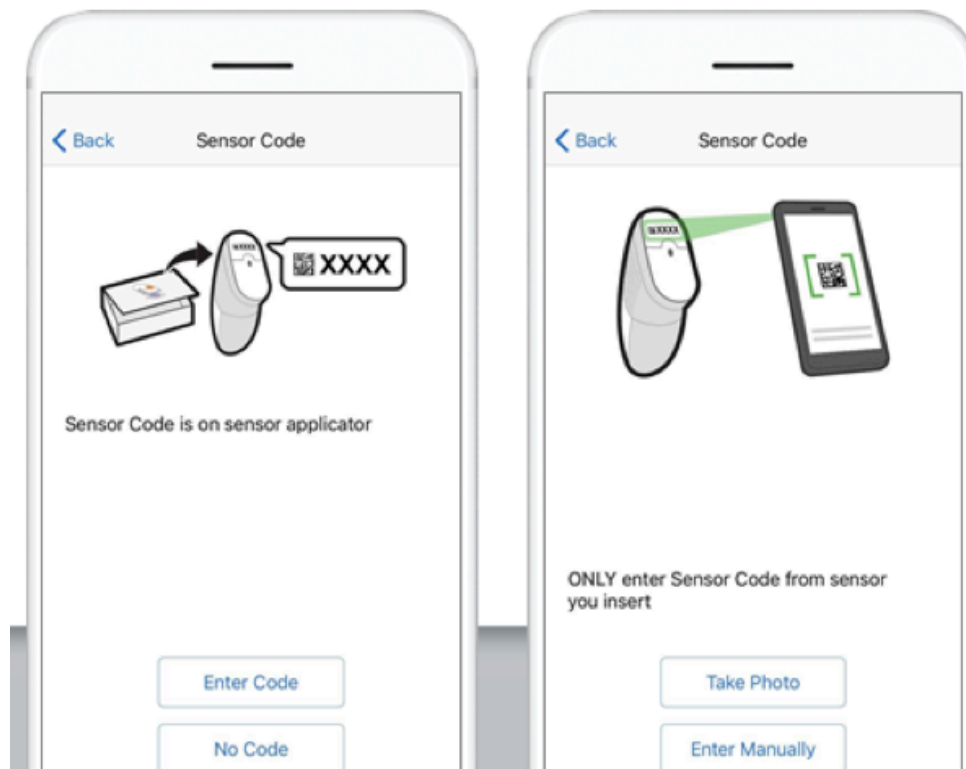
Linking the Transmitter serial number
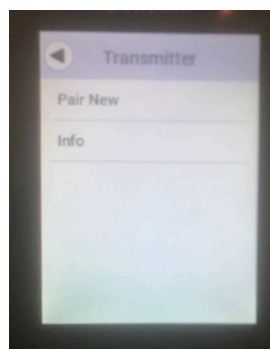
Select "menu" then "Transmitter, then "Pair new"

Enter the serial number of the transmitter

Inserting the sensor

1. Make sure the insertion area is clean and dry.

2. Do not insert it lumpy areas and avoid areas you sleep on.

3. Use an Overpatch to keep the adhesive in place if you have issues with keeping the sensor on:

   a. Contact Dexcom to request Overpatch.

   b. Type "Dexcom Overpatch" into Amazon or Google for options to purchase.

4. Sensors not sticking in place for 10 days you can try:

   a. Cleaning the area with an alcohol wipe to remove natural oils before insertion.

   b. Spraying a strong antiperspirant deodorant on the area 10 minutes before insertion.

   c. Try Skin Tac wipes 5 minutes before insertion – sear "Skin Tac wipes" into Amazon or Google.
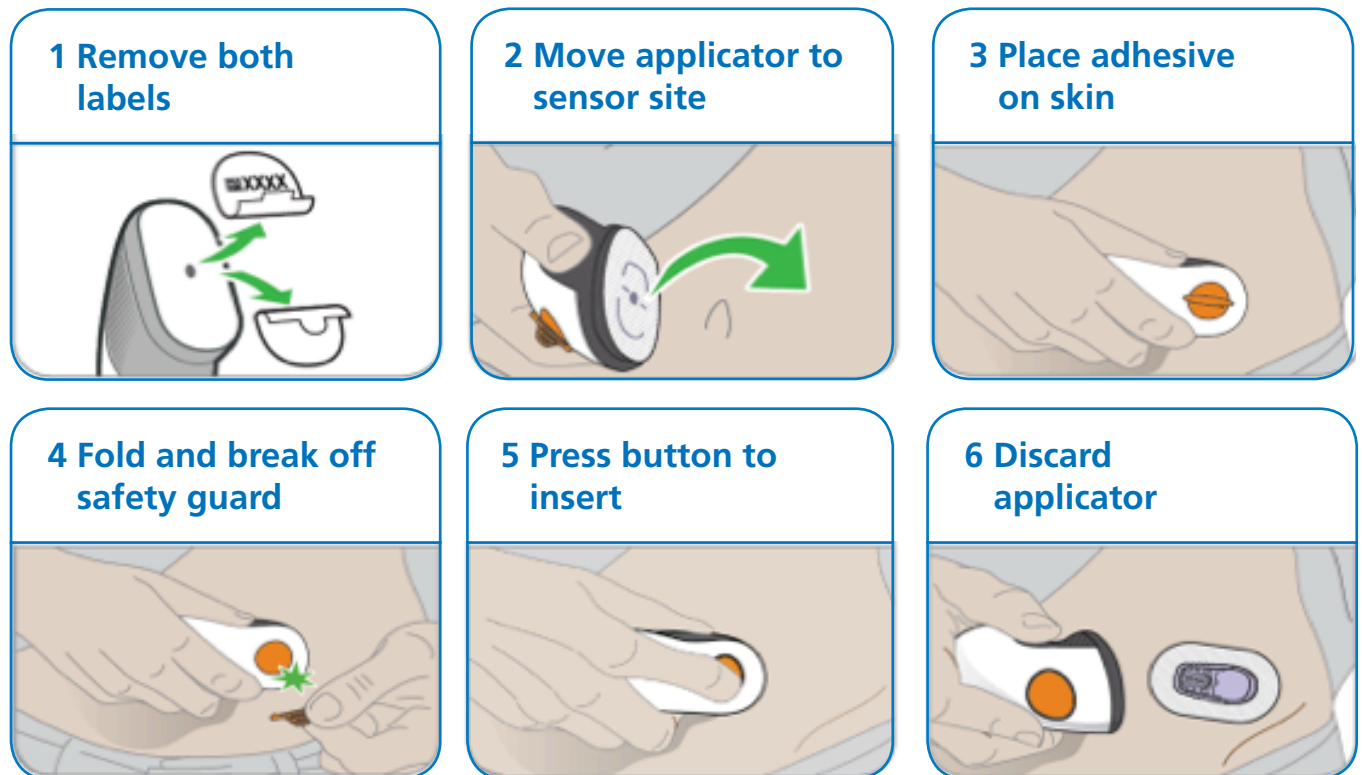
Tips for inserting the sensor

Avoid scar, hair, tatoos, irritation, boney areas, areas where the sensor can be rubbed (waist band, seat belt), and at least 7.5cm from insulin injection sites. Clean site with alcohol and let dry.

Optional Skin adhesive

- Create an empty oval on the skin with adhesive, such as Mastisol or Skin Tac.
- Let skin adhesive dry.
- Insert sensor on clean skin in centre of oval.

Inserting the sensor   Watch me: sensor insertion

1 Remove both labels	**2 Move applicator to sensor site**	**3 Place adhesive on skin**
4 Fold and break off safety guard	**5 Press button to insert**	**6 Discard applicator**

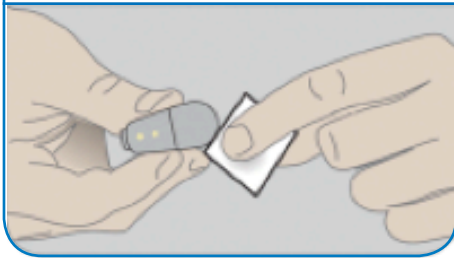**The families of Birmingham Top Tips for CGM success**

Sensor tips

- Try Rock tape if the Overtapes do not work.
- Try Micropore tape (from the chemist) if the plaster starts to come up.
- Try Skin Tac if the sensor keep coming off despite having the Overtapes on.
- Keep each sensor and transmitter packaging until it's finished in case replacements are needed.
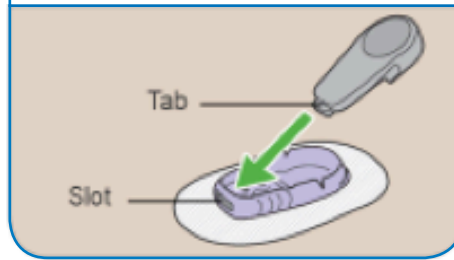
Must get replacement sensors from Dexcom for all sensors that do not last 10 days. If you do not you will run out of sensors before your next delivery.

Attaching the Transmitter

1 Clean transmitter with alcohol	2 Insert transmitter tab into slot

3 Snap transmitter firmly into place	4 Rub around patch 3 times

**The families of Birmingham Top Tips for CGM success**

Transmitter tips

- Let the transmitter cool for 15 minutes between sensors.
- If signal loss turn Bluetooth off then on. If this does not work turn the phone off and back on.
- When get a new transmitter, delete the old one from Bluetooth devices on the phone.
- Close all other APPS open in the background on your phone and make sure power save mode is NOT on.
- Call Dexcom technical support for signal loss, they can help you make changes to you phone settings.

Pairing the transmitter and starting the sensor

1. You will only have to do this every time you use a new transmitter – every three months unless you get a replacement for a faulty transmitter.
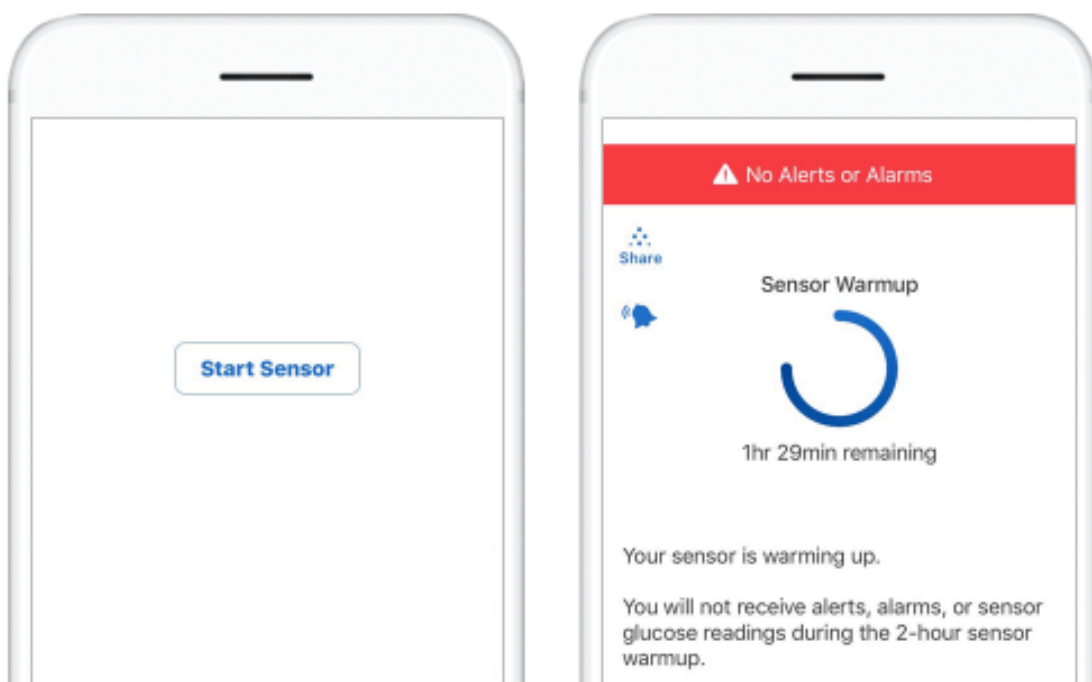
Pairing

Once you attach a new transmitter, it will need to be paired.
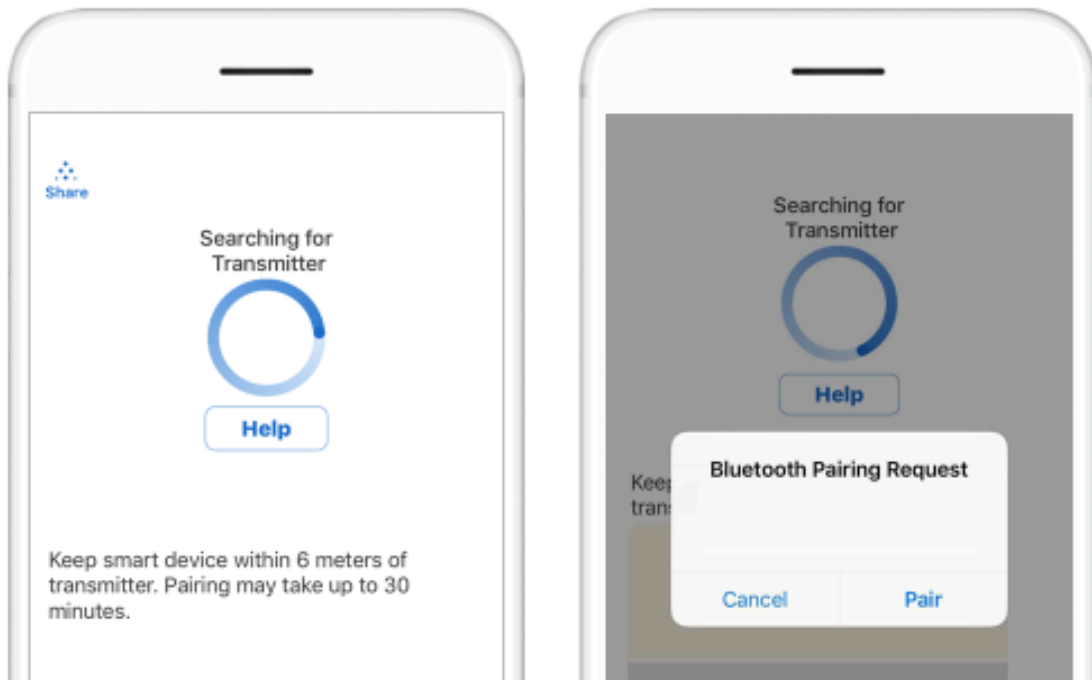
Start sensor

Once communication is confirmed, the sensor can be started.

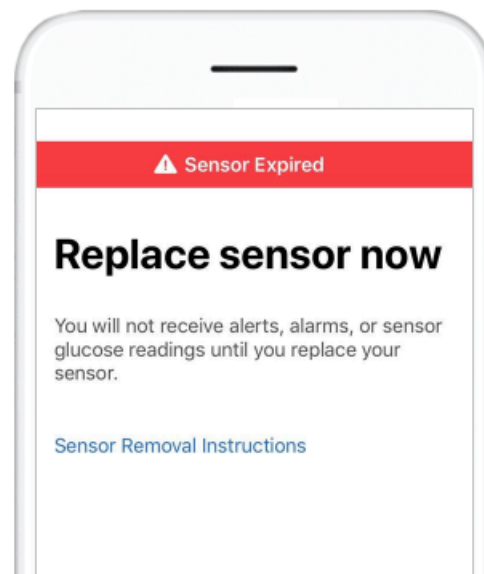# Ending sensor session and removing sensor and transmitter

1. Trouble with removing the sensor:

      a. You could remove the sensor after a bath to loosen the adhesive.

      b. You could get Lift Plus from the GP.

2. Remove and keep the transmitter before putting the sensor in the sharps bin.

Watch me: replacing sensor

Ending sensor session
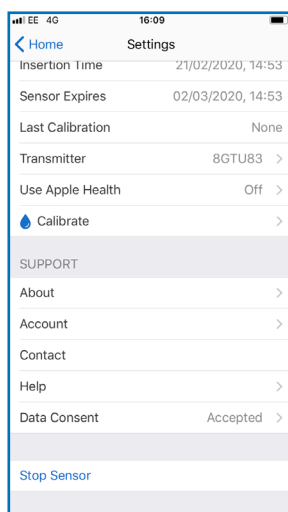
Sensor automatically shuts off after 10 days.

You will get an alert 6 hours, 2 hours and 30 minutes before this happens.

⚠ Sensor Expired

Replace sensor now

You will not receive alerts, alarms, or sensor glucose readings until you replace your sensor.
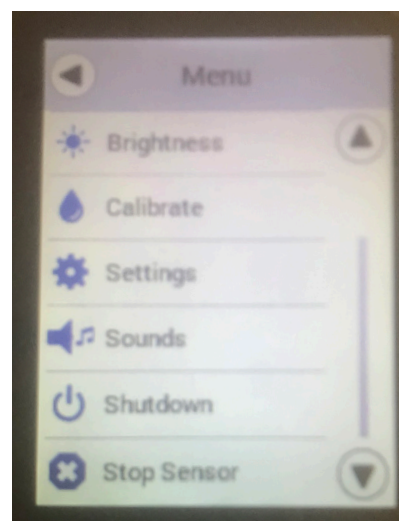
Sensor Removal Instructions

If you need to replace a sensor early

If the sensor fails early you will need to stop the sensor.

On the phone select "settings", then scroll to the bottom and select "Stop Sensor".

On the receiver go into the "Menu" "three lines, go to the bottom of the menu and select "Stop Sensor.

Insertion Time	21/02/2020, 14:53
Sensor Expires	02/03/2020, 14:53
Last Calibration	None
Transmitter	8GTU83 >
Use Apple Health	Off >
💧 Calibrate	>
SUPPORT	
About	>
Account	>
Contact	
Help	>
Data Consent	Accepted >
Stop Sensor	

Menu

☀ Brightness

💧 Calibrate
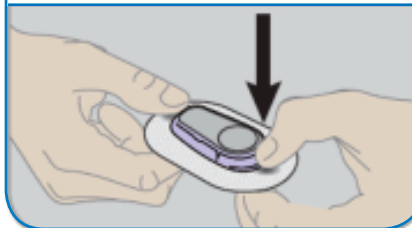
⚙ Settings

🔊 Sounds

⏻ Shutdown

❌ Stop Sensor

Watch me: If sensor does not last 10 days
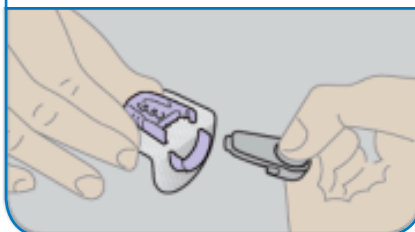
Removing sensor and transmitter

1 Peel the patch off like a bandage
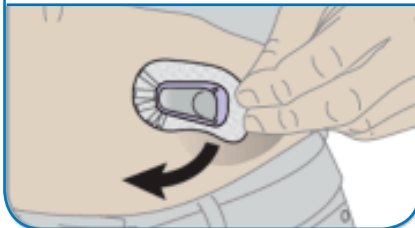
2 Bend and break the lip to release the transmitter

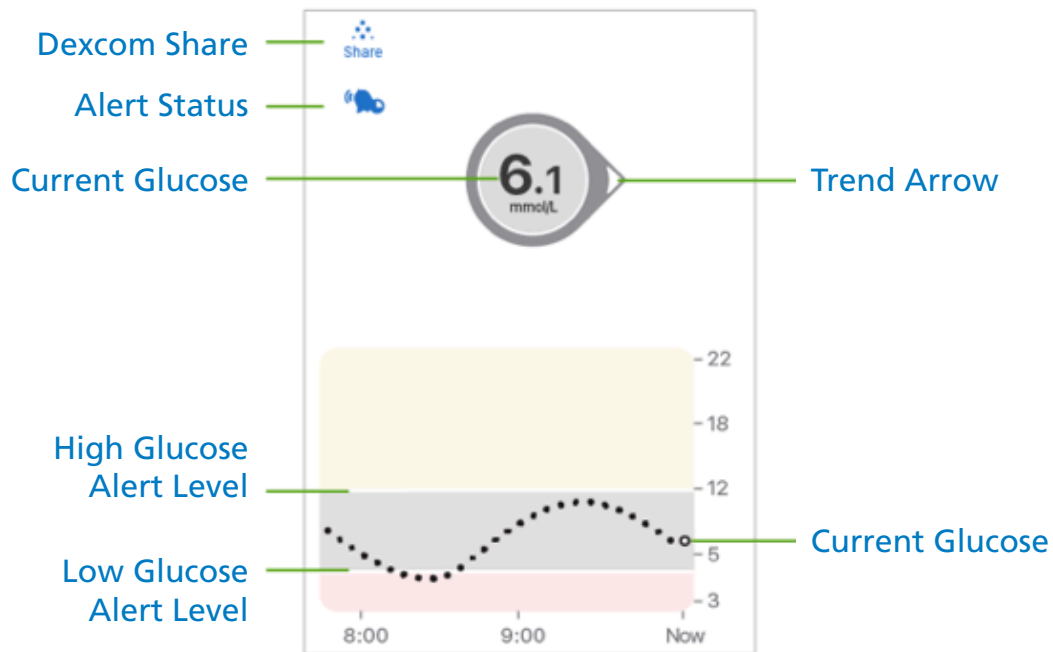**3 Slide transmitter straight out ot transmitter holder**

4 Keep the transmitter for next sensor session

The CGM Display

- The trend arrows will help you predict where the glucose level will be in 10 minutes.
- The dotted line will allow you to see where the glucose has been in the last 1, 3, 6, 12 and 24 hours.
- The glucose value will be grey when in target, red when it's low, and yellow when its high.

**Dexcom Share** — Share

Alert Status

Current Glucose — 6.1 mmol/L — **Trend Arrow**

High Glucose Alert Level

Low Glucose Alert Level

Current Glucose

22 · 18 · 12 · 5 · 3

8:00 · 9:00 · Now

4.3 mmol/l
Red = Low

12.4 mmol/l
Yellow = High

9.1 mmol/l
Grey = In Target

On the app, to see your graph over 1, 3, 4, 12 and 24 hours (with events), turn your smart device on its side (for landscape view) and tap the tabs at the top of the screen.
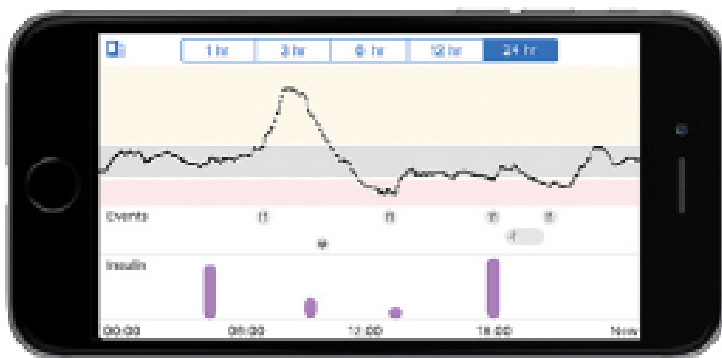
On the receiver, tap the graph to switch between 1-, 3-, 6-, 12- and 24-hour views.

Accuracy of CGM

- The finger prick measures the glucose in the blood.
- The CGM measures the glucose in the fat tissue (interstitial space).
- The CGM reading will be 5-10 minutes behind the blood glucose.
- The CGM reading and blood glucose reading will never be the exactly the same.
- The usual difference depends on the CGM level:

The below table shows what the usual difference is 90% of the time. Occasionally the difference will be larger, but this should only be 10% of the time.

CGM	Blood glucose	Accuracy
3.5mmol/l	3.0 - 4.0mmol/l	usually within 0.5mmol/l
7.0mmol/l	5.5 - 8.5mmol/l	usually within 1.5mmol/l
10.0mmol/l	8.0 - 12.0mmol/l	usually within 2.0mmol/l
15.0mmol/l	12.0 - 18.0mmol/l	usually within 3.0mmol/l
20.0mmol/l	16.0 - 24.0mmol/l	usually within 4.0mmol/l
This level of accuracy is good enough to replace the need to do blood glucose readings		

Sensors and meters measure glucose in different places
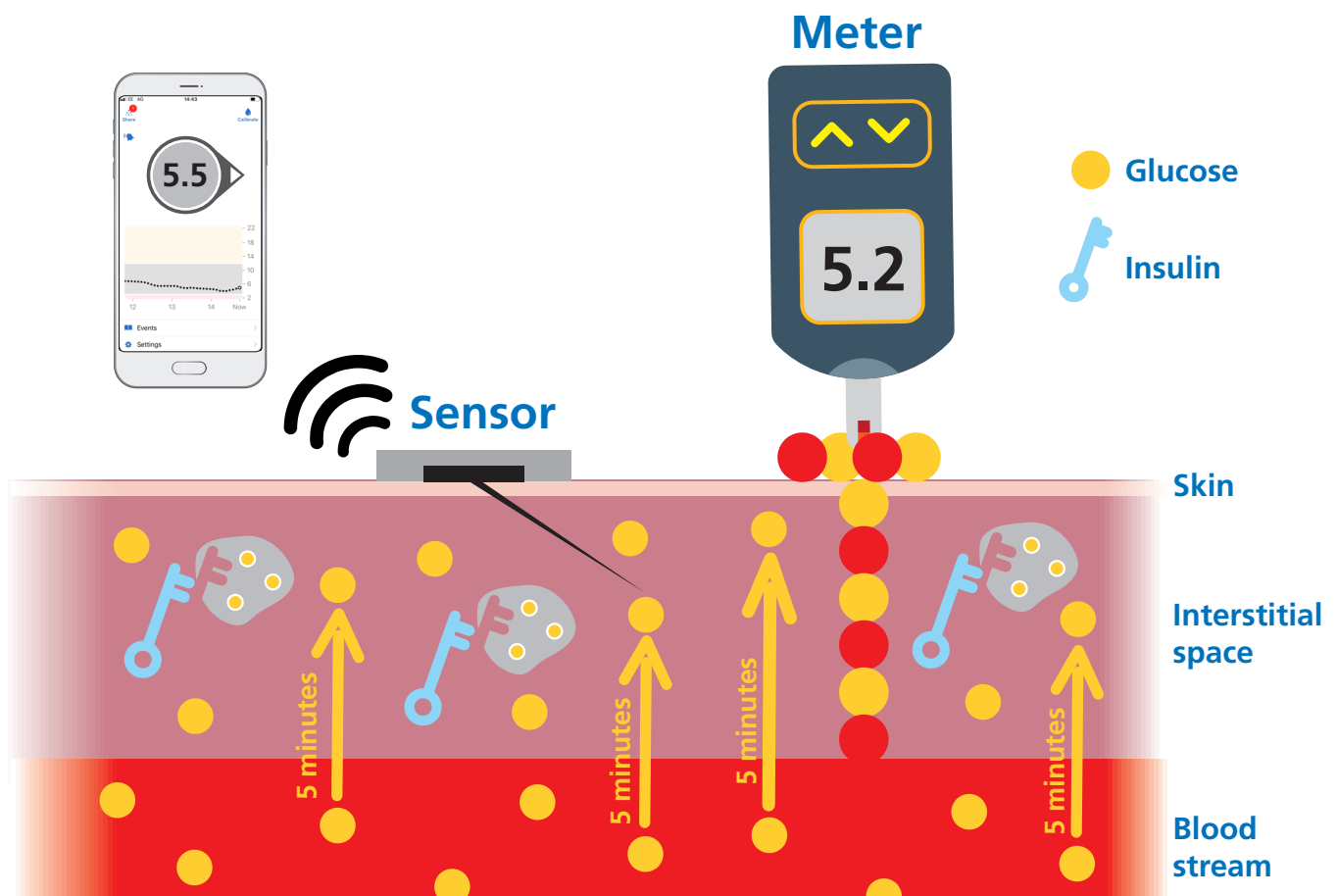
When you will need to test blood glucose levels

- There will be times when the difference between the CGM and blood glucose is greater than is acceptable:
    - o When there is a faulty sensor.
    - o When there is a faulty transmitter.
    - o When you are very dehydrated.
    - o When the device cannot pick up the sensor readings.
    - o If a calibration is entered that is inaccurate.

- You must test your blood glucose when:
    - o Your symptoms do not match the CGM reading.
        - You may feel hypo when the reading says 5.5mmol/l.
        - You may feel really high when the CGM reads 11.0mmol/l.
    - o There is no glucose value or arrow on the CGM device.

If you have both a CGM and blood glucose reading, use the blood glucose reading.

No number or arrow?
Use your meter

Symptoms don't match readings?
Use your meter

Watch me:
Accuracy and when to test

When you see	Notice
LOW mmol/l	No number
12.4 mmol/l	No arrow
App / Receiver — Signal Loss Alert — You will not receive alerts, alarms, or sensor glucose readings. OK	No number or arrow

Should you calibrate the Dexcom G6 system?

• The Dexcom G6 is more accurate when you DO DOT Calibrate, this is the way it is designed. It works by a unique factory calibration method.

• You will seriously impair the performance of the Dexcom G6 if you calibrate with a blood glucose reading that is inaccurate due to not washing, faulty meter, poor quality blood glucose meter, poor blood sample etc.

• If you do have CGM readings that are consistently (more than 10%) outside the below boundaries of your good quality finger prick glucose readings, please contact Dexcom Technical support.
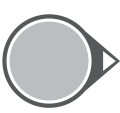
CGM	Blood glucose	Accuracy
3.5mmol/l	3.0 - 4.0mmol/l	usually within 0.5mmol/l
7.0mmol/l	5.5 - 8.5mmol/l	usually within 1.5mmol/l
10.0mmol/l	8.0 - 12.0mmol/l	usually within 2.0mmol/l
15.0mmol/l	12.0 - 18.0mmol/l	usually within 3.0mmol/l
20.0mmol/l	16.0 - 24.0mmol/l	usually within 4.0mmol/l
This level of accuracy is good enough to replace the need to do blood glucose readings		

• If you are advised to calibrate the system please make sure:

    o You have washed and dried your hands thoroughly.

    o You are using a blood glucose meter and strips that are high quality and effective.

    o You have done two finger pricks to make sure they are close together and take the average.

    o The CGM arrow is stable.

    o You are well hydrated.

    o Then go to settings, calibrate and enter the blood glucose level.
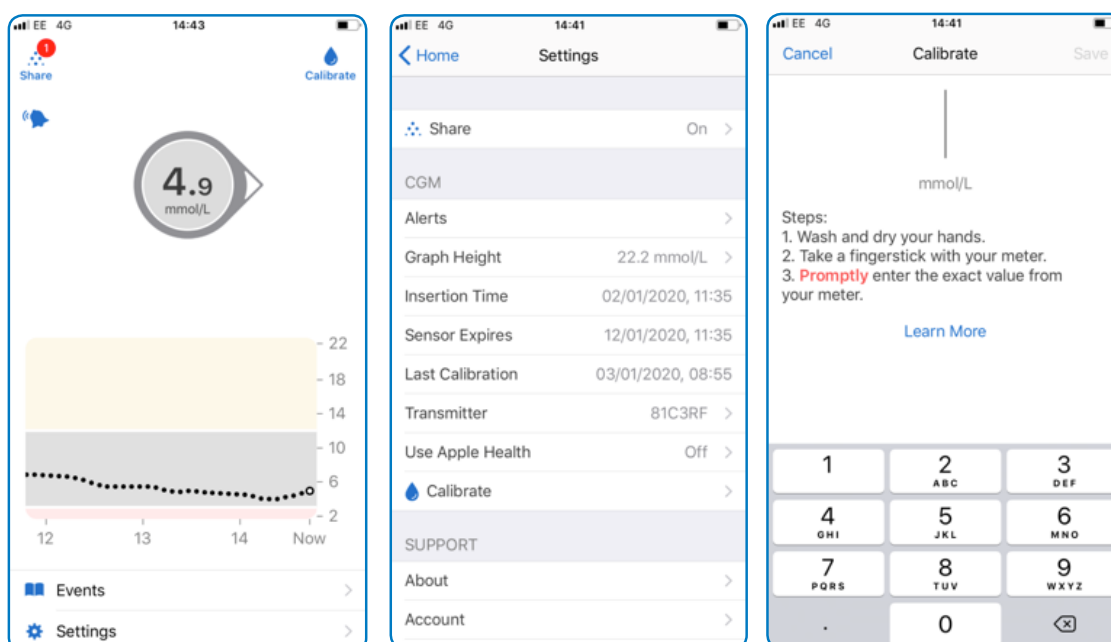
What do the trend arrows mean?

• The CGM device will tell you how fast the glucose is moving by trend arrows
• The trend arrows allow you to predict where the glucose will be in 10 minutes
• You can use the trend arrows and **DynamicGM** to:

     o Predict and prevent hypos.
     o Change carbohydrate amounts for exercise.
     o Give peace of mind that no highs are lows are coming up.
     o Decide when to give meal-time insulin.
     o And much more.

Trend arrow APP	Description	Where the glucose will be in 10 minutes
	Rapidly rising	**more than 2.0mmol/l higher**
	Rising	**1.5mmol/l higher**
	Slowly rising	**1mmol/l higher**
	Stable	**Same**
	Slowly falling	**1 mmol/l lower**
	Falling	**1.5 mmol/l lower**
	Rapidly falling	**more than 2.0mmol/l lower**

Activity: Where will these two glucose values be in 10 minutes time?

Watch me: trend arrows

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Low Alerts and alarms

- There are three different alerts and alarms that will help minimize the time you spend below 4.0mmol/l.
- When you give fast acting glucose to prevent or treat Hypoglycaemia, it will take 20 minutes before the glucose taken will show full effect on the CGM reading. This is much slower than finger prick blood glucose where the full effect is seen in 15 minutes. Therefore you have to wait 20 minutes between hypo treatments.

**With CGM wait 20 minutes before re-treating with hypo treatment.**

Urgent low soon alert

This can go off anywhere between 4.0 - 7.0mmol/l.

The alert will only go off when it's predicted to hit 3.1mmol/l in 20 minutes. It depends how quickly the glucose is dropping. The level of 3.1mmol/l cannot be adjusted.

It may not go off before the low alarm if the glucose is not predicted to hit 3.1mmol/l.

If it goes off give your usual hypoglycaemia treatment.
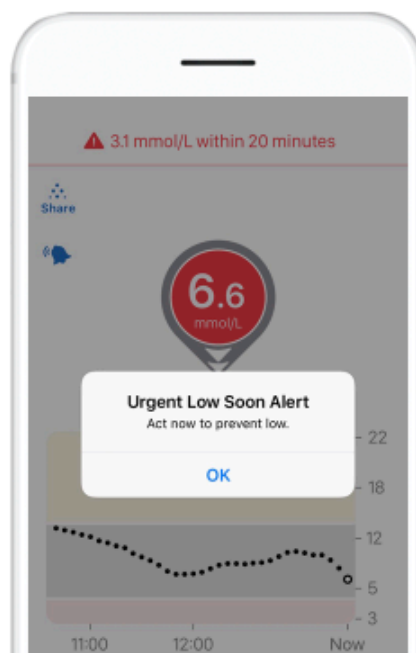

Low glucose alert

Set at   mmol/l - this can be adjusted.

If it goes off give your usual hypoglycaemia treatment UNLESS you have given a hypoglycaemia treatment for an Urgent Low Soon Alarm in the last thirty minutes. Only give a second treatment once it has been 20 minutes from the last treatment.

The Low Glucose Alert repeat alarm will go off in 30 minutes if it's still below 4.0mmol/l. If it does only give another hypoglycaemia treatment if its been 20 minutes since the last one.
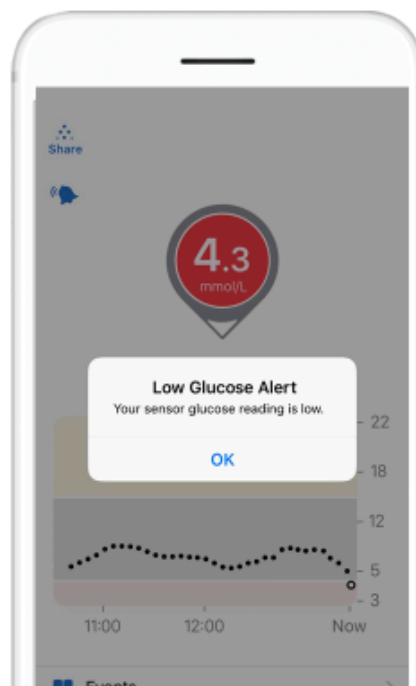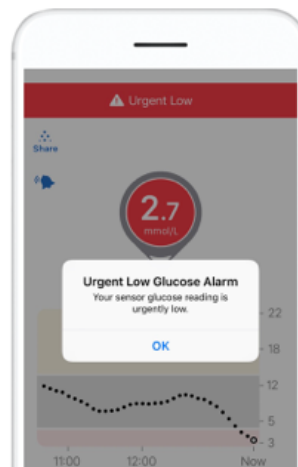
Urgent low alarm

Set at 3.1mmol/l - this cannot be adjusted

Do not give another hypoglycaemia treatment if you have given one in the last 20 minutes.

This alarm is to inform you the glucose level is continuing to drop.

Be patient and wait the 20 minutes since the last hypoglycaemia treatment before giving another.

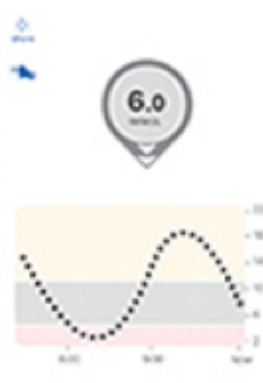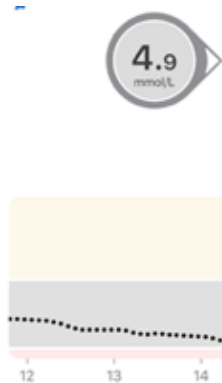# DynamicGM: Preventing hypoglycaemia with trend arrows

Use the CGM value and trend arrow with the below table to prevent hypoglycaemia if the Urgent Low Soon Alert has not gone off. If the glucose level is higher than the cut-offs in the table, do not give hypo treatment. Re-check the CGM in 10-20 minutes time, as the arrow may turned to stable.

Overtime you may find a full hypo treatment is too much and decide to drop it to half.

Trend arrow APP	Description	Sensor level and action
	Slowly falling	mmol/l or lower have hypo treatment
	Falling	mmol/l or lower have hypo treatment
	Rapidly falling	mmol/l or lower have hypo treatment

Activity: Tick the ones where you would give preventative hypo treatment

Watch me: Nini preventing a hypo

Watch me: Caitlin preventing a hypo
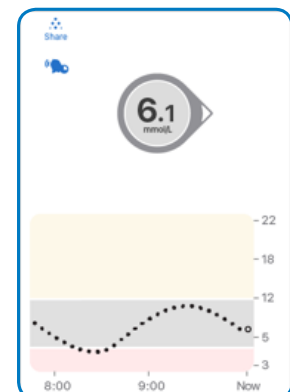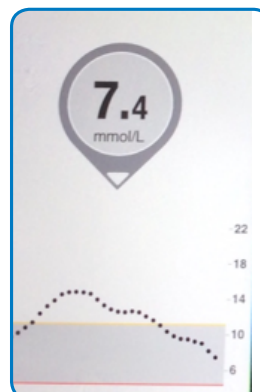
DynamicGM: before bed to prevent hypoglycaemia

Before using CGM you would have been happy with a glucose level of 6.5mmol/l. But what if you had a level of 6.5mmol/l with one arrow down, would you still be happy?

This table is a starting guide to help you prevent hypoglycaemia and hyperglycaemia overnight. This should give peace of mind. Take a look through the table then answer the questions below.

Sensor glucose level (mmol/l)	→	↘	↓	⇣
–	Injections: 5-10g carbs Pump: Temp basal 0% for 30 mins OR 5-10g carbs	Injections: Hypo treatment Pump: Hypo treatment	Injections: Hypo treatment Pump: Hypo treatment	Injections: Hypo treatment Pump: Hypo treatment
–	Injections: Go to sleep Pump: Go to sleep	Injections: 5 - 10g carbs Pump: Temp basal 0% for 30 mins OR 5-10g carbs	Injections: Hypo treatment Pump: Hypo treatment	Injections: Hypo treatment Pump: Hypo treatment
–	Injections: Go to sleep Pump: Go to sleep	Injections: Go to sleep Pump: Go to sleep	Injections: 5 - 10g carbs Pump: Temp basal 0% for 30 mins OR 5-10g carbs	Injections: 10 - 20g carbs Pump: Temp basal 0% for 60 mins OR 10-20g carbs
–	Injections: Consider a correction Pump: Consider a correction	Injections: Go to sleep Pump: Go to sleep	Injections: Go to sleep Pump: Go to sleep	Review in 10 minutes and follow this guide
–	Injections: Consider a correction Pump: Consider a correction	Injections: Consider a correction Pump: Consider a correction	Review in 30 minutes and follow this guide	Review in 20 minutes and follow this guide

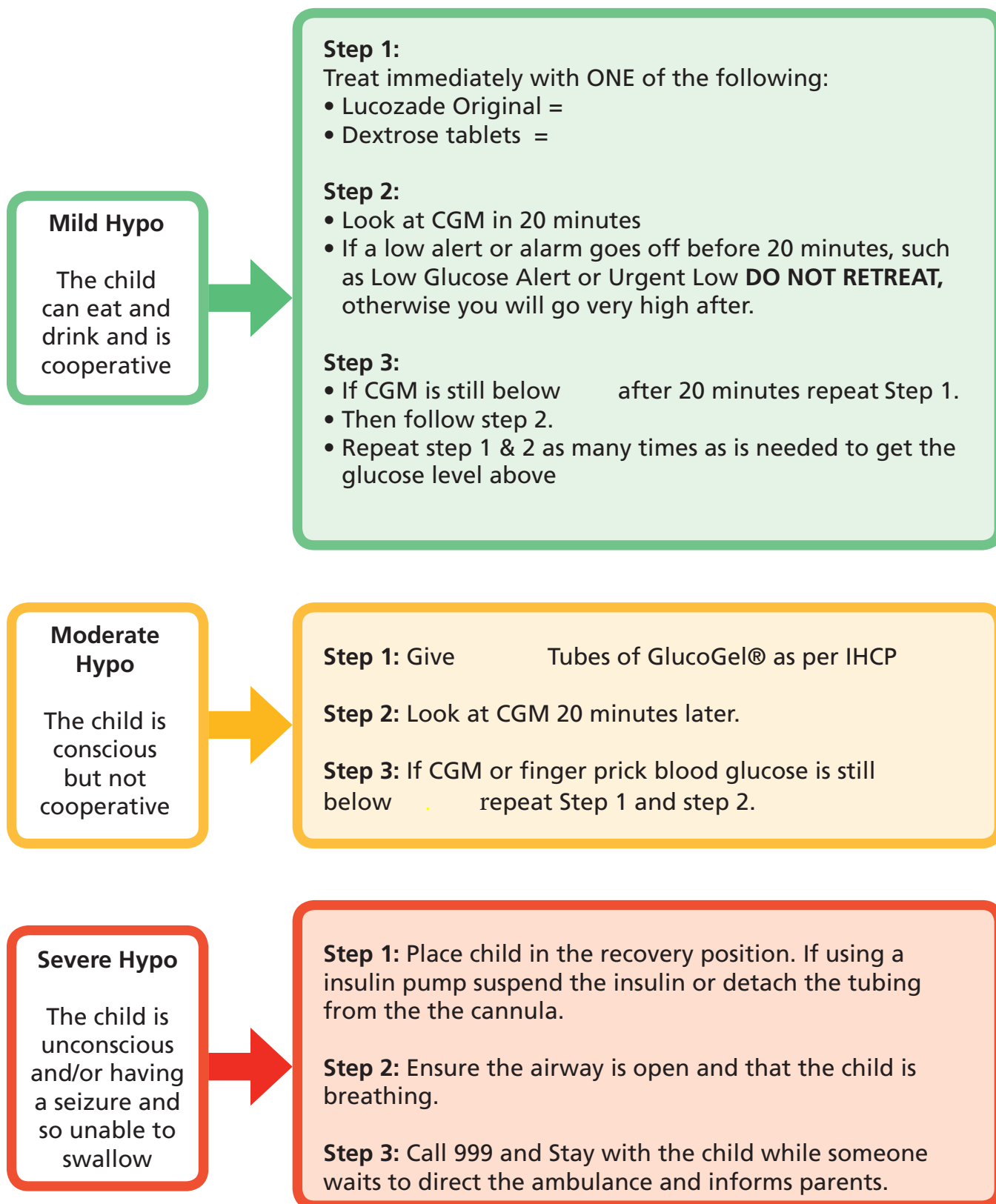**What action would you take in both of these examples if they were your readings before bed?**

7.4 mmol/L

6.1 mmol/L

....

....

Hypoglycaemia Flow Chart

('Hypo' or Low 'Blood Glucose')

1. Urgent Low Soon Alert.

2. Low Glucose Alert.

3. Hypoglycaemia predicted based on glucose value downward trend arrow.

Mild Hypo

The child can eat and drink and is cooperative

Step 1:
Treat immediately with ONE of the following:
• Lucozade Original =
• Dextrose tablets =

Step 2:
• Look at CGM in 20 minutes
• If a low alert or alarm goes off before 20 minutes, such as Low Glucose Alert or Urgent Low **DO NOT RETREAT,** otherwise you will go very high after.

Step 3:
• If CGM is still below   after 20 minutes repeat Step 1.
• Then follow step 2.
• Repeat step 1 & 2 as many times as is needed to get the glucose level above

Moderate Hypo

The child is conscious but not cooperative

Step 1: Give   Tubes of GlucoGel® as per IHCP

Step 2: Look at CGM 20 minutes later.

Step 3: If CGM or finger prick blood glucose is still below   .   repeat Step 1 and step 2.

Severe Hypo

The child is unconscious and/or having a seizure and so unable to swallow

Step 1: Place child in the recovery position. If using a insulin pump suspend the insulin or detach the tubing from the the cannula.

Step 2: Ensure the airway is open and that the child is breathing.

Step 3: Call 999 and Stay with the child while someone waits to direct the ambulance and informs parents.

High Glucose Alerts

- There is only one high glucose alert which we set at   mmol/l.

- When this goes off you need to take action to lower glucose level but do not need to test ketones until the glucose has been above 14.0mmol/l for 90 minutes.

With CGM wait 90 minutes, before testing for ketones

High Glucose Alert

Do not check for ketones the first time. What action to take:

- If on insulin pump give a correction dose using the bolus calculator.

- If using injections and an APP that has a bolus calculator, give a correction using the calculator.

- If using injections and a 1,2,3 sheet do not give a correction until the next meal.

The high glucose alert will go off again in 90 minutes if it's still above 14.0mmol/l. If this happens check ketones and follow your usual ketone rules.
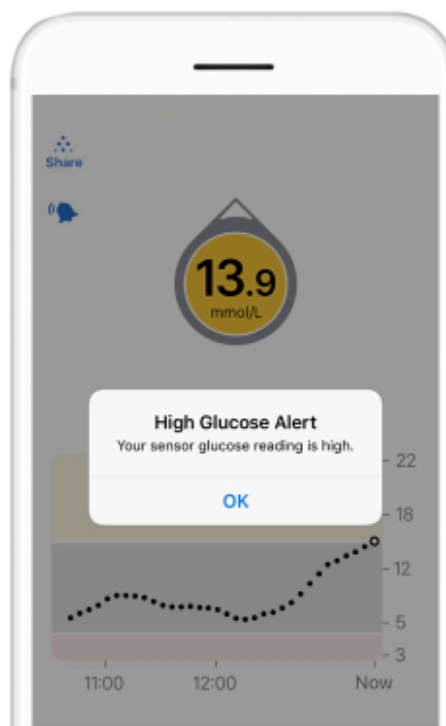
Hyperglycaemia Flowchart

Watch me: Hypergylcaemia summary

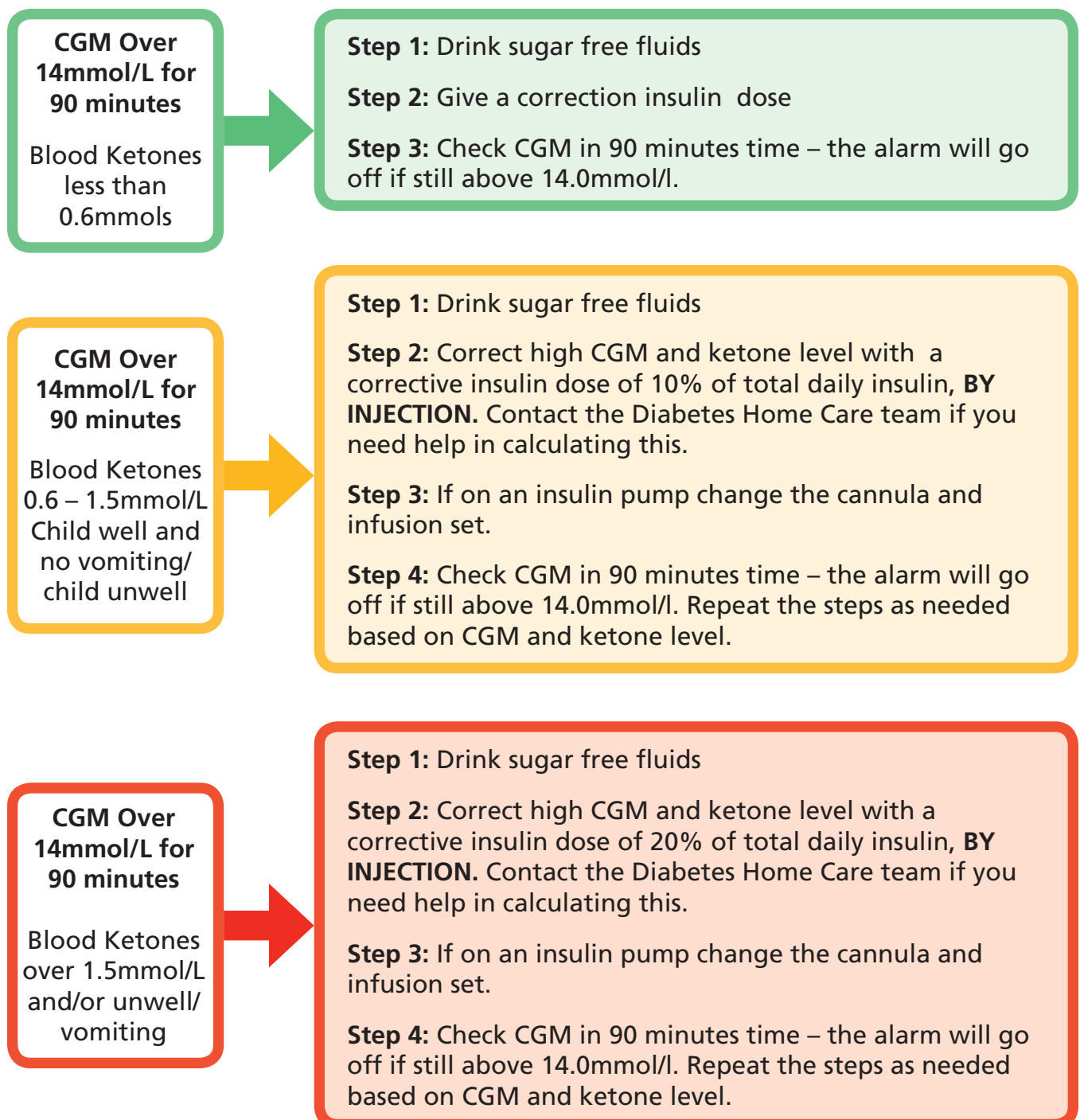('Hyper' or 'High blood glucose')

Step 1: Notified CGM above _____ mmol/l by first alert– clear the alarm & take action:
• If using an insulin pump give a correction does using the bolus calculator.
• If using injections and an APP, give a correction using the bolus calculator.
• If using injections and a 1,2,3 Chart, do not correct until the next meal.

Step 2: Wait 90 minutes

**Step 3:** If alarm goes off again after 90 minutes and above 14.0mmo/l - Check for Ketones

---

When CGM is over 14mmol/L for 90 minutes Ketones must be checked.

CGM Over 14mmol/L for 90 minutes

Blood Ketones less than 0.6mmols

→

Step 1: Drink sugar free fluids

Step 2: Give a correction insulin dose

Step 3: Check CGM in 90 minutes time – the alarm will go off if still above 14.0mmol/l.

CGM Over 14mmol/L for 90 minutes

Blood Ketones 0.6 – 1.5mmol/L Child well and no vomiting/ child unwell

→

Step 1: Drink sugar free fluids

Step 2: Correct high CGM and ketone level with a corrective insulin dose of 10% of total daily insulin, **BY INJECTION.** Contact the Diabetes Home Care team if you need help in calculating this.

Step 3: If on an insulin pump change the cannula and infusion set.

Step 4: Check CGM in 90 minutes time – the alarm will go off if still above 14.0mmol/l. Repeat the steps as needed based on CGM and ketone level.

CGM Over 14mmol/L for 90 minutes

Blood Ketones over 1.5mmol/L and/or unwell/ vomiting

→

Step 1: Drink sugar free fluids

Step 2: Correct high CGM and ketone level with a corrective insulin dose of 20% of total daily insulin, **BY INJECTION.** Contact the Diabetes Home Care team if you need help in calculating this.

Step 3: If on an insulin pump change the cannula and infusion set.

Step 4: Check CGM in 90 minutes time – the alarm will go off if still above 14.0mmol/l. Repeat the steps as needed based on CGM and ketone level.

Signal Loss

- If you lose signal for 20 minutes you will get an alarms.
- You lose signal mainly when the sensor is more than 6 meters away from the device.
- Moving the device close to the sensor usually sorts this issues.
- If the problem is frequent and not resolved by moving within 6 meters. Call Dexcom as they will be able to sort out the issue. The Diabetes team cannot help with this.
- Keep the device within 6 meters of you at all times.

Troubleshooting
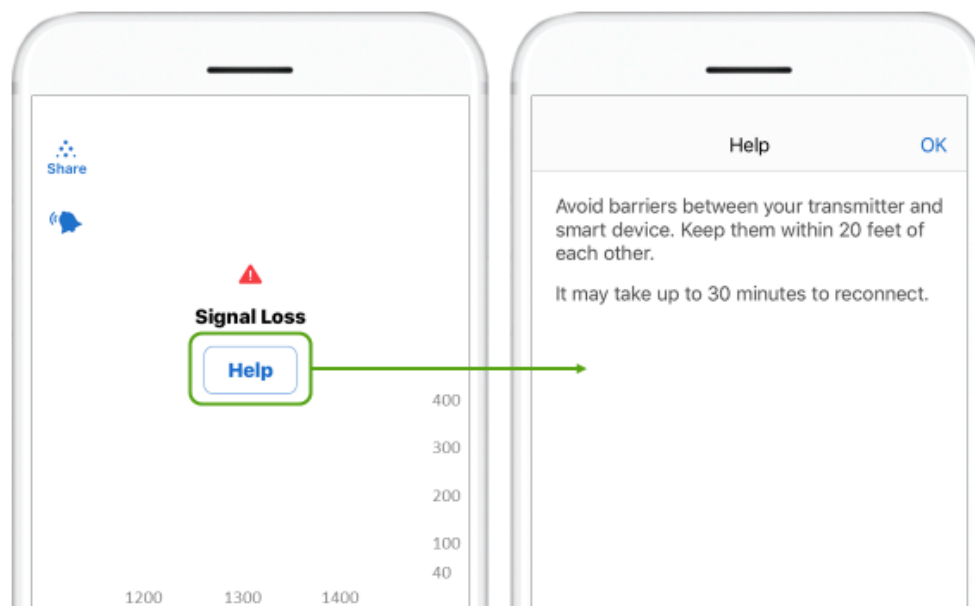
Signal loss alert
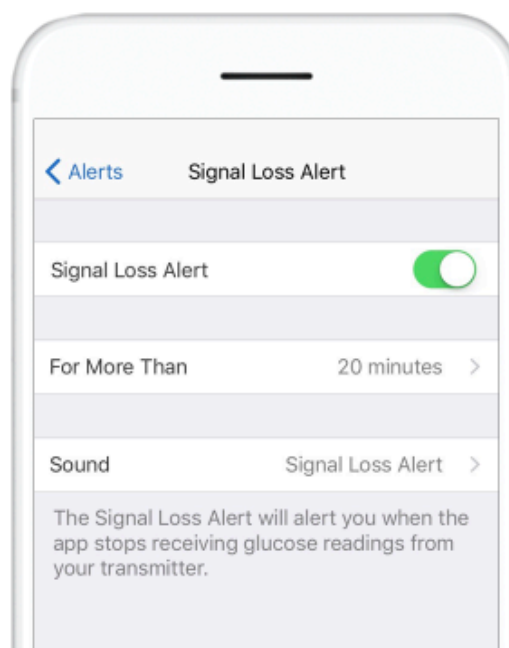
How to use the CGM readings to calculate insulin doses

Multiple daily injections: **Watch me: insulin dosing**

• If using a 1,2,3 Sheet - Take a picture and save on your phone.

      o Corrections must be 3 hours apart to prevent insulin stacking.

      o You must enter the carbohydrate amount and insulin dose into the Events on the APP or receiver.

  • If using an APP, enter the CGM reading into the bolus calculator.

      o The bolus calculator has a memory of the last insulin given called Active Insulin. Therefore you can correct between meals if you use the APP bolus calculator.

      o You must enter the carbohydrate amount and insulin dose into the Events on the APP or receiver.

Pumps:

  • You can enter the CGM reading directly into the bolus calculator.

  • You can correct between meals because the bolus calculator has a memory of the last insulin given called Active Insulin.

ROCHE Devices:

  • If you using a ROCHE Expert meter or Insight pump you will need to do a blood glucose test when the CGM value is more than 8.0mmol/l) to give a correction. You cannot enter the CGM values into these devices.

How to log information in the Events on the Dexcom

  • If using multiple daily injections, you must enter the carbohydrate (Carbs) amount and insulin doses at meal times (Fast-Acting Insulin) into the Events section.
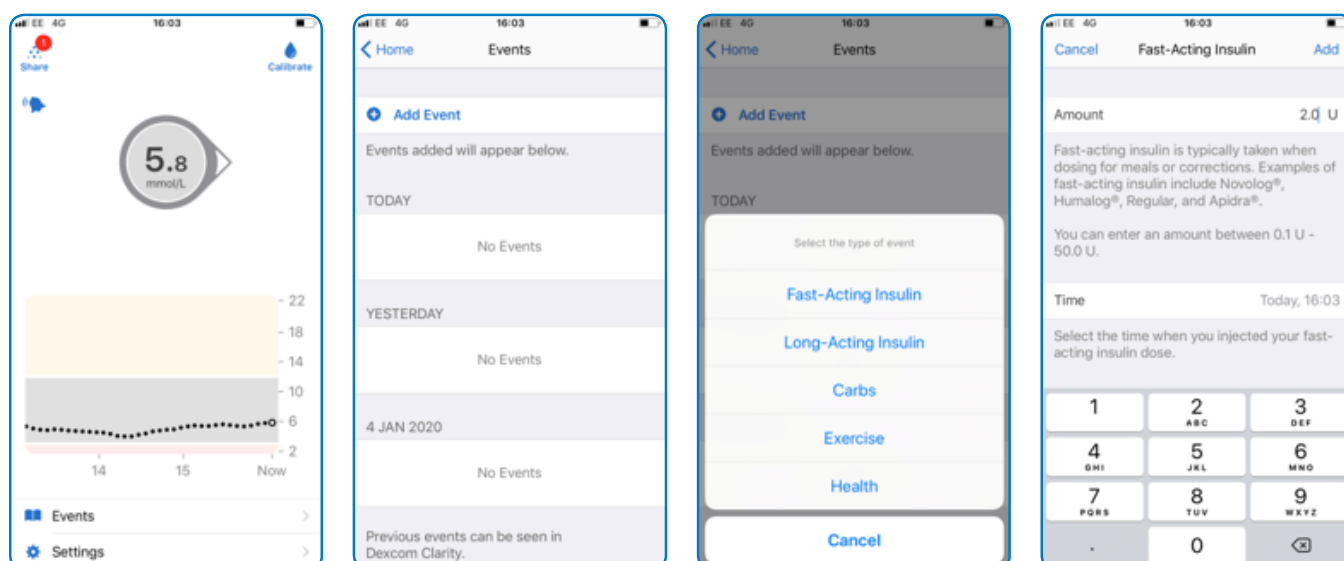
DynamicGM: Using trend arrows to manage exercise

- Based on your weight this is how much carbohydrate you will need to manage **20 minutes** of exercise depending on the CGM level and trend arrow.
- You can then convert that into the carbohydrate required into the amounts you will need of your usual exercise snack. **Watch me: Exercise   Watch me: Lenny & football**

Sensor glucose Levels	Rate of glocose change trend arrow & action to take	Carbohydrate grams for 20 minutes	Option 1: Dextrose (3g)	Option 2: Lucozade Original
<4.0 mmol/l	**No exercise: Treat hypoglycaemia**			
4.0 - 6.4 mmol/l	↓ (down)			
	↘↓			
	↘			
	→			
	↗			
	↑			
	↑			
6.5 - 9.9 mmol/l	↘			
	↓			
	↘			
	→			
	↗			
	↓ OR ↑			
10.0 - 13.9 mmol/l	↓			
	↘			
	↓ OR → OR ↗			
	↑ OR ↑			
>14.0mmol/l	**Check ketones: If less than 0.6mmol/l**	**Ok to exercise**		
	Chck ketones: If 0.6mmol/l or above	**No exercise and contact parent/guardian or diabetes team**		

Top tips for the first week

- Try not to make too many insulin regimen changes in the first week.
- Use this first week do a lot of observing to see the impact of different meals, activities and the difference between weekdays and weekends.
- Do not be alarmed if your glucose level goes higher one hour after eating, this is normal for people with type 1 diabetes. You will learn how to improve this in the CGM Academy.
- If the trend arrows are showing fast glucose movement, check again in 10-15 minutes to see if slowing down. Try not to panic.
- Keep well hydrated by drinking water regularly, at least eight glasses of water a day.
- Treat this as an experiment by trying the hypo prevention and exercise tables. You should expect some success and failure, we will help you learn from both.

How to use parental controls of APPS   Watch me: Parental controls

- Android: Google - Digital Wellbeing - https://wellbeing.google/for-families/
  - o Set APP time limits, Only Dexcom G6 allowed during school hours.

- iOS—Screen Time APP .
  - o Set APP time limits, Only Dexcom G6 allowed during school hours.

Dexcom numbers and useful websites

Tech support number:
0800 0315763 Mon – Friday – 07:00-18:00hrs, Sat & Sun – 8:30- 16:30hrs

Replacement sensors online: www.dexcom.com/UKIETechsupport

Customer services –
0800 0315761 - Mon – Friday normal working hours
gb.sales@dexcom.com

Dexcom website:
https://www.dexcom.com/en-GB

Link to compatible devices for Dexcom:
https://www.dexcom.com/dexcom-international-compatibility

Dexcom weekly webinars:
https://dexcomuk.edudip.com/w/320410

Dexcom online training resources:
https://www.dexcom.com/en-GB/training-resources

Setting up Dexcom Clarity:

Using the Receiver:

1 Go to https://clarity.dexcom.eu/

2 Click on Home User

3 Enter your Dexcom Account details
     a Username
     b Password

4 Click on "Settings"

5 Scroll to the bottom and click on "Share Data with new clinic"

6 Add the sharing code provided by the Diabetes Team and enter the young person's date of birth

7 To upload:
     a Click on Upload Instructions
     b Install the uploader
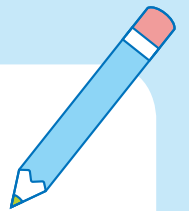   c Follow the instructions and use the green cable provided in the receiver box

Using the APP

1. Install Dexcom Clarity APP & open it

2. Click "Profile" then"Authorize sharing"

3. Add the sharing code provided by the Diabetes Team and enter the young person's date of birth

---

App Store ▪ıll 4G   08:12

Profile

Authorize Sharing   >
Allow data sharing with clinics

Glucose Ranges
Day (06:00-22:00): 4.0-10.0 mmol/L
Night (22:00-06:00): 4.0-10.0 mmol/L   >
Urgent Low: 3.1 mmol/L
AGP: 3.9-10.0 mmol/L
Goal: Time in Range is 70%

Notifications   >
Customize your push and email notifications

Support   >
Learn about features or contact tech support

About   >
Get information about this app

Summary   Reports   Goals   **Profile**

App Store ▪ıll 4G   08:13

‹ Back   Authorize Sharing

Sharing Code

????-????-????

Date of Birth

2   February   2017
3   March   2018
4   April   2019
5   May   2020
6   June   2021
7   July   2022
8   August   2023

Continue

Summary   Reports   Goals   Profile

Session 1 Review

Where does the sensor measure the glucose level?

How many minutes lag time is there between the CGM & blood glucose?

What is the usual difference between the CGM reading and Blood glucose at these levels?
- 3.5mmol/l
- 10.0mmol/l

If your CGM reading has two arrows going straight up, how much higher will the blood glucose be in ten minutes?

If you have a CGM reading and a BG, which is the true value?

In which two situations do you need to use a BG in place of the CGM?

1.

2.

After the first hypoglycaemia treatment, how long before you can re-treat again even if you have more alerts and the the CGM value stays below   mmol/l?

Do you test for ketones the first time the CGM hits 14.0mmol/l?

How much carbohydrate do you need before **20 minutes** exercise for these three readings?
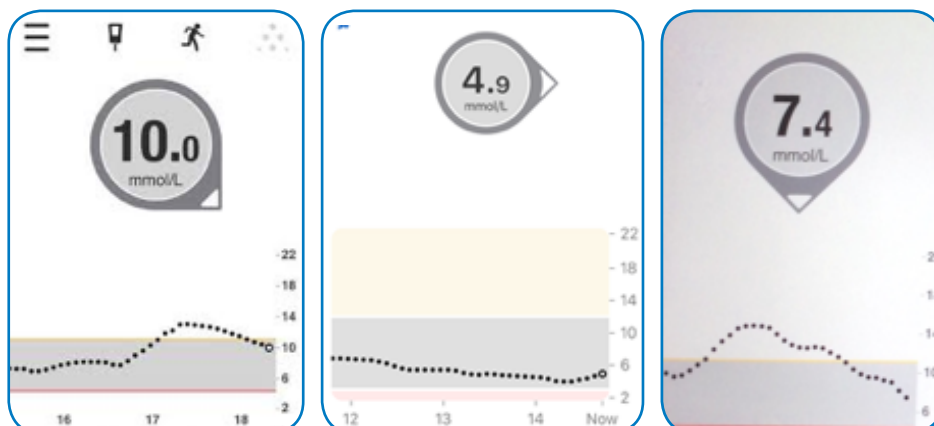
Top Tips for DynamicGM success

Daily Management tips

• Don't be afraid to try **DynamicGM**. You will quickly learn what works for you.

• Don't panic when you see double arrows down if the glucose level is above 7.0mmol/l, just re-check in 10-20 minutes time.

• Resist the urge to "JUST CHECK" social media every time you check your CGM. You will lose hours of your life if you are continually on social media.

• Resist contacting your child too often about glucose levels. Focus on the important times to intervene.

• Keep a record of meals that make the glucose level spike and try alternatives.

• Keep a record of meals that make the glucose levels go high four or more hours after eating.

Sleep tips

• Put the mobile phone outside the bedroom within 6 meters to avoid internet surfing at night.

• If using the Receiver and you cannot hear the alarms buy a baby monitor.

• If you do not hear the alarms put the phone on vibrate next to a coin on a glass surface.
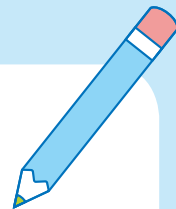
Homework from Session 1:

☐ Set up the receiver or phone APP on Dexcom Clarity.

☐ Try preventing hypos with trend arrows.

☐ Read back over session 1 to consolidate your knowledge.

☐ Remember cannot take the Dexcom into school until school have been trained.

Watch me: End of session 1

Setting up the Dexcom Follow APP

• You can have up to 5 followers.

• The followers will only be able to see the CGM if the person with the CGM has internet access.

• The Followers alarms can be personalised to prevent too many alarms.

Rules of Follower engagements

The Follower will have access to the young person's glucose levels at the press of the button and when alarms go off. This has the potential to allow a fantastic level of support, but there is also the risk of the Follower becoming a nuisance. You need to set clear rules around the Followers interaction.

    1. How soon can the Follower contact young person:

        a.When the CGM is less than 4.0mmol/l?

        b. When the CGM is higher than 90 minutes?

        c. If the glucose is dropping and it looks like a hypo is coming?

    2. When will you review glucose levels together in a supportive way, daily, weekly, monthly?

**Setting up the Dexcom Follow:**   **Watch me: Follow**

1. Select the "Share" Icon on the young person's phone.

2. Follow the instructions and enter the Followers details.

3. Personalise the alerts and alarms.

4. A child under 12 years:
    a. Urgent Low Soon: ON
    b. Low Alert: 4.0mmol/l for 0 minutes
    c. High Alert: 14.0mmol/l for0 minutes
    d.No More data: 0 minutes

5. A child over 12 years:
    a. Urgent Low Soon: Off
    b. Low Alert: 4.0mmol/l for 30 minutes
    c. High Alert: 14.0mmol/l for 90 minutes
    d. No More data: 60 minutes

6. Send the Invitation

7. Follower open their email and click:
    a. Install the APP, then
    b. "start Following"

8. Complete the set up in the Dexcom Follow APP.

9. Start following, RESPONSIBLY.
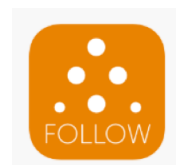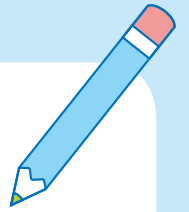
**iPhone:
Dexcom Follow
APP mmol/l**

**Android:
Dexcom Follow
APP mmol/l**
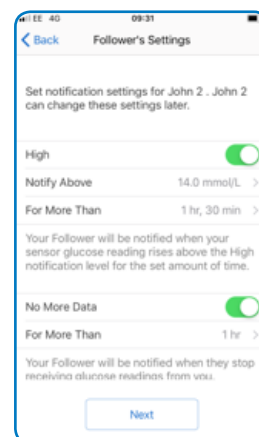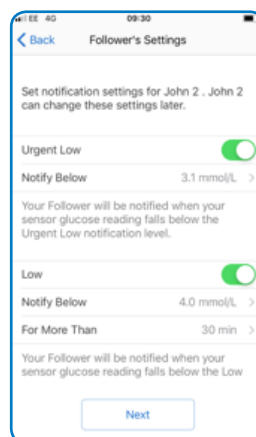
CGM Academy Session 2

Review of the first week

How has the CGM helped you this week?

What **DynamicGM** strategies have you tried?

What challenges have you had this week?

Do you have any concerns about using the CGM at school?

# Setting up Clarity Reports

1. Setting up glucose ranges for the report:
   - a. Open up the Clarity APP
   - b. Click on profile
   - c. Click on "Glucose Ranges"
   - d. Set all to 4.0 – 10.0mmol/l

2. Set up weekly email to receive reports in the notifications:
   - a. Open up the Clarity APP
   - b. Click on profile
   - c. Click on "Notifications"
   - d. Select all options
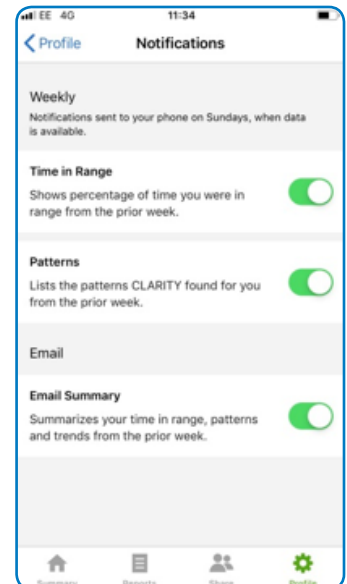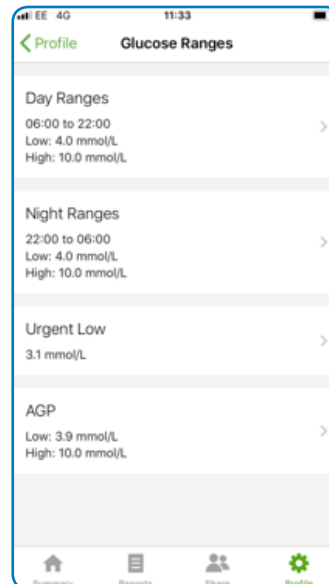
Creating a Clarity Report

We focus on the Ambulatory Glucose Report (AGP) and use the CGM Assessment Tool to think about making changes.

- • Click on Reports
- • Select 14 days
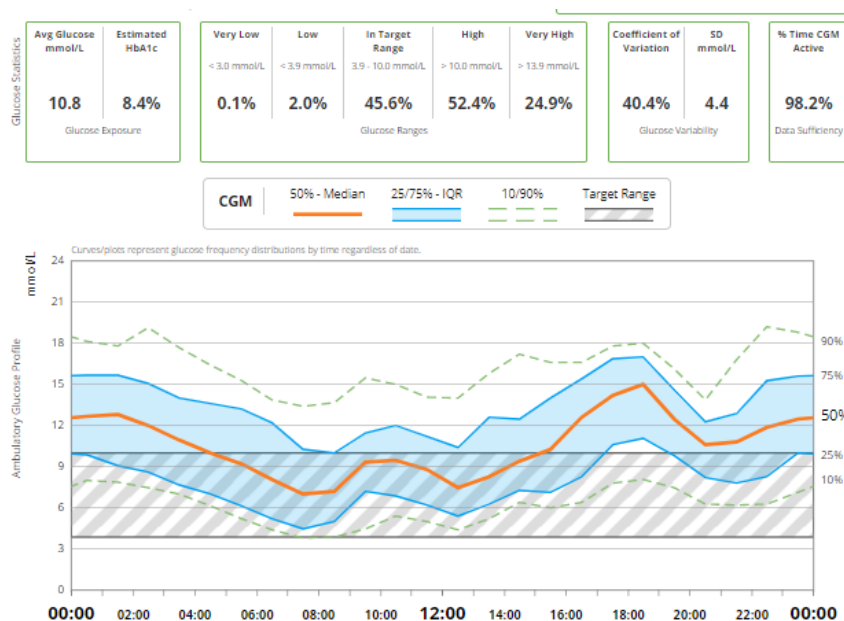- • Choose the AGP report
- • Click View Reports
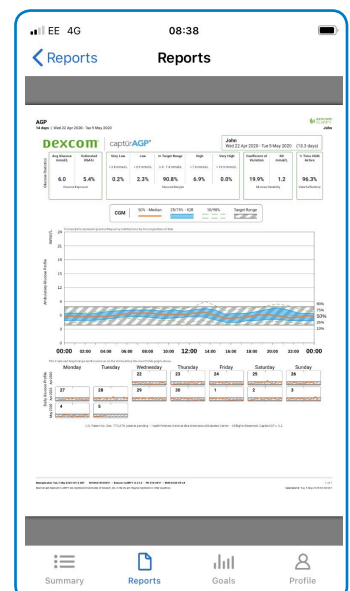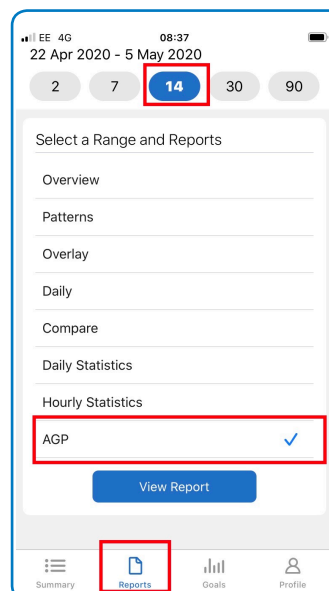
Using the Receiver:
1 Go to https://clarity.dexcom.eu/
2 Click on Home User
3 Enter your Dexcom Account details

4. Upload the receiver

5. Choose the AGP report

CGM Assessment Tool

	Percentage of time	Data capture today	Target next two weeks
Data capture percentage	More than 90%		
	Between 70-90%		
	Less than 70%		

Glucose range	Percentage of time	Data capture today	Target next two weeks
High: Above 10.0mmol/l	Less than 25%		
	Between 25-40%		
	More than 40%		
In target: 4.0 - 10.0mmol/l	More than 70%		
	Between 50-70%		
	Less than 50%		
Low: Below 4.0mmol/l	Less than 4%		
	Between 4-7%		
	More than 7%		

	Glucose Statistics									
	Avg Glucose mmol/L	Estimated HbA1c	Very Low < 3.0 mmol/L	Low < 3.9 mmol/L	In Target Range 3.9 - 10.0 mmol/L	High > 10.0 mmol/L	Very High > 13.9 mmol/L	Coefficient of Variation	SD mmol/L	% Time CGM Active
	10.8	8.4%	0.1%	2.0%	45.6%	52.4%	24.9%	40.4%	4.4	98.2%
	Glucose Exposure		Glucose Ranges					Glucose Variability		Data Sufficiency

CGM 50% - Median 25/75% - IQR 10/90% Target Range

Curves/plots represent glucose frequency distributions by time regardless of date.

Things to consider before making changes:

• Have there been any changes in routine, illness, holidays, monthly cycle?

AGP Report: time of day below 4.0mmol/l	
Overnight	**After meals**
1. Dark blue (most of the time): ☐	3. Dark blue (most of the time): ☐
2. Light blue / Green dotted line (occasionally): ☐	4. Light blue / Green dotted line (occasionally): ☐

AGP Report: time of day above 10.0mmol/l	
Overnight	**After meals & still above at next meal**
5. Dark blue (most of the time): ☐	7. Dark blue (most of the time) ☐
6. Light blue / Green dotted line (occasionally): ☐	8. Light blue / Green dotted line (occasionally): ☐
Other things to consider	
9. Glucose spiking after meals but coming back down by next meal? ☐	
10. Corrections working? ☐	

How much total daily insulin are you taking and how much is background/basal?

Add daily background/basal insulin to total daily mealtime insulin to get your total daily dose (TDD): E.g. 15 units Lantus + Novorapid 5 units breakfast, 5 units lunch, 10 units evening = 35 units (TDD)

Calculate your Basal/background % of TDD by the following sum:

Background/basal units ÷ TDD x 100.

$$\div \quad \textbf{x 100} = \quad \%$$

Using the above as an example: 15 ÷ 35 x 100 = 43%

Basal/background is expected to be within 25-50%

- • If less than 25% and the glucose level is mostly high, it is likely the basal/background needs increasing

- • If more than 50% and lots of hypoglycaemia, it is likely the basal/background needs reducing

Below 4.0mmol/l overnight

1. Dark blue line (most of time): 4-7 times a week:

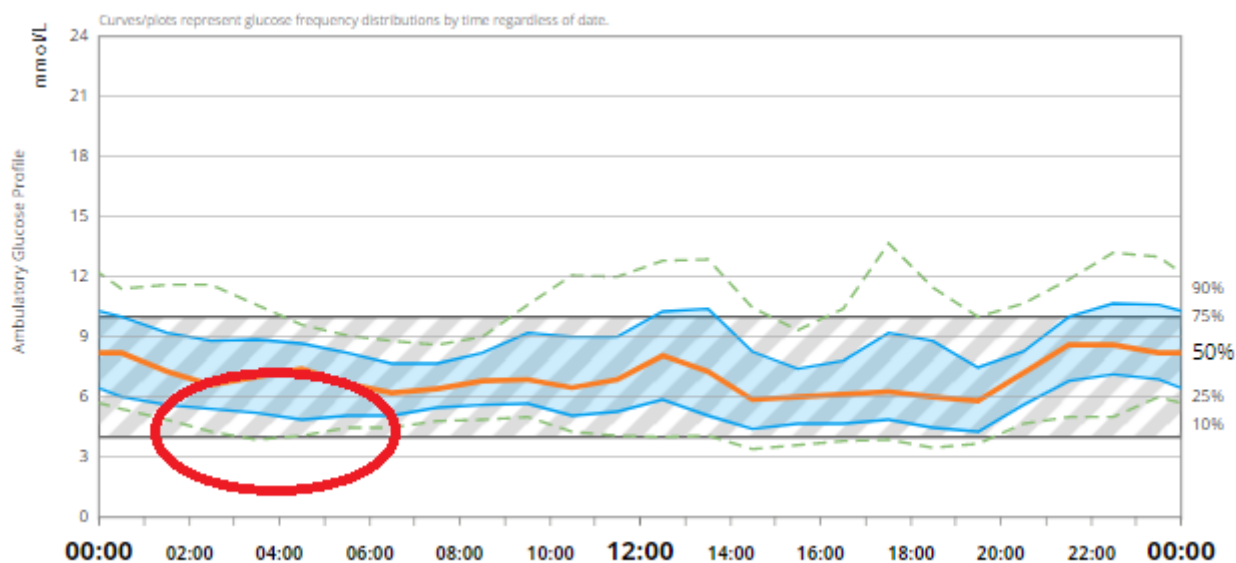   a. Dropping below the 4.0mmol/l line or clearly dropping throughout the night without a correction at bedtime:

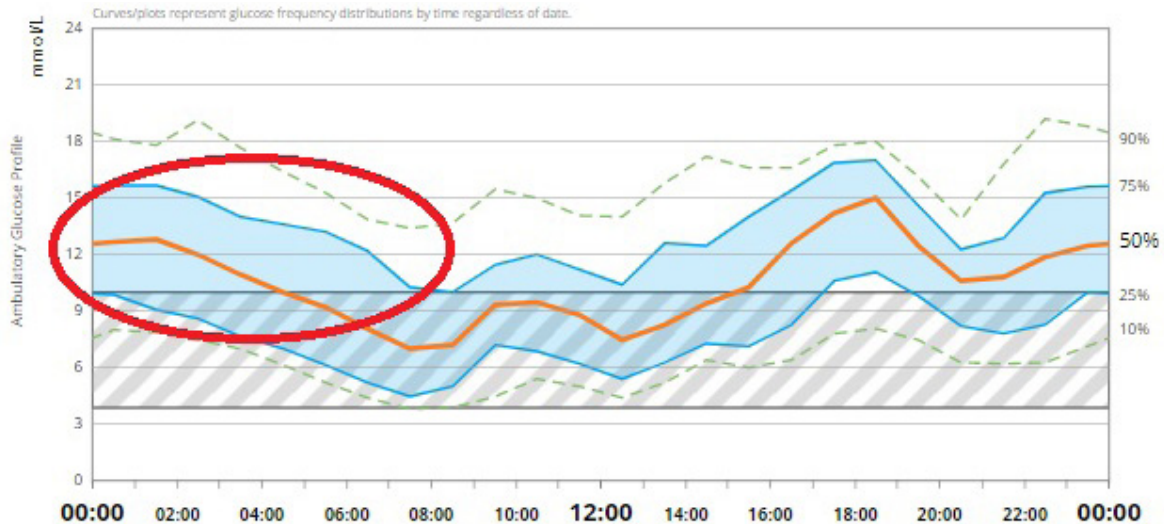   • Reduce background/basal insulin 10-20%
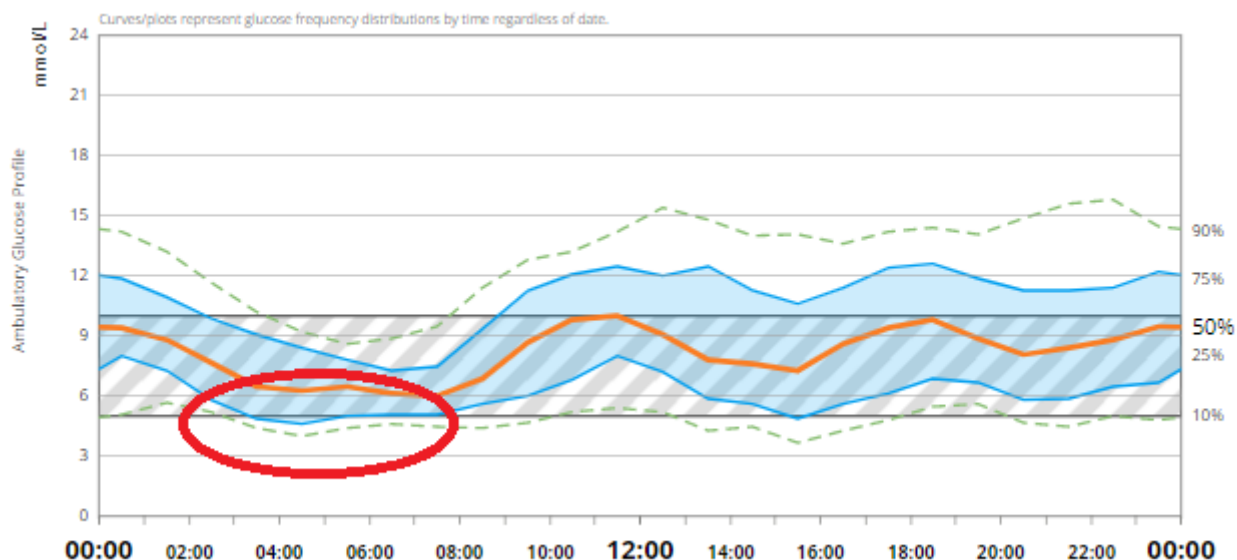
2. Light blue / green dotted line (occasionally): 1-3 times a week:

    a. Dropping below the 4.0mmol/l line or clearly dropping throughout the night without a correction at bedtime:

        • If after exercise try having 10-20g carbs without insulin

        • If after exercise consider a 20% reduction is background/basal insulin

        • Going to bed with arrows trending down without having hypo prevention?

Below 4.0mmol/l after breakfast, lunch, evening meal or supper:

3. Dark blue line (most of time): 4-7 times a week:

    a. Dropping below the 4.0mmol/l line before the next meal:

        • Change the carb ratio to decrease the insulin by 10-20%
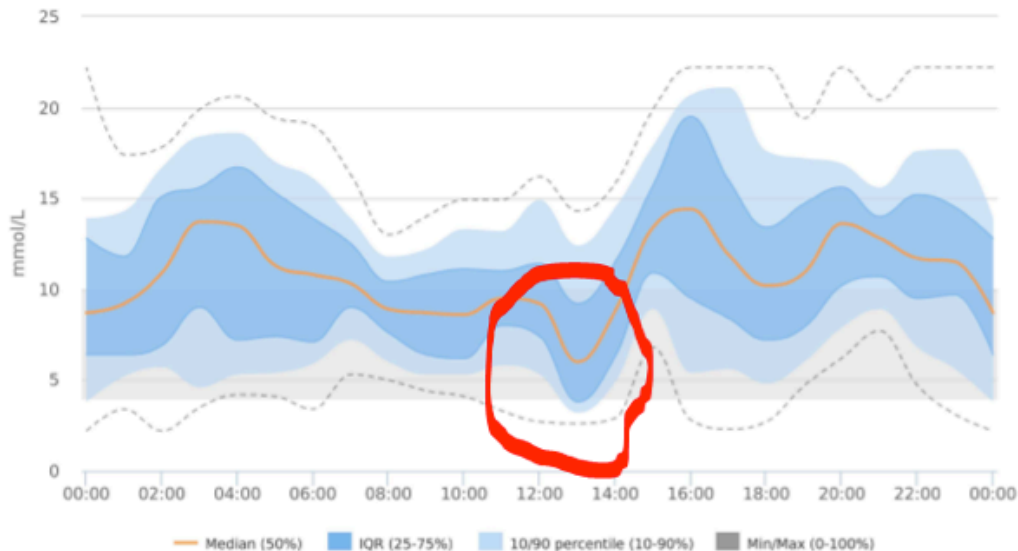
4. Light blue / green dotted line (occasionally): 1-3 times a week:

    a. Dropping below the 4.0mmol/l line before the next meal:

        • Occasionally overestimating carbohydrate content of meals?

        • If during exercise when eaten within 90 minutes, might need to reduce pre-exercise meal-time insulin does by 25-50%

        • If going low after exercise, might need to reduce post exercise meal-time insulin does by 25-50%

        • Not giving hypo prevention when arrows trending down?
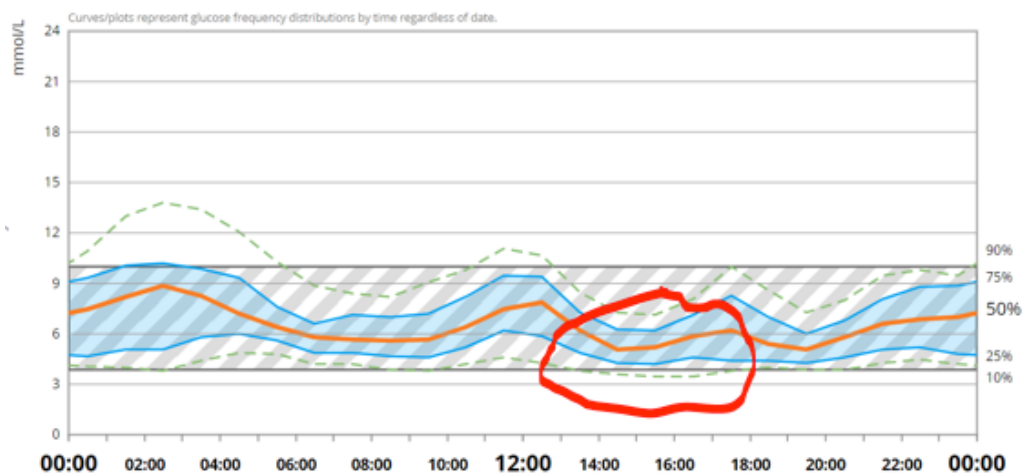
Above 10.0mmol/l overnight:

5. Dark blue line (most of time): 4-7 times a week:

  a. Going above the 10.0mmol/l line or clearly rising throughout the night without a carb snack not covered by insulin before bed:

   • Increase background/basal insulin 10-20%

6. Light blue / green dotted line (occasionally): 1-3 times a week:

  a. Going above the 10.0mmol/l line or clearly rising throughout the night without a carb snack not covered by insulin before bed:

   • Long acting insulin injection technique and waiting 10 seconds?

   • Manual suspend of insulin pump overnight?

   • Injecting or cannula into a lumpy area?

   • Underestimating carbohydrate content of before bed snack?

   • Going to bed with arrows trending up without checking later?
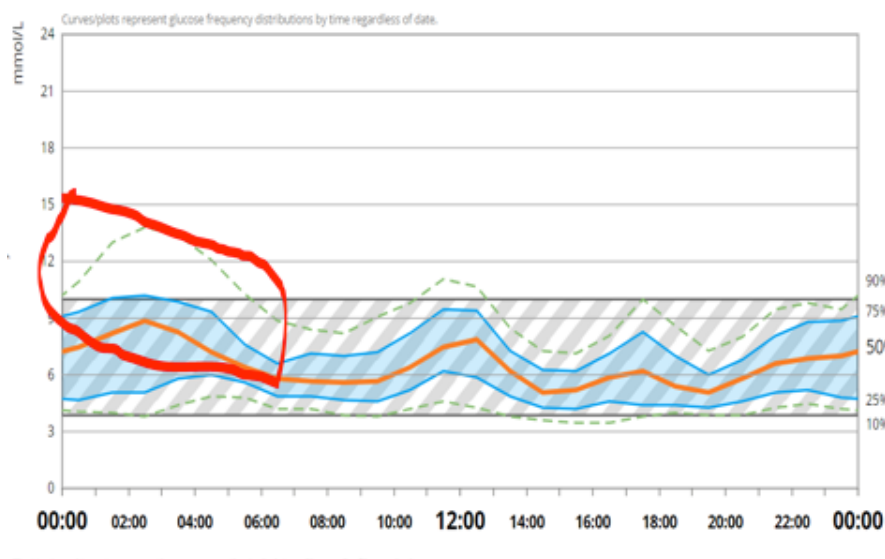
Above 10.0mmol/l after breakfast, lunch, evening meal or supper and staying above until next meal:

7. Dark blue line (most of time): 4-7 times a week:

    a. Going above and staying above the 10.0mmol/l at the next meal:
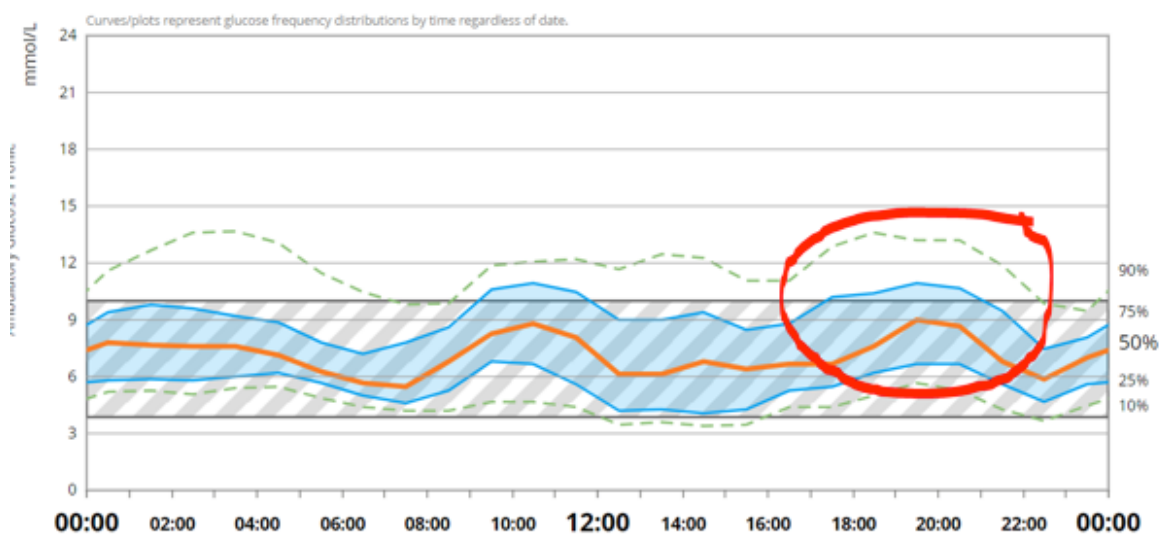
        • Change the carb ratio to increase the insulin by 10-20%
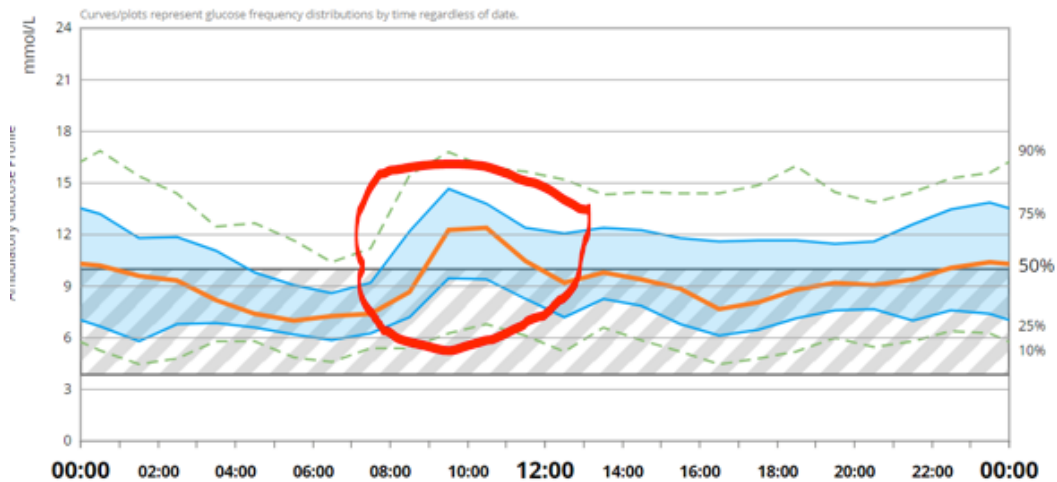
**8. Light blue / green dotted line (occasionally): 1-3 times a week:**

    a. Going above and staying above the 10.0mmol/l at the next meal:

        • Snacks without insulin?

        • Occasionally underestimating carbohydrate content of meals?

        • Changing fast acting insulin injection site or cannula site from abdomen to leg?

        • Over treating hypos?

9. Glucose spiking 1-2 hours after eating but coming back to target by 3-4hours with no correction:

- Giving insulin at least 15 minutes before eating? if so try 20-30 minutes before

- If on a pump try a super bolus

- Try a more balanced meal by including some protein (meat/fish/eggs/nuts)

- Try slowing digestion speed by eating more whole grains or adding fat

- Choose lower glycaemic index foods (wholemeal & higher fibre)
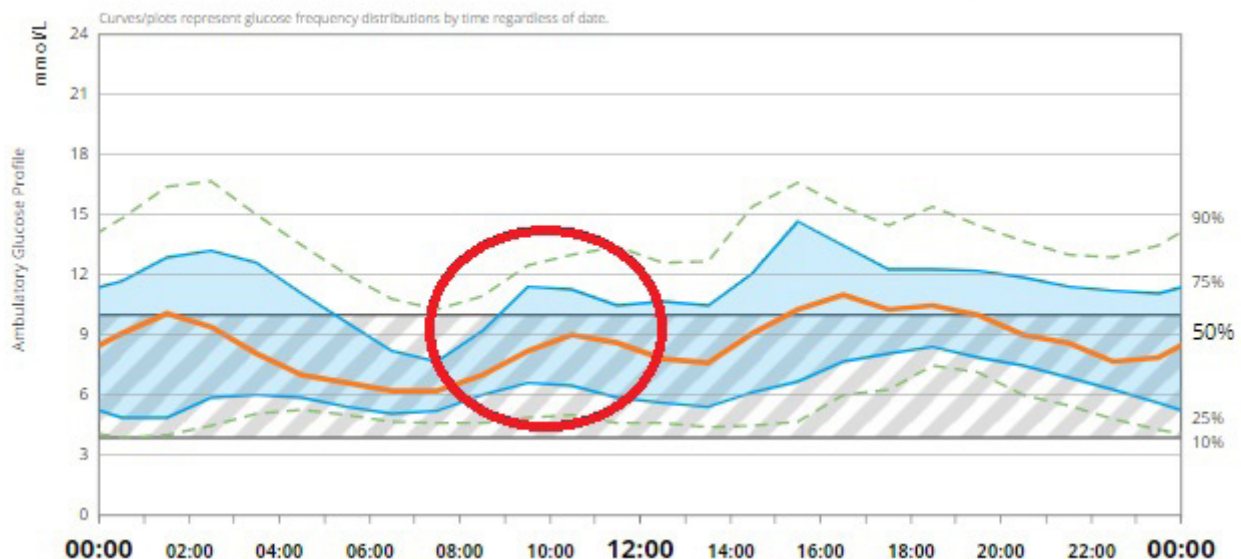
10. Corrections: Are the correction doses working when the glucose is high?

a. When a correction is given, does the glucose return to target range in three hours' time?

- Stays high most of the time – Correction factor: increase the insulin by 10-20%

- Goes low most of the time –Correction factor: reduce the insulin by 10-20%
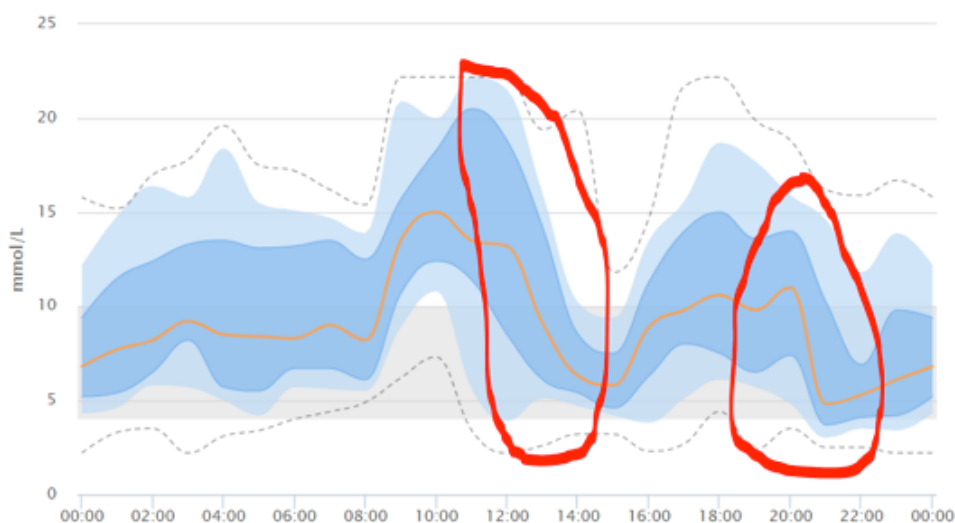
Dynamic management and behavioural changes to stabilize glucose levels

Examples: accurate carb counting, insulin 15-20 minutes before food, using KISS for high fat & protein meals, exercise management, using trend arrows, treating hypos effectively?)
1.
2.
3.

Insulin change plan

10-20% changes and review
1.
2.
3.

How to change insulin by 10-20%

Basal/background INCREASE insulin dose

- 10% = background/basal x 1.1 OR 20% = background/basal x 1.2

Enter background/basal   **10% =**   **20% =**

Basal/background DECREASE insulin dose

- 10% = background/basal x 0.9 OR 20% = background/basal x 0.8

Enter background/basal   **10% =**   **20% =**

Insulin to carbohydrate ratio INCREASE insulin dose

- 10% = carb ratio x 0.9 OR 20% = carb ratio x 0.8

Enter your carb ratio 1u: **10% =**   **20% =**

Insulin to carbohydrate ratio DECREASE insulin dose

- 10% = carb ratio x .1.1 OR 20% = carb ratio x 1.2

Enter your carb ratio 1u: **10% =**   **20% =**

Insulin sensitivity/correction factor INCREASE insulin dose

- 10% = correction factor x 0.9 OR 20% = correction factor x 0.8

Enter your sensitivity 1u: **10% =**   **20% =**

Insulin sensitivity/correction factor DECREASE insulin dose

- 10% = correction factor x .1.1 OR 20% = correction factor x 1.2

Enter your sensitivity 1u: **10% =**   **20% =**

DynamicGM: Adjusting insulin amounts at meal-times based on trend arrows

Should you give the same meal time insulin for the below three readings when the carb amounts is 50 grams? If not which one should have the least insulin and which one the most?
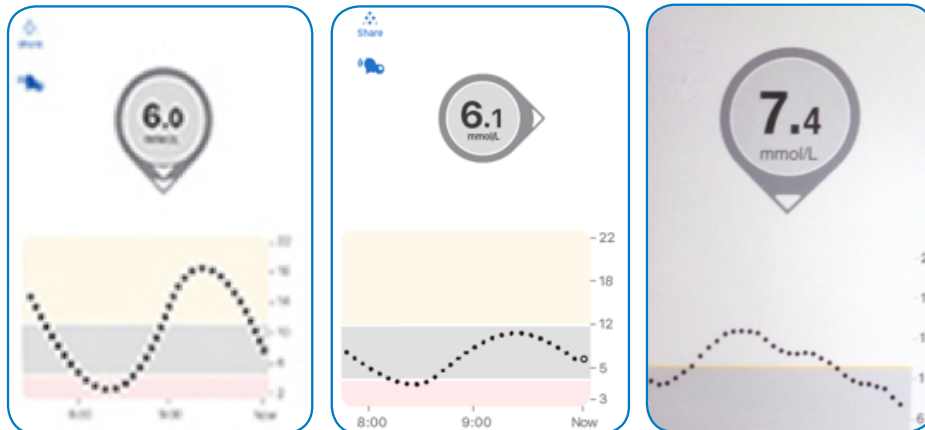

You can use the trend arrows of the CGM to increase or decrease you meal time insulin dose safely. Write your insulin sensitivity factor in this box and the chart on the next page will show you how much to adjust meal time insulin

Insulin sensitivity factor	Direction of trend arrows		
1. Go down to your insulin sensitivity factor 2. Go across to the arrow displayed on your CGM 3. This is the amount of insulin to add or take off your total insulin dose	The glucose is rising steadily, **ADD** the amount of units below to the total bolus amount	The glucose is rising moderately, **ADD** the amount of units below to the total bolus amount	The glucose is rising rapidly, **ADD** the amount of units below to the total bolus amount
	The glucose is falling steadily, **TAKE OFF** the amount of units below to the total bolus amount	The glucose is falling moderately, **TAKE OFF** the amount of units below to the total bolus amount	The glucose is falling rapidly, **TAKE OFF** the amount of units below to the total bolus amount
1.0	1.5	3.0	4.0
1.5	1.0	2.0	2.5
2.0	0.75	1.5	2.0
2.5	0.6	1.2	1.5
3.0	0.5	1.0	1.5
3.0 - 4.0	0.4	0.8	1.0
4.5 - 5.0	0.3	0.6	1.0
5.5 - 6.0	0.25	0.5	0.75
7.0 - 8.0	0.2	0.4	0.5

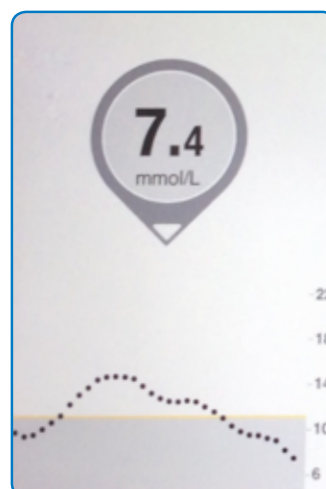| Trend arrow APP	Description	How much insulin to add or take off at meal times
	Rapidly rising	**Add**
	Rising	**Add**
	Slowly rising	**Add**
	Slowly falling	**Take off**
	Falling	**Take off**
	Rapidly falling	**Take off**

Watch me: Adjusting insulin doses

Activity: If your meal time insulin dose came to 5 units, how much would you give for the below three readings.

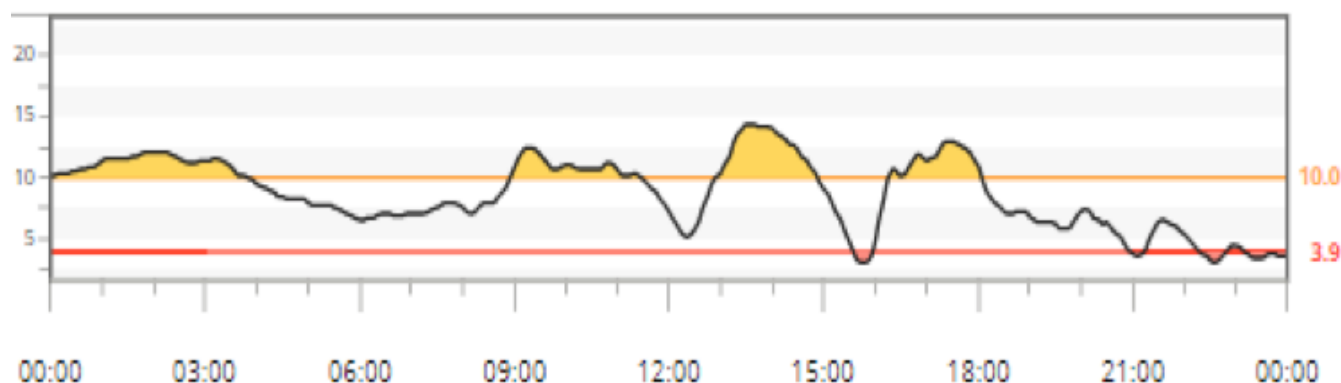..................   ....
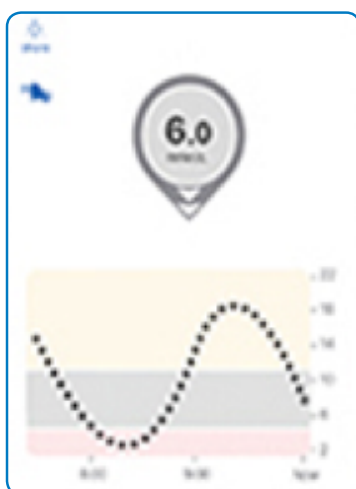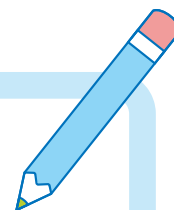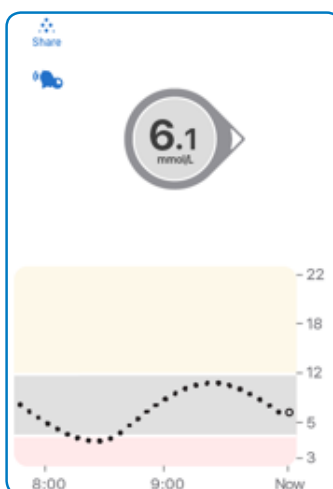
DynmamicGM: Preventing glucose spikes after eating

When you start using CGM it can be surprising to see what happens to your glucose level after eating. You often see the glucose level spikes up above 10.0mmol/l after eating, even though it comes back down before the next meal. Most people think the answer is to give more insulin. But is this the correct option?

What would happen if you increase the insulin dose at breakfast, lunch and evening meal in the above example?

....

The issue is not that the insulin dose is not correct. The issue is the carbohydrate is absorbed into the blood steam as glucose much faster than the insulin can work. The insulin does catch up, but it takes the full 3-4hours of insulin action to get the glucose back down to target.

There two strategies each with different tactics to stopping the glucose spike:

- DynamicGM Strategy 1: Speeding up how quickly the insulin works
  - o DynmaicGM tactics
    - Giving meal time insulin a head start (session 2).
    - Giving mealtime insulin in the abdomen or arm, not the leg (session 2).
    - Stay away from lumpy injection sites (session 2).
    - Speeding up insulin absorption by splitting large doses (session 2).
    - Short bouts of activity to make insulin work faster (session 2).
    - Superbolus if on an insulin pump (advanced session).

- DynmaicGM Strategy 2: Slow down how quickly the carbohydrate gets digested
  - o DynmaicGM tactics
    - Lower glycaemic index carbohydrate choices (session 3).
    - Exchanging some carbohydrate for fat and or protein (session 3).

These **DynmaicGM** tactics are a set of tools that may find useful. **You do not need to use them all.** Let's work through each of them and you can decide which ones you want like.

Giving meal time insulin a head start
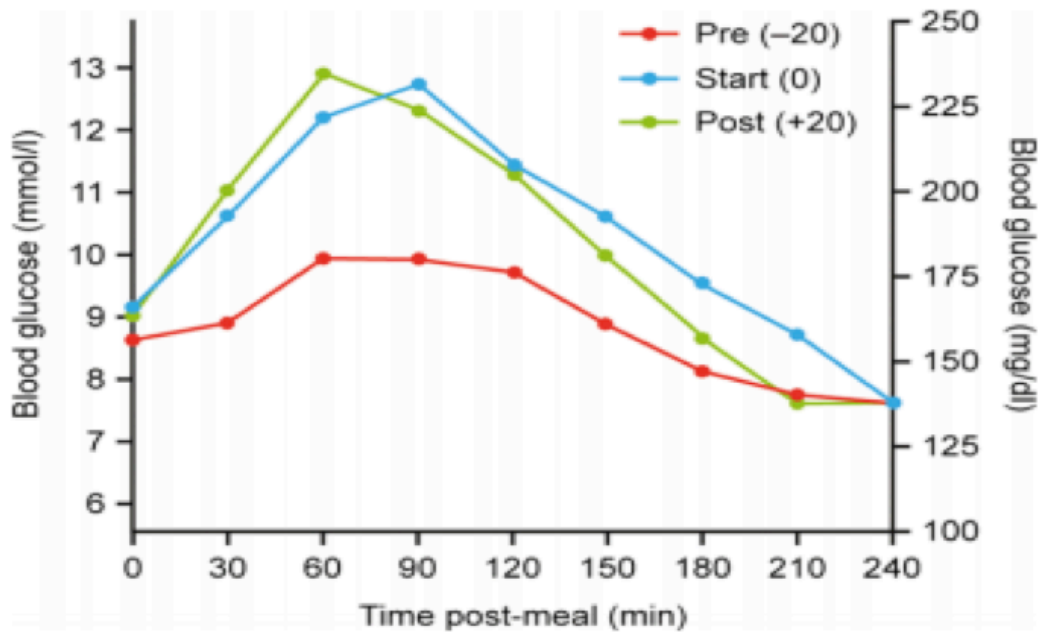
The above graph shows why giving meal time insulin 20 minutes before a meal (red line) reduces the spike in glucose after eating. Compare this to giving insulin at the meal (blue line) or 20 minutes after (green line). This is why you should aim to give insulin 15-20minutes before each meal. This makes a big difference to your HbA1c and future health.

When you may not want to give before eating;

- Very slow eater who takes more than 45 minutes.

- Cannot be sure the meal will be finished.

# Giving mealtime insulin in the abdomen or arm, not the leg
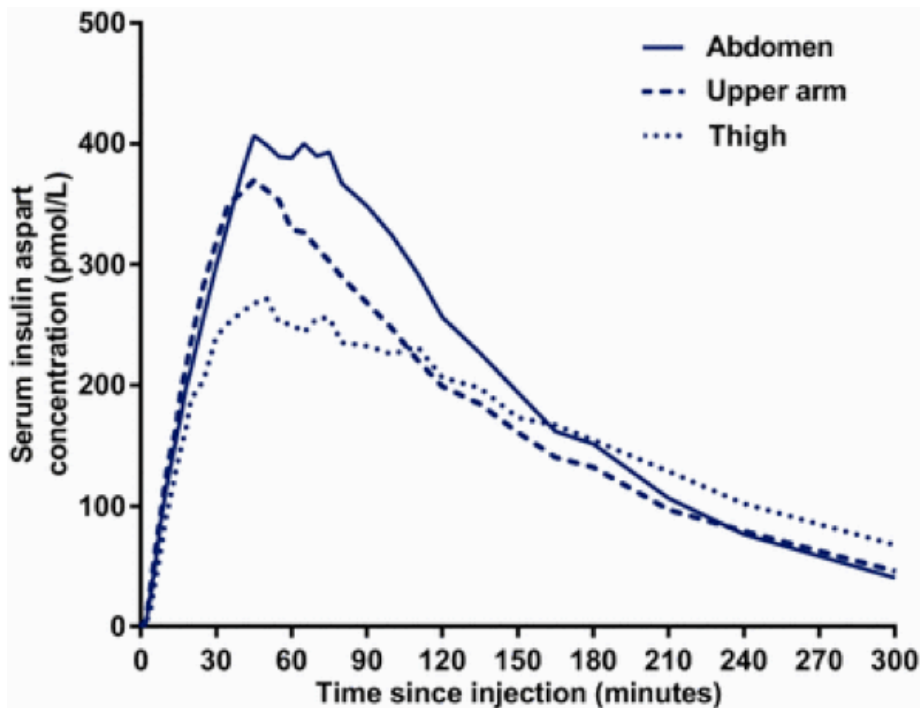
Meal time insulin works 60% faster in the abdomen or upper arm after 60 minutes.

For people using insulin pumps, use your abdomen when placing your cannula. If you do use your thigh you will most likely see much higher spikes after eating. If you swap and change between abdomen and leg, expect the glucose control to be much more unpredictable.

For people using injections follow these rules:
- Long-acting insulin in the leg.
- Fast-acting insulin in the abdomen or upper arm.

Stay away from lumpy injection sites
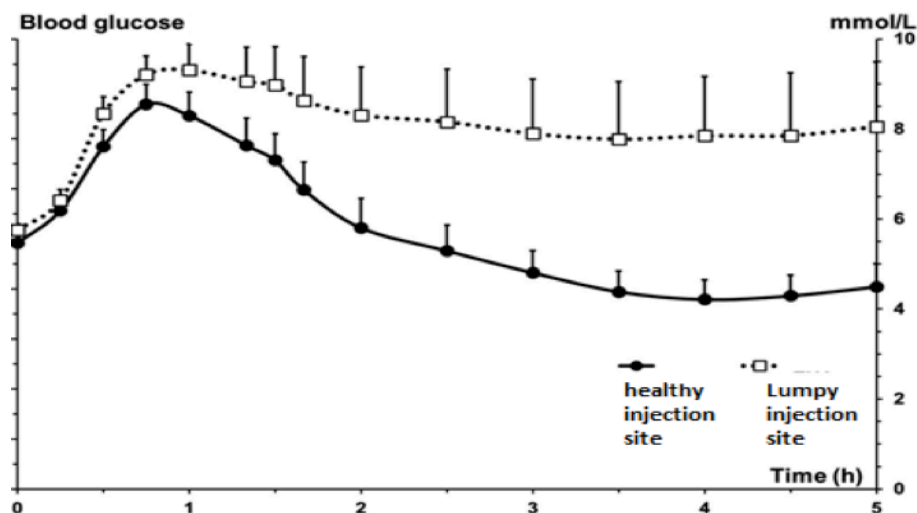
This graph shows the glucose level will be about 4mmol/l higher four hours after eating if the insulin is given into a lumpy injection site when compared to a healthy injection site. It is very important to check for lumps under the skin before inserting a new cannula or giving an insulin injection.

## Check for lumps to avoid glucose bumps!

Injection sites

- If you inject into the same place a lot of the time, you are at risk of developing some lumps and bumps. The posh name for this is Lipohypertrophy.

- If you develop lipohypertrophy and inject your insulin into them, then your insulin won't be absorbed as effectively, this will lead to it working much faster on some days and much slower on others.

- In order to prevent this from happening it can be useful to have a plan of rotating your injection sites.
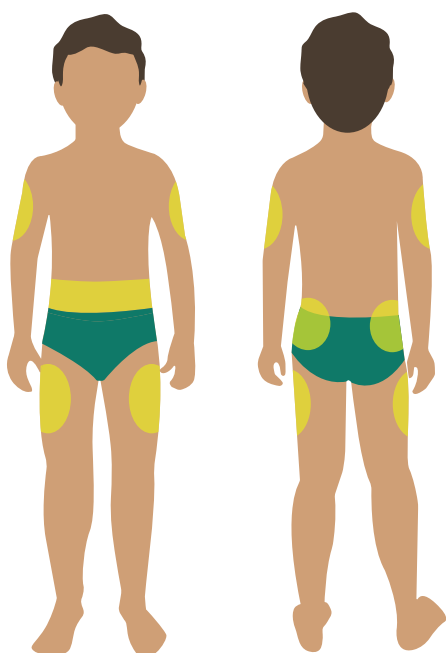

Top Tip

initial next to the insulin dose in your blood glucose diary where you have given your insulin
e.g LL = Left Leg, RL = Right Leg.
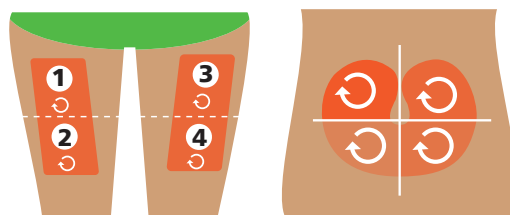
DynamicGM: Speeding up insulin absorption by splitting large doses

When fast acting insulin is delivered by a pump or injection it forms in a ball in the fat tissue. The insulin is slowly absorbed from the outside of the ball into the blood. If the ball of insulin is big, just like a beach ball, the absorption is slow because there is a lot of insulin in the middle that cannot be accessed immediately. When the ball of insulin is smaller, like a football, the absorption is quicker because there is more insulin on the outside of the two balls that can be absorbed immediately.

See the pictures below, on the left one large ball of 10 units, on the right, two smaller balls of 5 units. Although in both cases 10 units has been delivered, the two separate deliveries of 10 units would get absorbed faster because there is more insulin that can be absorbed immediately from the outside of the balls.
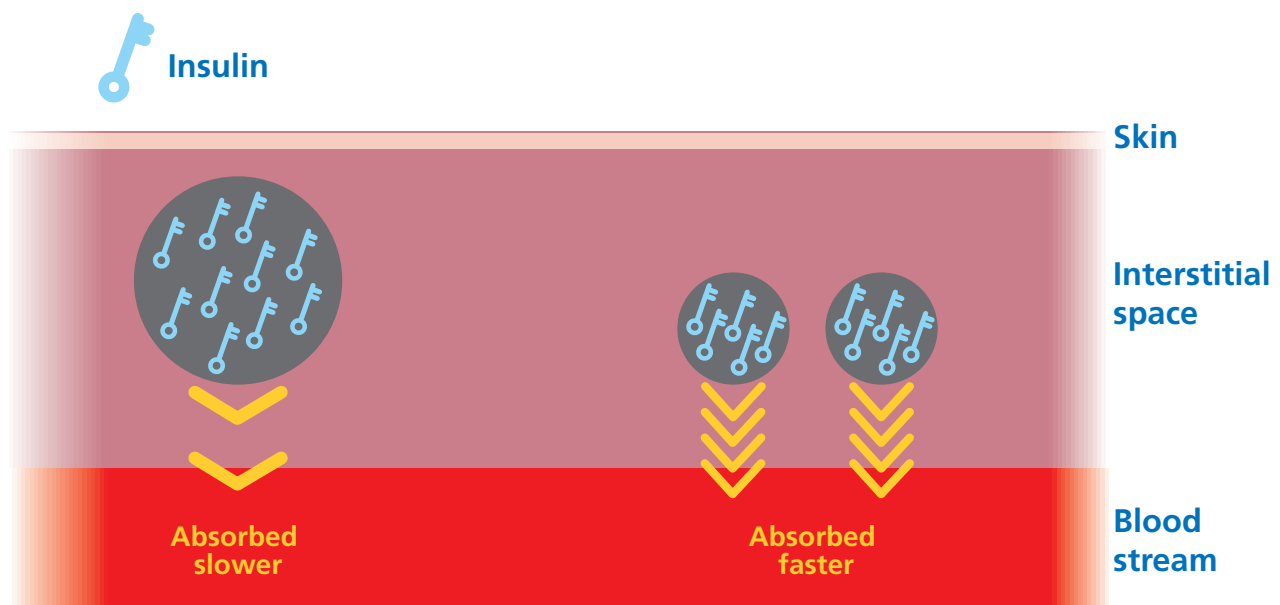
For people on injections, if you are happy to have two injections, you could consider:

- To split the fast acting insulin amount into two injections if it is above 10 units.

    o For example, you could give two injections of 8 units in different sides of the abdomen if the total fast acting insulin amount was 16 units.

    o If the total fasting acting insulin came to 18 units, how could you split the injections to speed up the absorption?

    ....

Watch me: Insulin delivery

For people on pumps you could consider;

- Using an extended/square bolus over 15minutes if the amount is above 10 units. This would keep the size of insulin ball under control over 15 minutes, instead of pumping in a large ball in less than 2 minutes.

DynamicGM: Short bouts of activity to make meal time insulin work faster

How quickly insulin takes glucose from the blood into the muscle cells is determined by the amount of blood supplied to the muscles.

- The more blood supplied, the quicker the insulin moves glucose from the blood to the muscle cells. This prevents glucose spiking after eating

- The less blood supplied, the slower insulin moves glucose from the blood to the muscle cells. It is more likely the glucose will spike after eating.

Glucose

Insulin

Blood Moving Fast

Exercising

Blood Moving Slow

Relaxing
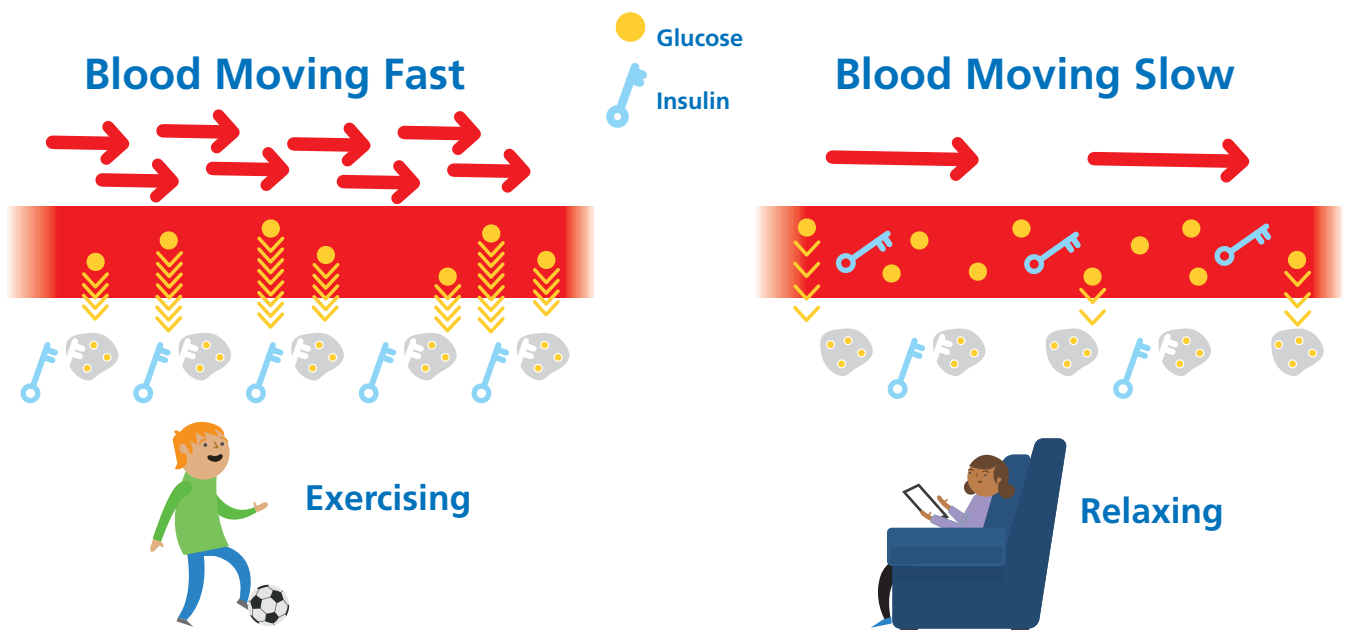
Watch me: Activity and insulin

How can short bouts of activity help?

When you become active the blood supply is re-directed from digesting food. The blood rushes to the muscles to supplying oxygen. This helps prevent glucose spikes in two ways:

- Less blood supply to the digestive system slows down how quickly the carbohydrate is digested. Glucose appears much more slowly I the blood stream.

- Iincrease supply of blood to the muscles allows insulin to work faster and move glucose more quickly from the blood into the muscles.

Practical tip: You can use a short bout of 10 minutes activity to prevent glucose spikes after eating. This could be walking, playing on the trampoline, jogging or even gardening!

Homework
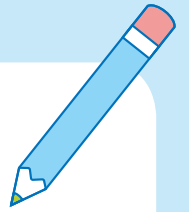
- Keep the food diary at the back of this booklet for the next two weeks. We will use the food diary in the next session to help you;

    o The importance of balanced meals

    o Which foods spike glucose levels after eating

    o Which foods require extra insulin, more than you would calculate for just the carbohydrate content

    o Do you need different exercise plans

    o How you could use exercise to prevent highs and lower high glucose levels

    o Where you can use correction doses in-between meals

    o Where you could have prevented hypos

    o How you could have increased or decreased meal time insulin doses based on trend arrows

    o And a lot more

- Read the rest of this booklet and complete the activities, so you are ready to discuss and try the strategies in the next session

- If using the receiver please Upload it to Clarity

- Try some of the **DynamicGM** skills such as preventing hypos, exercise management, changing insulin timing based on glucose level and trend arrow

<div align="center" style="color:red">Watch me: End of session 2</div>

CGM Academy Session 3
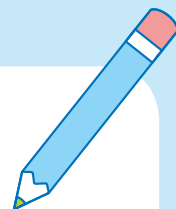
Review of the second week

How has the CGM helped you this week?

What **DynamicGM** strategies have you tried?

What challenges have you had this week?

Do you have any concerns about using the CGM at school?

DynamicGM: Lower glycaemic index carbohydrate choices

Individual foods and meals affect blood glucose levels in different ways. Some foods cause a rapid rise, whilst others produce a slow, gentle rise.

Glycaemic Index (GI) is a way to rank foods based on how quickly a food will raise blood glucose.

- Foods with a high GI ≥70 raise blood glucose quickly.
- Foods with a low GI ≤55 raise blood glucose slowly.
- Foods with a medium GI (56-69) are still good choices

Low GI foods produce a slower and less pronounced rise in blood glucose levels. It will benefit your blood glucose if you have at least one low GI food at each meal. If you have a low GI meal, the benefit will last until after the next meal.

If high GI foods are mixed with lower GI foods e.g. Coco Pops and Bran Flakes, the effect on blood glucose will also be reduced.
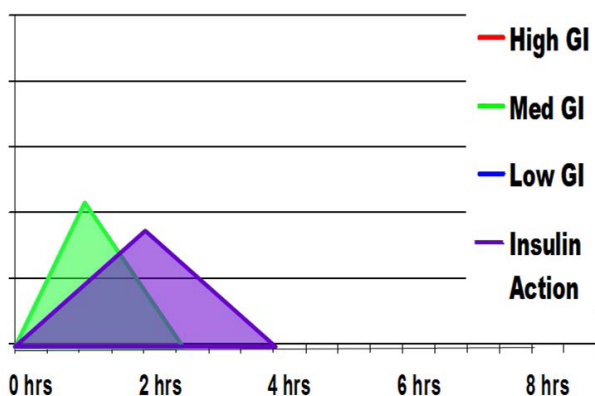
High GI

Low GI

Blood glucose levels

Time/Hours
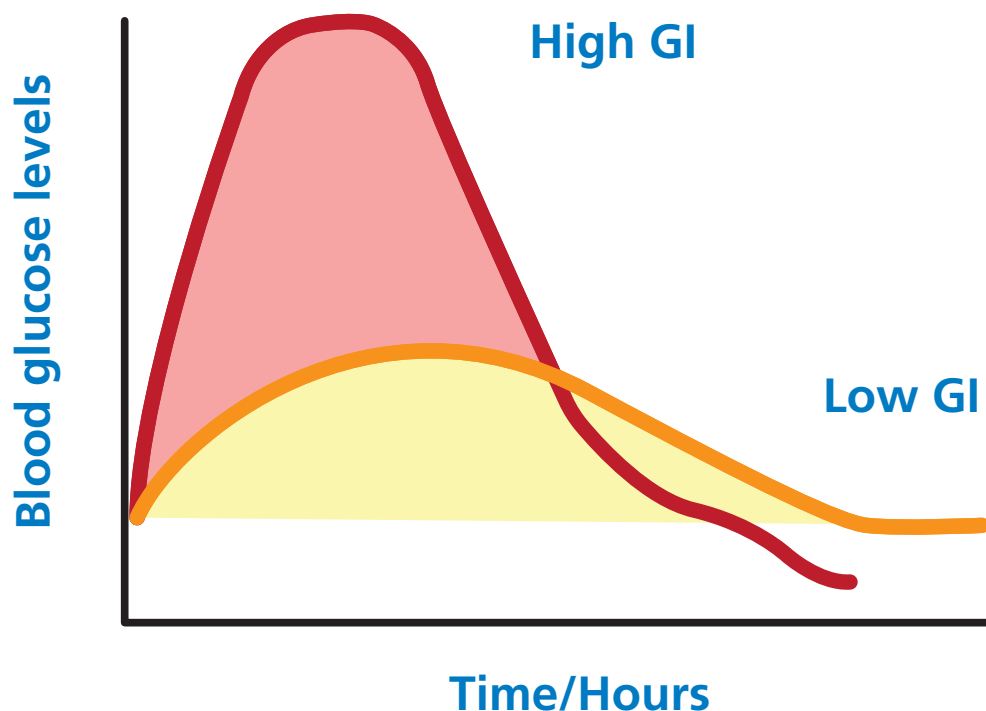
Showing how different GI foods can influence blood glucose over time

Speed of carbohydrate turning into sugar
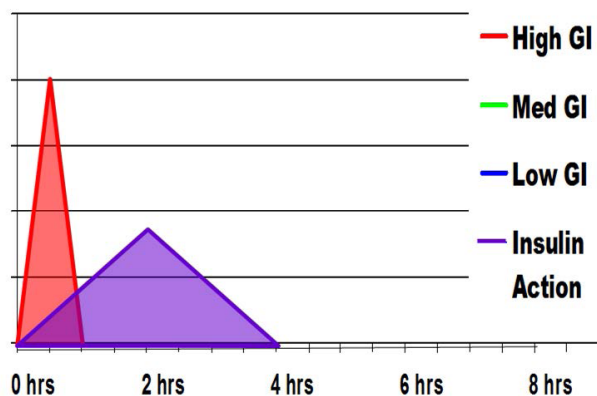
High GI foods such as sugary cereal or drink gets absorbed into the blood stream very quickly, making it very difficult to match with insulin. Mixing high GI with low GI foods is therefore very important to control blood glucose levels.

Medium GI foods get absorbed into the blood stream slower than high GI foods, but their absorption time is still slightly quicker than the insulin time. Injecting for these foods 15 minutes before eating is essential to achieve more in target glucose readings.
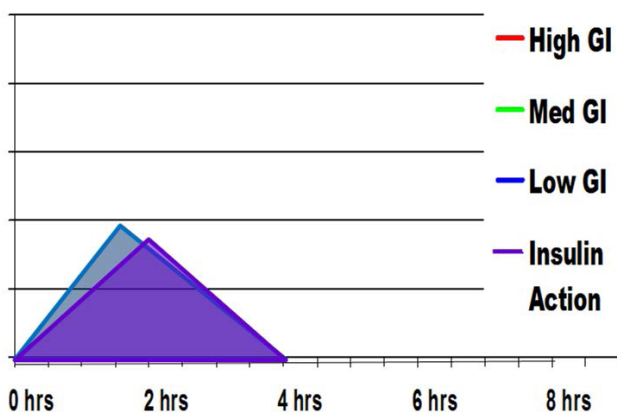
Low GI foods get absorbed into the blood stream almost identically matches insulin action when given 15 minutes before eating, and hence keeps the glucose level very stable. Aim to include a variety of these foods in your diet.

The list below shows the GI of many common starchy carbohydrate foods. Aim to have as many of the low GI options in your diet as possible for good health and blood glucose control.

Low GI cereals	Medium GI cereals	High GI cereals
All bran	Muesli (no added sugar)	Cornflakes
Oat bran	Mini wheats	Instant porridge
Porridge (whole oats)	Rolled oats	Coco Pops
Special K	Sultana bran	Weetabix
Oatibix	Shredded Wheat	Rice Krispies
Readybrek	Fruit and Fibre	Cheerios
		Bran Flakes

Low GI Breads	Medium GI Breads	High GI Breads
Sourdough bread	Oatmeal	White bread
Soya & Linseed	Pitta bread	French baguette
Granary	Wholemeal bread	Flatbread
Tortilla wrap	Chapatti	
Muffins (for toasting)	Bagel	

Low GI Starchy Foods	Medium GI Starchy Foods	High GI Starchy Foods
Pasta /Spaghetti (not overcooked)	Boiled potato	Mashed potatoes
Gluten free pasta	Sweet Potatoes	Baked potato
Cheese Tortellini	Easy cook	Thai rice (Jasmine)
Yam	American rice	Glutinous rice
Rice noodles	Wild rice	
Quinoa, pulses	Couscous	
Basmati rice		
Brown rice		

What else affects GI?

- If a food contains little or no carbohydrate, it does not have a GI value e.g. avocado, meat, fish, eggs, cheese and most alcoholic drinks.

- Most fruit and vegetables are low GI and it is therefore recommended to include a variety of these in your diet. Including vegetables or salad at main meals will help to make sure the overall GI of the meal is lower.

- When making food choices, think about the fat and sugar content. Some foods with a low or medium GI will have a high calorie (energy) value e.g. croissant, chocolate, crisps, ice cream, nuts and dried fruit. Keeping the portion size of these small will benefit your health.

- Fat and protein in foods slows down how fast carbohydrates leave the stomach. For example eggs on toast would have a lower GI compared to toast with jam. Having a good protein food at main meals will help balance your blood glucose control.

- Fibre also affects how fast carbohydrates will break down into sugar. Wholegrain bread is a better choice than white bread.

- Less processed foods are harder to digest and have a lower GI than very processed foods. It's always best to have a piece of fruit compared with fruit juice for example.

- Adding vinegar or lemon/lime juice into salad dressings at a meal will reduce the GI of the meal.

What do you think are the key changes that will improve your health and blood?
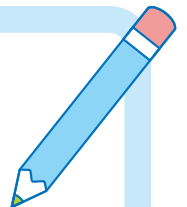
Key changes   **Watch me: Glycaemic Index**

1 ....

....

2 ....

....

3 ....

....

DynamicGM: Exchanging some carbohydrate for fat and or protein

Meals and snacks that are mostly carbohydrate can spike the glucose level after eating. Have you ever noticed this after breakfast cereals, toast and jam and jacket potato with beans?

In these type of meals there is very little fat and protein to slow down the carbohydrate digestion. The glucose gets in the blood much faster than the insulin can work. Boom, your glucose spikes and you see arrows up and the CGM rapidly climbing.

If you replaced some of the carbohydrate with fat and protein, digestion would be slowed. This would give the insulin a chance to keep up. The table below offers some

Meals high in carbohydrate and low in fat and protein that can make the glucose spike 1-2 hours after eating	How you exchanges some of the carbohydrate for fat and protein glucose spiking by adding fat and protein
Breakfasts	
Large Breakfast cereal with skimmed or semi skimmed milk	Medium breakfast cereal with full cream milk and a boiled egg.
Two toast with spread and jam or honey	One toast with spread and scrambled egg or mackerel or cheese spread
Croissant with Jam	Croissant with cream cheese
4 pieces of fruit	2 pieces of fruit with normal yoghurt
Lunches	
Two ham sandwich with low fat yoghurt and fruit	One cheese sandwich with full fat yoghurt
Tomato soup with 2 slices white bread and rice cakes	Tomato soup with one wholemeal bread with spread on small bag of crisps
Baked potato with spaghetti hoops	Sweet potato with spread and cheese
Evening meal	
Large white rice with curry	Basmati rice with curry and vegetables
Baked potato with beans - no spread	Baked potato with tuna mayonnaise
Mashed potato, baked beans and waffles	Mashed potato with sausages, vegetables and baked beans
Snacks	
3 Rice cakes	Small bag Corn or tortilla chips
Low fat snack bars	Nut based snack bars
Dried fruit	Nuts

DynamicGM: Moderate intensity activity:
walking, playing in the playground, jogging, football

Liver

Blood Vessel

Exercise opens the side door

Energy

Normal Cell

● Glucose

⚷ Insulin
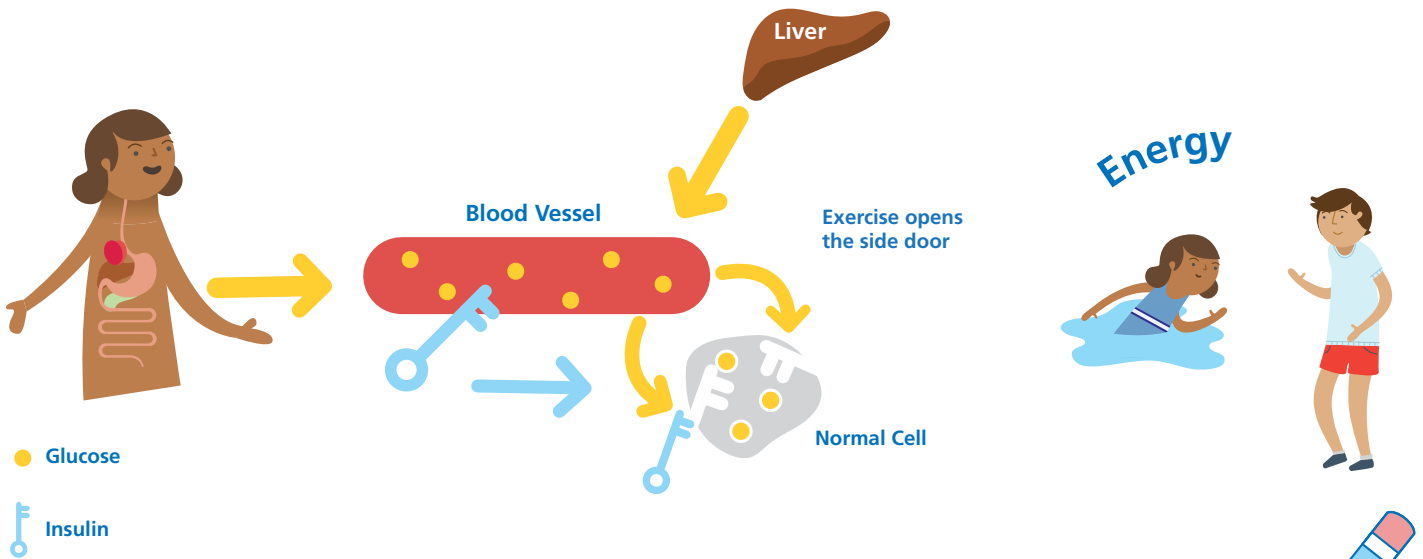
What will happen to the blood glucose level if double the glucose leaves the blood into the muscles?

The graph below shows what usually happens to the blood glucose level during low to moderate intensity exercise. What are the two options you could choose to prevent the low blood glucose?

Glucose Trend

Activity Guide

Number of minutes the activity is after insulin bolus for meal	Before Activity Meal before activity	During Activity Check BG before and during 20 minute intervals if possible	After activity If more than 45 minutes
0 - 90 minutes Peak insulin action	**Activity up to 30 minutes:** -25% off the bolus insulin **Activity 30+ minutes:** -50% off the bolus insulin	**Check Blood Glucose before and every 20minutes:** Ccarbohydrate amounts on next page	**Only give half of the usual correction dose** **Option 1:** -25% off the bolus insulin after activity meal **Option 2:** If not having a meal have 10-20g carbohydrate and/or protein with no insulin **Option 3:** Reduce basal by -25% for 2-6 hours
90 + minutes Moderate insulin action	**Full amount of bolus insulin**	**Check Blood Glucose before and every 20minutes:** Ccarbohydrate amounts on next page	**Only give half of the usual correction dose** **Option 1:** -25% off the bolus insulin after activity meal **Option 2:** If not eating have 10-20g carbohydrate and/or protein with no insulin **Option 3:** Reduce basal by -25% for 2-6 hours

DynamicGM: Exercise Calculator

What activity are you doing?

How many minutes before exercise are you eating and giving insulin?

How many minutes are you exercising for?

Activity	Meal Before	During Activity	After Activity: 3 choices

Activity and blood glucose monitoring

The plans are a good starting guide but they will not be perfect. The only way they can be improved is by effective glucose monitoring. We recommend you check glucose level:

- Before activity
- Every 20 minutes during
- After activity
- If activity more than 45 minutes a test at 2-3am

DynamicGM: Using trend arrows to manage exercise

- Based on your weight this is how much carbohydrate you will need to manage **20 minutes** of exercise depending on the CGM level and trend arrow.
- You can then convert that into the carbohydrate required into the amounts you will need of your usual exercise snack.

Sensor glucose Levels	Rate of glocose change trend arrow & action to take	Carbohydrate grams for 20 minutes	Option 1: Dextrose (3g)	Option 2: Lucozade Original
<4.0 mmol/l	**No exercise: Treat hypoglycaemia**			
4.0 - 6.4 mmol/l				
6.5 - 9.9 mmol/l				
	OR			
10.0 - 13.9 mmol/l				
	OR **OR**			
	OR			
>14.0mmol/l	**Check ketones: If less than 0.6mmol/l**	**Ok to exercise**		
	Chck ketones: If 0.6mmol/l or above	**No exercise and contact parent/guardian or diabetes team**		

CGM Academy Advanced session

DynamicGM: Giving insulin before meals based on trend arrows

Use the CGM value and trend arrow to workout the time before eating to give insulin

Sensor glucose Levels	Trend arrow	Minutes to bolus before meal
4.0 - 5.9 mmol/l	↓↓	Prevent hypo
	↓	Prevent hypo
	↘	Prevent hypo
	→	15
	↗	20
	↑	25
	↑↑	30
6.0 - 9.9 mmol/l	↓↓	0
	↓	10
	↘	15
	→	20
	↗	25
	↑	30
	↑↑	35
10.0 - 14.0 mmol/l **Watch me: Yusuf giving insulin 25 minutes before**	↓↓	15
	↓	20
	↘	25
	→	30
	↗	35
	↑	40
	↑↑	45
More than 14.0 mmol/l	↓↓ OR ↓	25
	↘	30
	→	40
	↗	45
	↑ OR ↑↑	50

Activity: How many minutes before the meal could you deliver the insulin for the below examples?

....
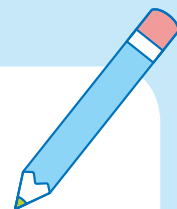
Watch me:
Insulin before meals based on glucose and arrows

DynamicGM: Using short burst of activity to prevent glucose spikes

Practical tip: use short bouts of activity if your glucose level is spiking **1-2 hours** after eating

Dexcom sensor glucose Levels	Trend arrow	How many minutes of activity
8.0 - 10.0 mmol/l	↗ (rising slightly)	5
	↑ (rising)	10
	↑↑ (rising quickly)	15
10.0 - 14.0 mmol/l	→ (steady)	15
	↘ (falling slightly)	20
	↑ (rising)	25
	↑↑ (rising quickly)	30
More than 14.0 mmol/l	↓ (falling)	15
	↘ (falling slightly)	20
	→ (steady)	25
	↘ (falling slightly)	30
	↑↑ (rising quickly)	40

Watch me: Short burst of activity

Activity: How many minutes of activity could you do to rectify this glucose level spiking 60 minutes after eating?

....

DynamicGM: Preventing delayed glucose rises 4-8 hours after eating a meal

Have you noticed what happened to your glucose level 4-8 hours after eating high fat and protein meals such as Pizza, take always and fish and chips?

The example below is where a pizza eaten and insulin dose given to cover the carbs, which were counted correctly at 18:00. The glucose level was controlled at 21:00 but after that the glucose level increased quickly, requiring a correction at 22:30 to bring it back down.
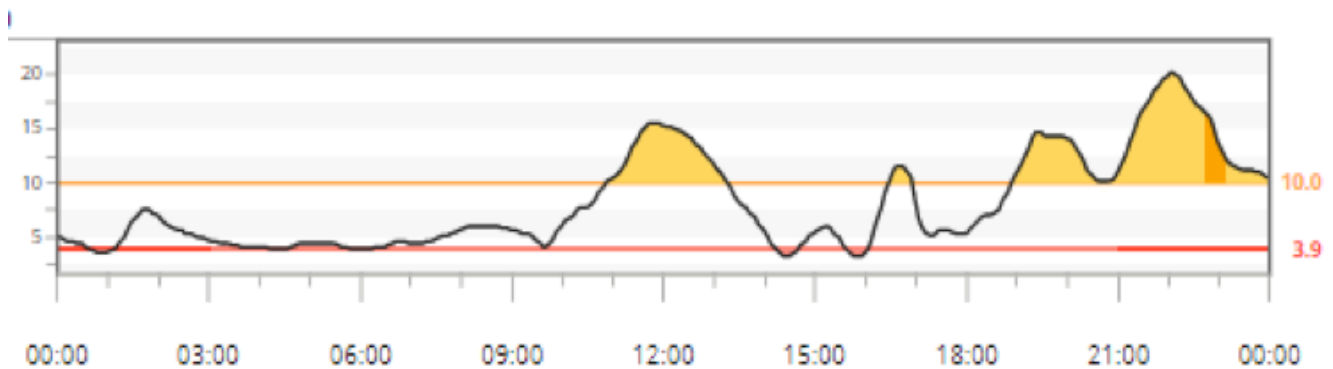
This happens when you have meals that have a lot more fat and protein than you usually eat. This section will teach you how stop this from happening.

Activity: What meals have caused this to happen to your glucose level?
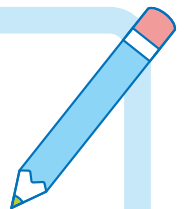
1 ....

....

2 ....

....

3 ....

....

When carbohydrate counting works well

- When you weigh foods regularly.
- When you convert weighed portions into household measures - saves time!
- When you give insulin 15 minutes before eating.
- When you plan ahead before eating out.
- When you eat your usual well-balanced meals.

The secret to keeping your glucose levels in target after eating is to choose meals that have a similar amount of carbs, a palm size protein option and plenty of vegetables or salad.

When carbohydrate counting is not effective

- When you eat meals that are **high in fat and protein**, much higher than your usual well-balanced meals.

Your insulin to carbohydrate ratio will calculate an accurate insulin dose to cover your usual well-balanced meals. But it will not calculate enough insulin if your meal is very high in fat and protein.

High fat and protein meals
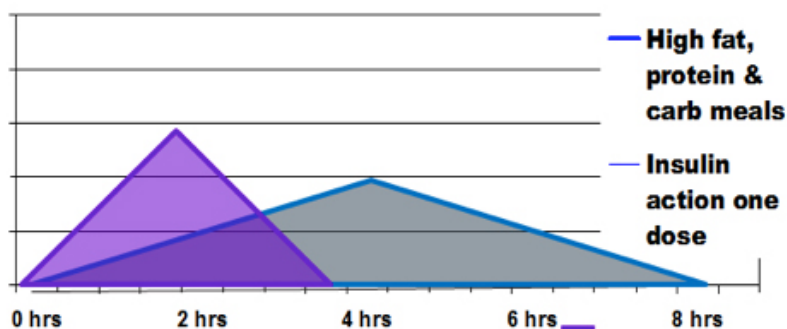
High fat, protein and carb meals such as pizza get absorbed slower than usual meals. Also, the high fat and protein content requires extra insulin. If all the insulin is given in one dose before the meal, the glucose will often go low first, then very high later.
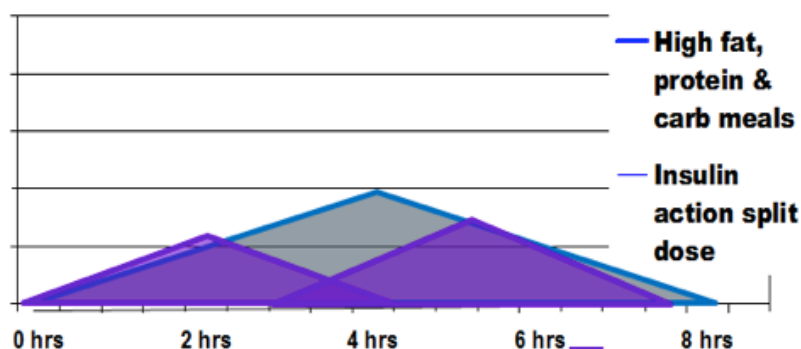
There is a two-step process to prevent the glucose level going down then up for high fat, protein and carb meals. First, increase the total amount of insulin to cover the impact of the high fat and protein. Second, split the insulin dose into two separate parts.

What meals do you eat that are high in fat and protein?
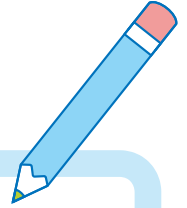
1 -   3 -

2 -   4 -

When you have a meal that contains a high amount of fat and protein that's way above your usual meal, your body needs more insulin to process the carbohydrate. The high fat and protein in the meal prevents the insulin from working effectively, the technical term for this is insulin resistance.

If you consider insulin works like a key, opening the cell doors to allow glucose in, think of a meal high fat and protein as putting another lock on the cell, so two insulin keys are needed instead of one.
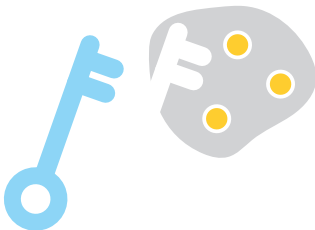
Normal meal   ### High fat and protein meal
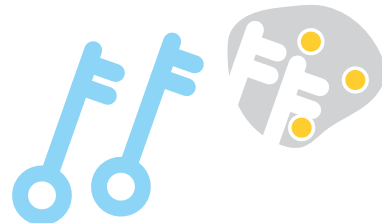
Watch me:
Extra insulin for high fat and protein

When Carbohydrate Counting Works
Well-balanced breakfast

When more insulin is needed
High fat and protein breakfast

Well-balanced lunch
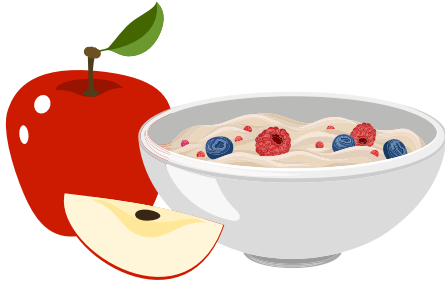
High fat and protein lunch
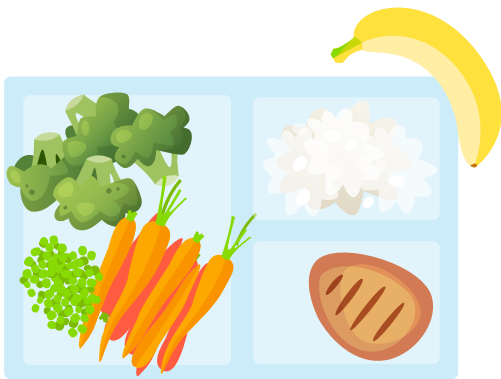
Well-balanced evening meal
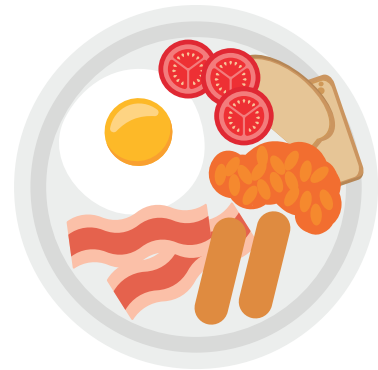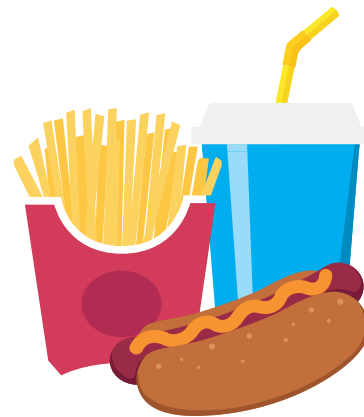
High fat and protein evening meal

Meal	Extra Insulin	Multiwave/Dualwave or split injection
Fish and Chips	25%	Pumps: 50% now, 50% over 2.5 hours Injections: 50% 15 mins before & 50% 60mins after
Indian Takeaway	25%	Pumps: 50% now, 50% over 2.5 hours Injections: 50% 15 mins before & 50% 60mins after
Pizza	25%	Pumps: 50% now, 50% over 2.5 hours Injections: 50% 15 mins before & 50% 60mins after
Chinese Takeaway	25%	Pumps: 50% now, 50% over 2.5 hours Injections: 50% 15 mins before & 50% 60mins after
Pasta with creamy sauce e.g. Macaroni cheese	25%	Pumps: 50% now, 50% over 2.5 hours Injections: 50% 15 mins before & 50% 60mins after
Fast food meals e.g. McDonalds, KFC	25%	50% 15 minutes before eating. 50% 60 mins after eating

How do I do this?

1. **Work out the total insulin dose and add the extra 25%:**
   - Set up a Health Event with +25% on the Expert meter
   Or
   - Multiply the insulin amount by 1.25 if not using and Expert meter
   - E.g. 8units x 1.25 = 10units

2. **Split the total dose in half and decide how to give depending if on a pump or injections. If using injections give half 15 minutes before eating and the other half 60 minutes after eating. If using a pump use a dual/extended wave give 50% now and 50% spread over 2 1/2 hours.**
   - For example
   - 10 units x 0.5 = 5 units
   - 5 units before and 5 units 60 minutes after (injections) or 5 units over 2 1/2hours (pump)

3. **Monitor glucose:**
   - Before
   - 2.5 hours after
   - 6 hours after

4. **Follow the guidance on the next page to see if you need to change the insulin doses for next time.**

Guidance on adapting insulin percentages from the 2.5 hours test

Two half hour test: Does the first insulin dose percentage need adjusting?

• If blood glucose at 2.5 hours is **more than 4mmol.l** higher than pre meal:

> • **Increase initial percentage** by 20% next time to:
> • 70% (multiply total insulin by 0.7) & 30% multiply total insulin by 0.3).
> • Give the 70% 15 minutes before and the 30% 60 minutes after or over 2 1/2 hours.
> • E.g. 10 x 0.7 = 7units & 10units x 0.3units = 3units.

• If blood glucose at 2.5 hours is **lower** than pre meal:

> • **Reduce initial percentage** by 20% next time to:
> • 30% (multiply total insulin by 0.3) & 70% multiply total insulin by 0.7).
> • Give the 30% 15 minutes before and the 70% 60 minutes after or over 2 1/2 hours.
> • E.g. 10 x 0.3 = 3units & 10units x 0.7units = 7units.

Guidance on if you need more than 25% extra insulin next time, from the 6 hour test

Six hour test - do you need more insulin?

Guidance on adapting extra insulin:
• If blood glucose at six hours is **2 - 6mmol.l higher** than pre meal:

> • Increase the additional insulin by 10% so from 25% extra to 35% extra by:
>> • **Set up health Event of +35% on Expert meter**
>> • Or
>> • Insulin dose x 1.35
>> • E.g. 10 x 1.35 = 13.5

• If blood glucose at six hours is **more than 6mmol.l higher** than pre meal:

> • Increase the additional insulin by 20% so from 25% extra to 45% extra by:
>> • **Set up health Event of +45% on Expert meter**
>> • Or
>> • Insulin dose x 1.45
>> • E.g. 10 x 1.45 = 14.5

First time experiment

Meal: _____   **Meal carbohydrate:** _____

Calculation for 25% extra insulin to cover high fat high protein meal

Insulin dose x 1.25=

Time to test Blood Glucose	Blood Glucose
Pre meal	
2.5 hours after meal	
6 hours after meal	

Does the percentage up-front need adjusting based on the 2.5 hours test?

Does the total amount of insulin need increasing above 25% based on the 6 hours test?

Second time experiment

Meal: _____   **Meal carbohydrate:** _____

Calculation for 25% extra insulin to cover high fat high protein meal

Insulin dose x 1.25=

Time to test Blood Glucose	Blood Glucose
Pre meal	
2.5 hours after meal	
6 hours after meal	

Does the percentage up-front need adjusting based on the 2.5 hours test?

Does the total amount of insulin need increasing above 25% based on the 6 hours test?

When to consider the Super Bolus

Does your blood glucose ever go very high one to two hours after eating, but then returns back to target by fours hours, even though you have not given a correction at two hours?

If you answered yes, consider:

- What meals cause this to happen?

- Is there a time of day that this happens?

- What things have you tried to prevent this from happening?

This commonly happens after eating:

- Breakfast cereals

- Toast with jam

There are lots of solutions to this problem, ask yourself the following questions:

- Do I carbohydrate count accurately?

- Do I give my bolus insulin 15-30 minutes before eating?

- Have I tested my Insulin to carbohydrate ratio (ICR) to see if it's correct.
    - o This means confirming a few times that four hours after eating, your blood glucose is back to target, with no snacking or correction in-between.

If you have answered **YES** to all of the above and are on an insulin pump, you can try a Super Bolus.

DynamicGM: Super Bolus

Very simply...
A Super Bolus is where your borrow the basal insulin for two hours, and add it to the bolus insulin that is delivered 15-30 minutes before eating.

Why?
So that you get more insulin working in your blood when you need it the most. Which is just as you eat those foods that cause your blood glucose level to rise very quickly!

Lets take an example:
Craig has a basal rate of 1.00units per hour. He is eating 50g of carbohydrate (cornflakes) for breakfast and his ICR is 1unit:10g.

Normally he would bolus 5 units before breakfast.

What would be different with a Super Bolus?

- First, he would put a temporary basal rate of 0% on for 2 hours.

- Second, he would enter 50g carbohydrate into his bolus calculator, which would suggest 5 units of insulin.

- Finally, he would override the 5 units and increase it by 2 units, and he would deliver the 7 units before eating.

Would Craig not go hypo?

No because the total amount of insulin the pump delivers over the two hours after the bolus is exactly the same, 7 units. The only difference is he will be getting more of the 7 units working when he needs it the most, just after he eats his cornflakes.

This will mean his blood glucose after two hours will be lower than usual, but his four hour glucose level will be the same, in target.

A Real life Super Bolus

Look at the picture below, this is a real life example of a young person with Type 1 Diabetes who used a Super Bolus for 57g of breakfast cereal on the first day, and then a normal bolus for the exact same meal the next day.

A few things to notice...

- On both days the amount of insulin for the cereal was 4.7units

- The basal rate must have been 0.5units per hour, because a temporary basal rate of 0% for two hours meant 1.0unit was added for the Super Bolus.

- After the Super Bolus the blood glucose never went above 7.7mmol/l.

- After the Normal Bolus the glucose level went up to 11.9mmol/l and took four hours to come back down to target.

6.7

5.8

4.7

1.0

Super Bolus

12pm 2pm 4pm

11.9

9.2

5.8

4.7

Normal Bolus

12pm 2pm 4pm
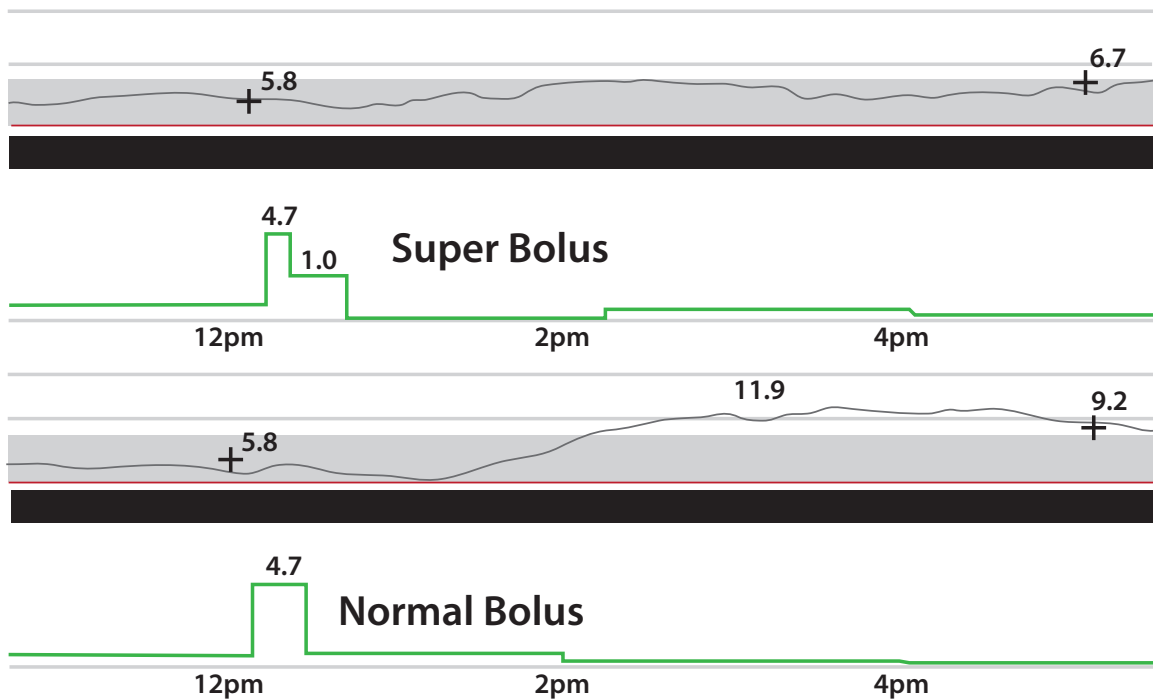
Your turn to practice

What is your basal rate for the two hours after you eat the meal that causes this issue?

If you put a temporary basal rate of 0% for two hours, how much total basal insulin will you be missing?

Practice:

> • Putting a temporary basal of 0% for 2 hours.
>
> • Entering 50g of carbohydrate into the bolus calculator.
>
> • Override to bolus amount and add the missed basal.
>
> • **DO NOT DELIVER** the Bolus.
>
> • Cancel the temporary basal rate.

How will you know if the Super Bolus has worked?

Test your blood glucose level:

> • Before the meal.
>
> • Two hours after the meal.
>
> • Four hours after the meal.

Ideally the blood glucose should not increase more than 4mmol/l from the reading before the meal at two hours, and be back into target by 4 hours.

> • If it has increased more than 4mmol/l, you could try making the Super Bolus more aggressive by doing a temporary basal for 3 hours at 0% and adding the 3 hours of missed basal onto the bolus.
>
> • So in Craig's example, he would bolus 8 units instead of 7 units, and he will have a temporary basal of 0% for three hours running, not two hours.

Watch me: Superbolus

Advanced settings on the Dexcom APP

On the Dexcom APP you can set up an alert schedule where you can change the alert settings for a certain time frame in the day and a certain number of days in the week. In the below example a different set of alarms have been set for weekdays 10:30pm – 6:45am. For the rest of the time the alerts and alarms will revert back to usual settings.
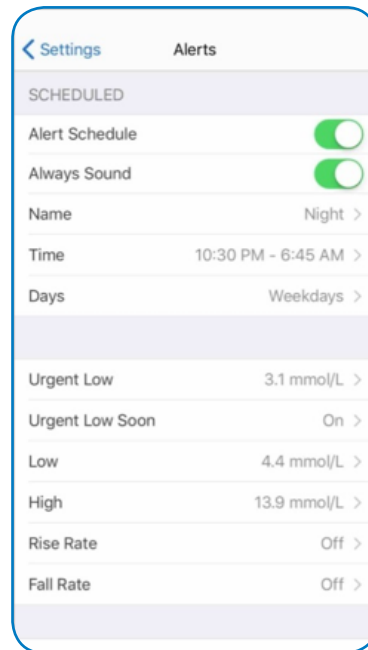
You may want different alerts and alarms for different days of the week, for school versus home, or night versus day. Here are some examples of alert schedules people in Birmingham have used:

- Overnight 10:00pm – 7:00am every night:

    o Low alert at 4.5mmol/l to minimise hypos.

    o High alert 11.0mmol/l to allow corrections if rises overnight.

- Weekends: All day Saturday and Sunday

    o Low alert at 5.0mmol/l – much more active and want to prevent hypos.

    o High alert 12.0mmol/l to allow action if rising for better control.

- School time: 08:30 – 15:30 Monday to Friday:

    o Low alert at 4.0mmol/l – as school have been trained on this.

    o High alert 14.0mmol/l - as school have been trained on this.

    o Then the normal settings how you want them for out of school time.

Name _____

Date _____

Meal / Time	Food eaten	Carbohydrate (g)	Activity type, how long, how hard
Time			
Time			
Time			
Time			
Time			
Time			

Name —————————————— **Date** ——————————

Meal / Time	Food eaten	Carbohydrate (g)	Activity type, how long, how hard
Time			
Time			
Time			
Time			
Time			
Time			

Name _____ **Date** _____

Meal / Time	Food eaten	Carbohydrate (g)	Activity type, how long, how hard
Time			
Time			
Time			
Time			
Time			
Time			

Name _____

Date _____

Meal / Time	Food eaten	Carbohydrate (g)	Activity type, how long, how hard
Time			
Time			
Time			
Time			
Time			
Time			

Name _____   **Date** _____

Meal / Time	Food eaten	Carbohydrate (g)	Activity type, how long, how hard
Time			
Time			
Time			
Time			
Time			
Time			

Name _____

Date _____

Meal / Time	Food eaten	Carbohydrate (g)	Activity type, how long, how hard
Time			
Time			
Time			
Time			
Time			
Time			

Glossary of Terms

Background/basal insulin: is needed to keep blood glucose levels under control, and to allow the cells to take in glucose for energy. It is usually taken once or twice a day depending on the insulin, or delivered hourly from an insulin pump as a basal rate.

Blood glucose: the main sugar found in the blood and the body's source of energy.

Bolus: an amount of insulin taken to cover a rise in blood glucose from a meal or snack, and may also include a correction dose.

Continuous Glucose Monitoring (CGM): Glucose monitored continuously in the interstitial space, measured by an indwelling sensor.

Correction dose: The amount of insulin required to bring the blood glucose from a high level back to target and is determined by the insulin sensitivity/correction factor.

Dynamic glucose management(DynamicGM): Combining glucose and trend arrow information with proactive diabetes management strategies to maximise time in range.

HBA1c: a test that measures your average blood glucose level over the last 2-3 months. Also called Haemoglobin A1C.

Hyperglycaemia: higher than normal blood glucose. Fasting hyperglycaemia is blood glucose above a desirable level after not eating for at least 8 hours. Postprandial hyperglycaemia is blood glucose above a desirable level 1 to 2 hours after eating.

Hypoglycaemia: also called low blood glucose, a condition that occurs when one's blood glucose is lower than normal. Signs include hunger, nervousness, shakiness, perspiration, dizziness or light-headedness, sleepiness, and confusion. If left untreated, hypoglycaemia may lead to unconsciousness.

Interstitial space: The space between the cells of the fat tissues where the indwelling sensor measures the glucose level.

Insulin to carbohydrate ratio: A ratio that specifies the number of grams of carbohydrate covered by each 1 unit of rapid- or short-acting insulin.

Insulin sensitivity/correction factor: refers to the number of mmol/l 1 unit of rapid acting insulin lowers your blood glucose.

DynamicGM[1]

DynamicGM: Dynamic Glucose Management is combining glucose and trend arrow information with proactive diabetes management strategies to maximise time in range (3.9-10.0mmol/L or 70-180mg/dL)

DynamicGM strategies

Preventing time below range (<3.9mmol/L or <70mg/dL)

Fast acting glucose when trending down

Before bed hypo prevention algorithm

Trend Arrow Adjustment Tool at mealtimes[2]

Responding to low alarms & alarms

Maximising time in range (3.9-10.0mmol/L or 70-180mg/dL)

Ten minutes of moderate activity after food

Exercise carbs based on glucose & arrow

Individualised exercise plans[3]

Insulin dosing guide based on meal type[4]

KISS for high fat and/or protein meals[5]

Lower glycaemic index food choices[6]

Preventing time above range (>10.0mmol/L or >180mg/dL)

Insulin tactics[7]

Insulin timing based on glucose & arrow

Short-burst of exercise drops after meal highs

Trend Arrow Adjustment Tool at mealtimes

Super bolus[8]

Reviewing & improving

What is your DynamicGM Score?

Ambulatory Glucose Profile Assessment Tool[9]

Sugar Surfing? [10]

1. Pemberton J, Kershaw M, Dias R, Mohamed Z, Saraff V, Barrett T, et al. DYNAMIC: DYNAmic glucose Management strategies delivered through a structured education program improves time In range in a socioeconomically deprived cohort of Children and young people with type 1 diabetes with a history of hypoglycaemia. Diabetes Care. 2020;In Press. 2. Lawson ML, Heffernan E, Richardson CA, Courtney JM, Bradley BJ. Evaluation of a Novel Tool to Adjust Insulin Boluses Based on Continuous Glucose Monitoring Trend Arrows and Insulin Sensitivity in Children and Youth with Type 1 Diabetes. Can J Diabetes. 2016;40(5):S16. 3. Riddell MC, Gallen IW, Smart CE, Taplin CE, Adolfsson P, Lumb AN, et al. Exercise management in type 1 diabetes: a consensus statement. Lancet Diabetes Endocrinol. 2017;5(5):377–90. 4. Bell KJ, Smart CE, Steil GM, Brand-Miller JC, King B, Wolpert HA. Impact of fat, protein, and glycemic index on postprandial glucose control in type 1diabetes: Implications for intensive diabetes management in the continuous glucose monitoring era. Diabetes Care. 2015;38(6):1008–15. 5. Pemberton J, Leal C, McCoubrey H. KISS Advanced Bolus System for managing the post-prandial glycemic effect of fat and protein in young people with T1D. Endocr Abstr. 2018;58:P062. 6. Ryan RL, King BR, Anderson DG, Attia JR, Collins CE, Smart CE. Influence of and optimal insulin therapy for a low-glycemic index meal in children with type 1 diabetes receiving intensive insulin therapy. Diabetes Care. 2008;31(8):1485–90. 7. Gradel AKJ, Porsgaard T, Lykkesfeldt J, Seested T, Gram-Nielsen S, Kristensen NR, et al. Factors Affecting the Absorption of Subcutaneously Administered Insulin: Effect on Variability. J Diabetes Res. 2018;1205121. 8. Ziegler R, Freckmann G, Heinemann L. Boluses in Insulin Therapy: A Commentary. Journal of Diabetes Science and Technology. 2017. p. 11(1). 9. Battelino T, Danne T, Bergenstal RM, Amiel SA, Beck R, Biester T, et al. Clinical targets for continuous glucose monitoring data interpretation: Recommendations from the international consensus on time in range. Diabetes Care. 2019;42(8):1593–603. 10. Ponder SW, McMahon KL. Sugar Surfing: Basics for Diabetes Educators. AADE Pract. 2019;7(5):18–22.
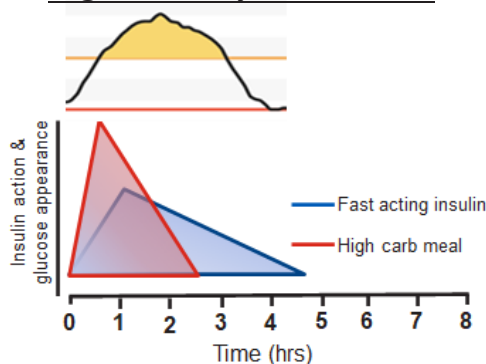
NHS
Birmingham Women's and Children's
NHS Foundation Trust

Birmingham Children's Hospital Charity

Mealtime Insulin for Type 1 Diabetes

NHS
Birmingham Women's and Children's
NHS Foundation Trust

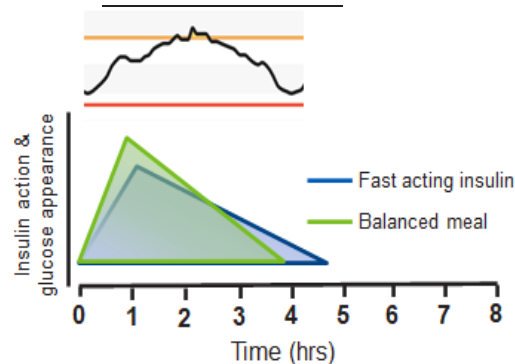> **What does the Insulin to Carb Ratio (ICR) actually cover?**
> Glucose from digested carbohydrate and the small amount of insulin required to use fat and protein effectively.
>
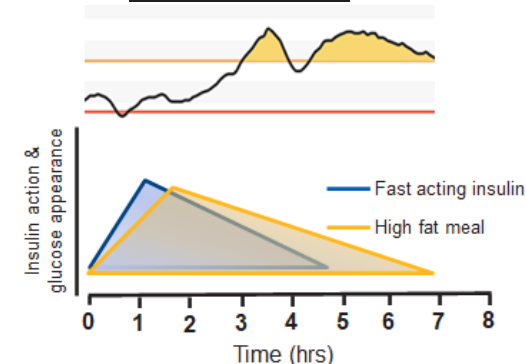> Fast acting mealtime insulin **peaks after 60-90 minutes and lasts 4-6 hours**

High carbohydrate meals

Legend: Fast acting insulin (blue), High carb meal (red)

Balanced meals

Legend: Fast acting insulin (blue), Balanced meal (green)

High fat meals

Legend: Fast acting insulin (blue), High fat meal (yellow)

Glucose appearance peaks at 30-60 mins, lasts 3-4 hours

Carbs more than 55%

Breakfasts: Cereal with light milk, toast and jam, fruit bread
Meals: Jacket potato & beans, super noodles, waffles & hoops
Snacks: Cereal bars, biscuits, rice crackers, fat free yoghurt

How to better match insulin to a high carbohydrate meal?

1. Count carbs (g) within 10g accuracy & use ICR
2. Choose lower glycaemic index carb choices
3. Must be normal bolus 20 minutes before eating

Glucose appearance peaks at 60-90 mins, lasts 4-5 hours

40-55% carbs, 20-40% fat & 10-20% protein

Breakfasts: Porridge with semi or full milk, egg on toast
Meals: Meat & potatoes & veg, jacket potato & cheese & salad
Snacks: Whole fruit with nuts, nut butter on toast, whole yoghurt

How to better match insulin to a balanced meal?
1. Count carbs (g) within 10g accuracy & use ICR
2. Normal bolus 20 minutes before eating

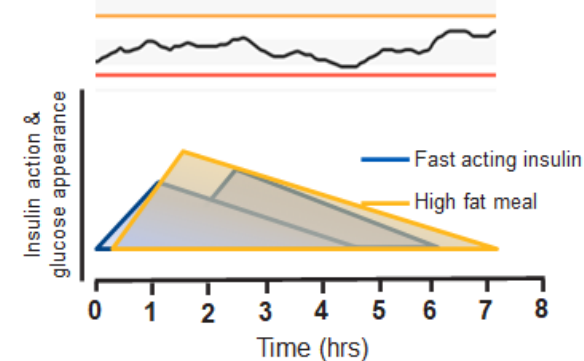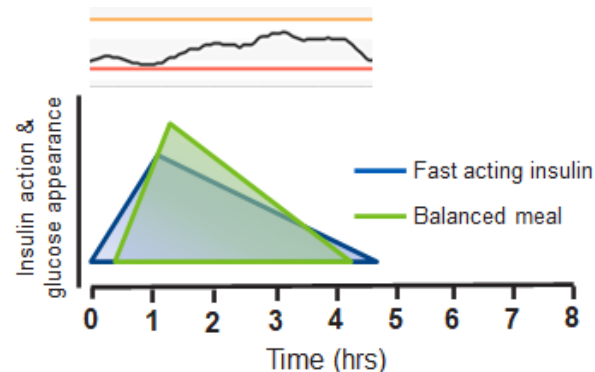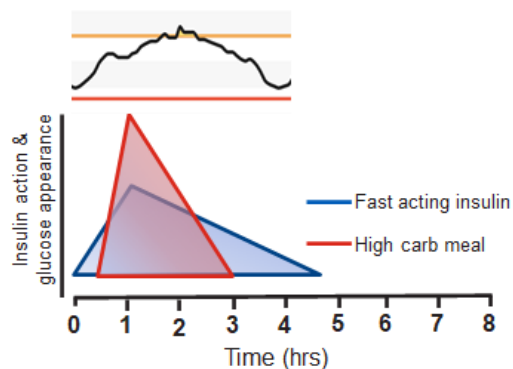Want simple changes for balanced meals?

Glucose appearance peaks at 120-180 mins, lasts 6-9 hours

Fat more than 40g with at least 30g carbs

Pizza, takeaways, creamy curry, Sunday roast, English fry-up

How to better match insulin to a high fat meal?

1. Count carbs (g) within 10g accuracy & use ICR
2. Increase insulin by 25% (may need 17-124%)
3. Pump: 50% 20 minutes before, 50% over 120 mins

   MDI: 50% 20 minutes before, 50% in 60 mins
4. KISS method to adjust extra insulin and how to split

Legend: Fast acting insulin (blue), High carb meal (red)

Legend: Fast acting insulin (blue), Balanced meal (green)

Legend: Fast acting insulin (blue), High fat meal (yellow)

Stopping after meal glucose spikes

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Nutrition tactics

Three balanced whole food meals with minimal snacks

Do not follow:
"Eat what you like, when you like, just give insulin"

Low glycaemic index carb choices

Insulin tactics

Insulin 20 mins before meal

Meal insulin into abdomen or upper arm not leg or buttocks

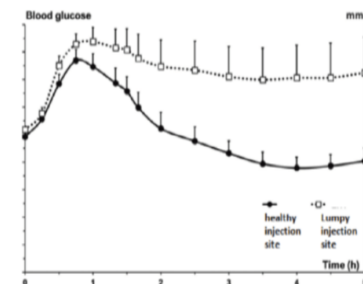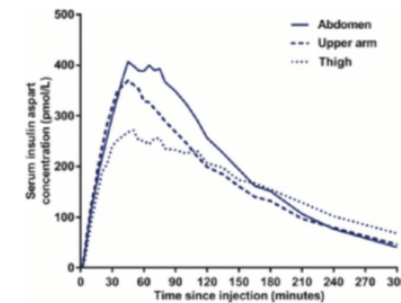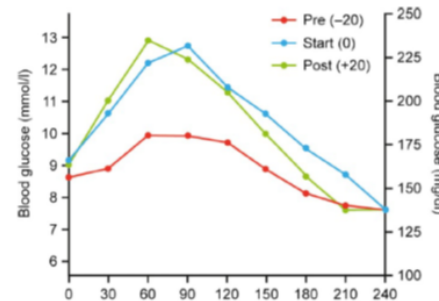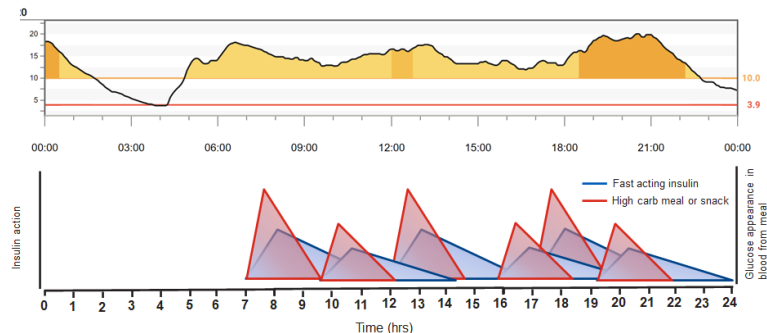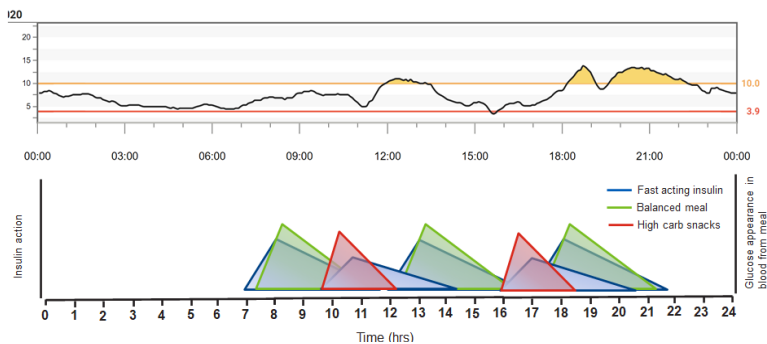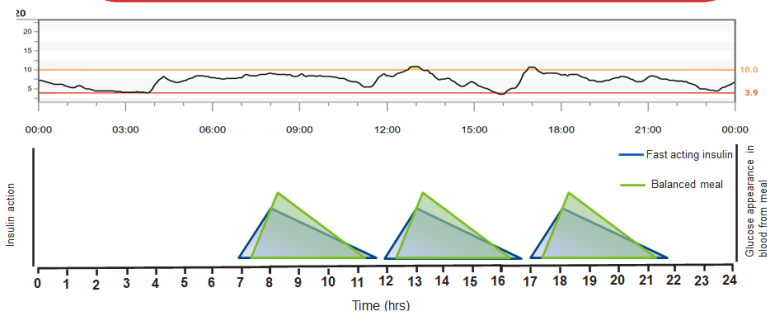Avoid lumpy injection sites and rotate injection/cannula sites

Activity tactics

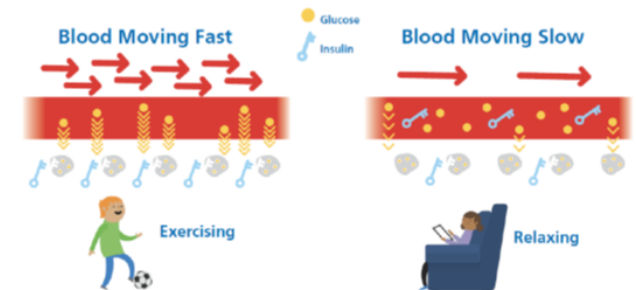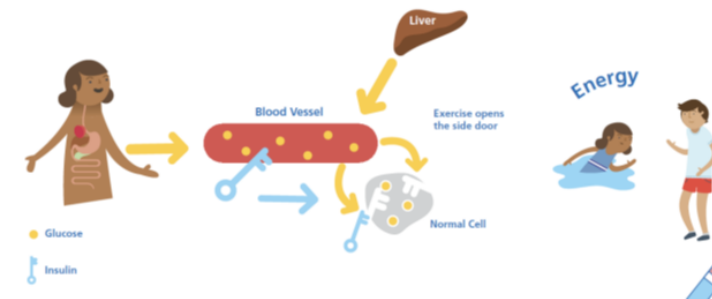60 mins moderate activity a day, try three 20 minutes:

"Opens a side door to muscle cells to let more glucose in"

10 mins of moderate activity after meals:

"Gets insulin to the muscles faster to speed up its action"

Low to moderate intensity activity: walking, playing in the playground, jogging, shopping

Keep it simple, do 10 minutes of moderate activity after each meal to stop glucose spikes!

Dexcom numbers and useful websites

Tech support number:
0800 0315763 Mon – Friday – 07:00-18:00hrs, Sat & Sun – 8:30- 16:30hrs

Replacement sensors online: www.dexcom.com/UKIETechsupport

Customer services:
0800 0315761 - Mon – Friday normal working hours
gb.sales@dexcom.com

Dexcom website:
https://www.dexcom.com/en-GB

Link to compatible devices for Dexcom:
https://www.dexcom.com/dexcom-international-compatibility

Dexcom weekly webinars:
https://dexcomuk.edudip.com/w/320410

Dexcom online training resources:
https://www.dexcom.com/en-GB/training-resources