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Board

Insulin Masterclass - Strategies for Type 2 Diabetes Management - Concurrent Workshop
Friday, 21 June 2013 Start 4:30pm Duration: 120mins Picasso



Rotorua GP CME 2013
NZMA
New Zealand Medical Association

General Practice Conference & Medical Exhibition

20-23 June 2013 | Energy Events Centre | Rotorua

Insulin Masterclass

GPCME, Rotorua- 2013

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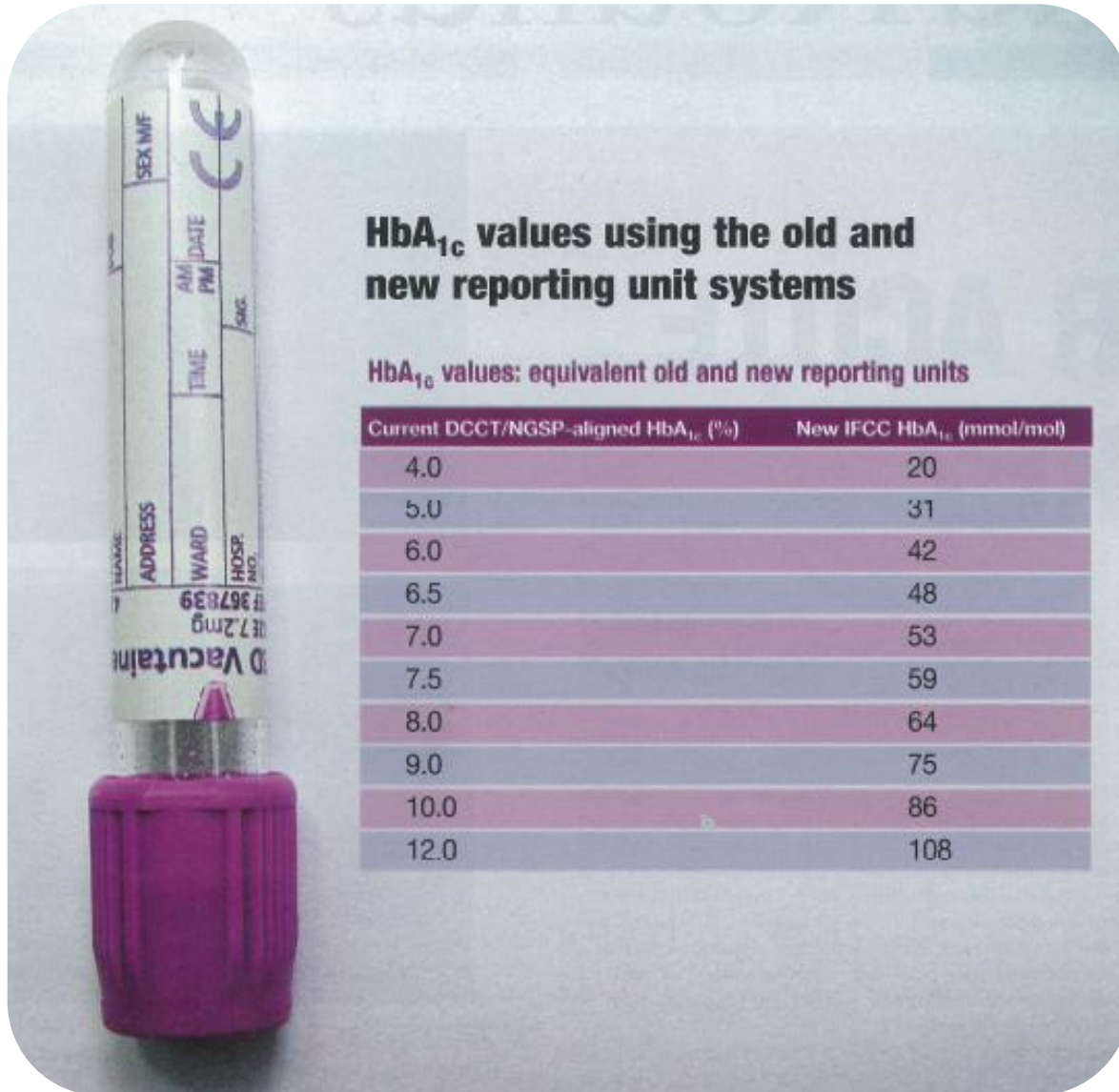
Disclaimer

- My stay, travel and speaker fees have been paid by Sanofi.
- I have received consultation fees from Novo Nordisk and Eli Lilly in the past.

What I will cover:

- HbA1c from % to mmol/mol- Estimating average BGs from hbA1c
- Occupational influence on decision making
- Interpreting glycaemic fluctuations- Checklist
- Sick day management
- Insulin management during travel

HbA1c reporting (% to mmol/mol)



HbA1c (%)	HbA1c (mmol/mol)
5	31
6	42
7	53
8	64
10	86
12	108

BG monitoring rationale



Pre-prandial



Post-prandial



2 a.m.

Reality: Before breakfast, lunch,
dinner and bedtime

Aim for: A week of readings before
seeing their HCP

Relating BG measurements to A1C

$$Av\ BG = 2A1C - 6$$



Pre-prandial = 1-2 mmol/L lower than Av BG



If av pre-prandial BG is close to value calculated from A1C...
confident that measure BG and A1C values are correct

Case scenario- Mr JK, 52 years

- Married with 2 school going children
- Taxi driver/ Only earning member in the family
- T2D diagnosed 8 years ago/ insulin initiated 2 years ago
- Mild retinopathy/ No microalb/ Feet normal sensations
- BP 136/80 mmHg, BMI 33 kg/m²

Current Medications

- Metformin 1 g bd
- **Humalog Mix 25 30 units evening**
- Simvastatin 20 mg od
- Cilazapril 2.5 mg od
- Aspirin 100mg od

Current hbA1c 48 mmol/mol (6.5%)

List some important things you want to check...

- What foods does he eat? Exercise/ ETOH/ Smoking?
- BG monitoring- when and why?
- Hypo awareness?
- What should he always carry with him?
- What if he feels a hypo whilst driving?
- Has he kept Land Transport informed?
- SIGHT either BG meter readings or BG diary...

BG diary

	BB	AB	BL	AL	BD	AD	2-3am
Sunday	3.3						
Monday	9.7						
Tuesday	4.1						
Wednesday							
Thursday	10.8						
Friday	2.9						
Saturday	5.5						

Checklist:

- Compliance with diet/ medications including insulins/ BG monitoring
- Check his insulin....

Humalog versus Humalog Mix25 versus Humalog Mix50



Check injection sites



Check insulin timings....

Check change in eating habits/ weight/ renal function...

With fluctuating fasting BG readings

- Always exclude nocturnal hypos.....

What next?

- Need for more intense BG monitoring
- NOT to DRIVE UNTILL HYPOS resolved and ensuring he has preserved awareness

Diabetes

and driving



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If you've got diabetes, you need to be aware of the risks involved when you're driving. If you know the risks, you can take steps to manage them.

Hypoglycaemia (low blood sugar)

Low blood sugar levels are dangerous for drivers with diabetes. If you're taking insulin or tablets for diabetes (except Metformin), it's very important that you avoid low blood sugar levels, which can dangerously impair your driving.

Hyperglycaemia (high blood sugar)

Very high blood sugar levels could leave you feeling unwell or tired, and may affect your ability to drive safely. You should not drive if you're severely hyperglycaemic.

Newly diagnosed?

If your diabetes has just been diagnosed and your treatment is still being adjusted, you may not be fit to drive just yet. Check

because it can cause hypoglycaemia or worsen its effects. We recommend that people with diabetes avoid consuming even small amounts of alcohol if they're going to drive.

When you shouldn't drive

In some situations, you may need to refrain from driving. If you have a mild hypoglycaemic episode, we recommend that you don't drive for at least an hour, to give your brain time to recover.

If you have a severe hypoglycaemic episode (eg when you need someone else's help to deal with it), you shouldn't drive for 24 hours. If you have several hypoglycaemic episodes, you should talk to your doctor before you return to driving.

If you have a severe hypoglycaemic episode while you're driving, you shouldn't drive for at least a month – whether you're involved in a crash or not. It's likely you'll need to see a specialist before you can safely return to driving, and you'll need to talk to your doctor.

with your doctor.

Precautions while driving

If your diabetes is well controlled, you can drive a private car safely. However, there are times when you need to take precautions:

1. Always have meals and snacks before and during long journeys. It's safest not to delay meal times. Take regular, short breaks from driving.
2. Check your blood sugar levels regularly. If you feel that your blood sugar is low, stop driving and treat it with a quick acting sugar, eg three glucose tablets. Follow this up with a plain muesli bar or biscuits. Wait until the sugar has started to work before you start driving again.
3. Keep a supply of plain muesli bars, biscuits, glucose tablets, dried fruit and long lasting fruit juice in your pocket or in the glove box.
4. Don't delay treating low blood sugar levels. The brain becomes confused when blood sugars reach low levels. Be aware of your warning signs. Although a mild hypo may not seem to impair your driving, it's vital to act before your judgement is affected.
5. If you sometimes experience hypoglycaemia unawareness (hypos without warning signs), it may be unwise for you to drive. You should discuss this with your doctor or specialist diabetes nurse.
6. Remember that changing a car tyre or pushing a car could result in low blood sugar levels. Be prepared!
7. If you have diabetes, alcohol can be particularly dangerous

Passenger services and heavy vehicles

People with type 1 diabetes are generally not considered fit to drive heavy trade vehicles, taxis, buses and other related vehicles. The NZTA may, in exceptional circumstances, grant a licence after consultation with your general practitioner and diabetes specialist. If a licence is granted to drive any of these vehicles, then strict conditions are likely to be imposed.

Long-term complications

Your driving ability could be affected by long-term complications of diabetes, such as eyesight deterioration and the loss of normal sensation in your feet. Check with your doctor.

Licence conditions

Sometimes a driver with diabetes may be issued with a licence that has certain conditions attached. The conditions will depend on:

- the type of licence (classes and endorsements)
- how the diabetes is controlled
- whether the driver has any history of hypoglycaemic attacks
- how carefully the driver follows their medication schedule
- an assessment of the extent to which the driver suffers from the medical complications that are commonly associated with diabetes.

The NZTA decides the licence conditions, having regard to the Medical aspects of fitness to drive booklet, and in consultation with the NZTA's Chief Medical Advisor.

Legal note

Insulin and tablets for the control of diabetes are classified as drugs under the Land Transport Act 1998. You may be prosecuted under this Act if you misuse or abuse diabetes medications and your driving results in crashes or injuries. For a case to proceed, however, there would need to be proof that the way you'd used the drugs was contrary to medical advice.

Where can I find out more?

- Contact Diabetes New Zealand:
 - phone: (04) 499 7145
 - email: national@diabetes.org.nz
 - website: www.diabetes.org.nz
- See your doctor or other specialist. A handbook that includes a chapter on diabetes, Medical aspects of fitness to drive, has been issued to all doctors.
- Contact the NZTA.

What medication alteration will you suggest?

1. Stop Metformin
2. Reduce Humalog Mix25 dose by 10-20%
3. Switch Humalog Mix 25 to morning with breakfast
4. Switch Humalog Mix25 to Mix50
5. Switch Mix insulin to a basal insulin +/- bolus

What medication alteration will you suggest?

1. Stop Metformin
2. Reduce Humalog Mix25 dose by 10-20%
3. Switch Humalog Mix 25 to morning with breakfast
4. Switch Humalog Mix25 to Mix50
5. Switch Mix insulin to a basal insulin +/- bolus

You decide to switch Mix to a basal insulin in this case

How do you decide on the dose?

- Humalog Mix 25 has 25% short acting and 75% basal insulin i.e $1/4^{\text{th}}$ and $3/4^{\text{th}}$.
- 30 units of Mix thus has $3/4^{\text{th}}$ basal insulin i.e around 22 units basal component.
- As you are dealing with hypos in this scenario, you want to reduce this by another 10-20%, thus switching to an initial basal dose of 18-20 units.

You switch Mr JK to insulin Glargine nocte and titrate it to achieve satisfactory fasting BGs...

HbA1c 2 months later measures 65 mmol/mol (8.1%)

	BB	AB	BL	AL	BD	AD	2-3am
Sunday	6.3		7.6		7.1	13.4	
Monday	5.7						
Tuesday	6.1				9.4		
Wednesday							
Thursday	6		8.6		8.8	14.1	6.2
Friday	5.9						
Saturday	5.5		7.1		7.3	12.8	

What next?

1. Give Glargine (Lantus) with evening meal instead of bedtime
2. Switch to BD Lantus insulin
3. Add bolus insulin with dinner
4. Add Gliclazide with dinner
5. Accept current glycaemic control

What next?

1. Give Glargine (Lantus) with evening meal instead of bedtime
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5. Accept current glycaemic control

Can he start driving?

- Specialist advice may be needed.
- Ensure no significant hypos.
- Reemphasise driving precautions.

Mr LK, 48 years

- Married with 3 young children
- Heavy Goods Vehicle driver
- T2D diagnosed 7 years ago
- Macular oedema awaiting macular grid laser/ No microalb/ Feet normal sensations
- BP 126/76 mmHg, BMI 36 kg/m²

Current Medications

- Metformin 1 g bd
- Gliclazide 80 mg bd
- Simvastatin 20 mg od

Current hbA1c 68 mmol/mol (8.4%)

Checklist....

- What foods does he eat? Exercise/ ETOH/ Smoking?
- BG monitoring- when and why?
- Hypo awareness?
- What should he always carry with him?
- What if he feels a hypo whilst driving?
- Has he kept Land Transport informed?
- SIGHT either BG meter readings or BG diary...

BG diary, HbA1c 8.4%

	BB	AB	BL	AL	BD	AD	2-3am
Sunday	8.8						
Monday	9.1		11.2				
Tuesday					12.1		
Wednesday	8.6		9.8				
Thursday	9.7				9.9		
Friday	8.9						
Saturday			12.3			12.2	

What next?

1. Increase Gliclazide to 160 mg bd
2. Commence basal insulin
3. Commence Mix insulin
4. Add pioglitazone
5. Add GLP-1/ gliptins if can afford
6. Add acarbose

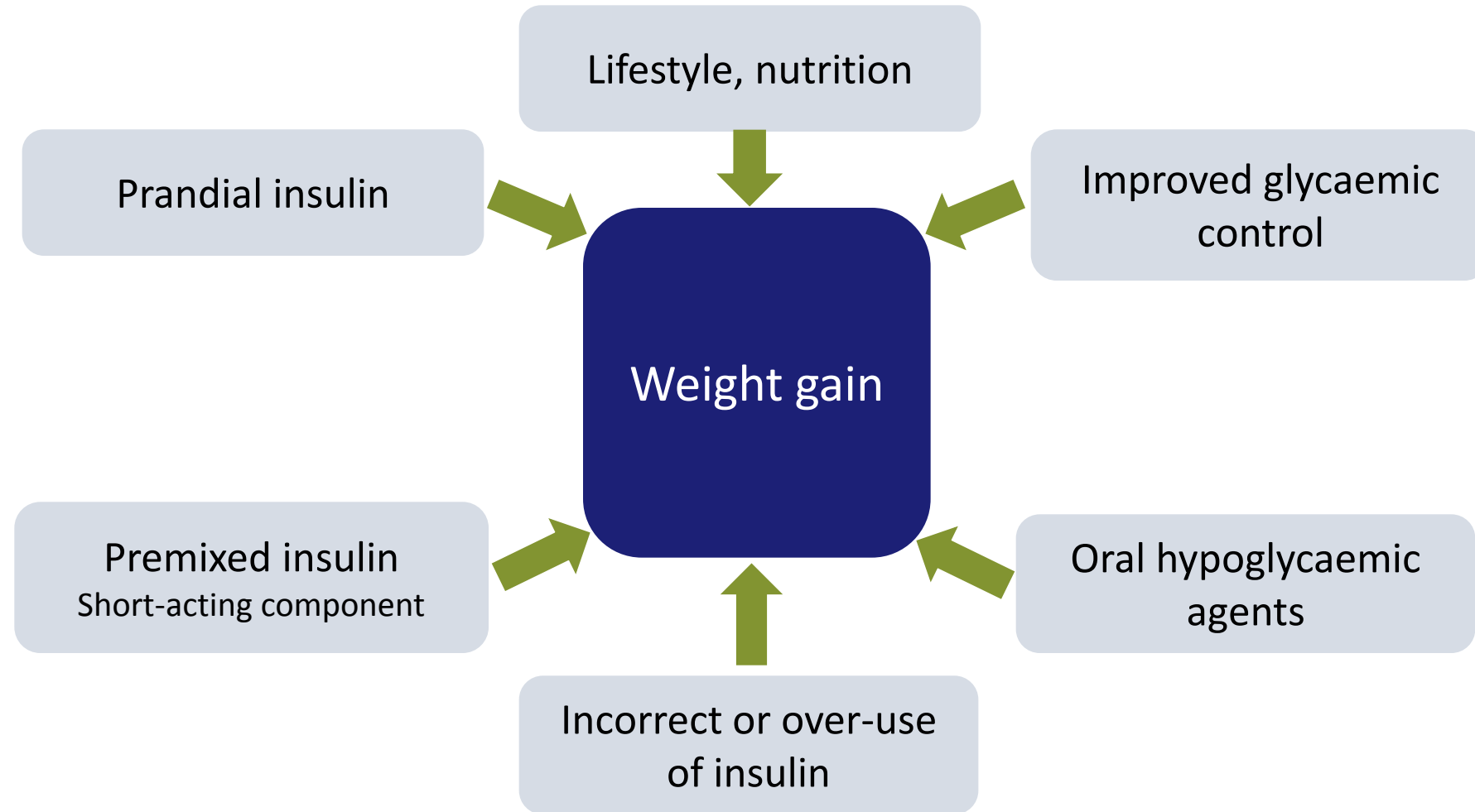
What next?

1. Increase Gliclazide to 160 mg bd
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6. Add acarbose

Mr LK commences basal insulin Glargine

- At follow up in 3 months, his glargine insulin has been gradually titrated to 32 units nocte. He continues on metformin 1 g bd and gliclazide 80 mg bd.
- His overall glycaemia now appears satisfactory with BG consistently between 5-8 throughout the day
- He is however now concerned about his weight which has increased by 2 kg over the last 3 months
- How does insulin cause weight gain and how do you manage this?

Weight gain in T2D



Which of these oral hypoglycaemic agents is associated with the least weight gain?

1. Pioglitazone
2. Gliclazide
3. Metformin
4. Sitagliptin

Which of these oral hypoglycaemic agents is associated with the least weight gain?

1. Pioglitazone

2. Gliclazide

3. Metformin

4. Sitagliptin

What about continuing OHAs with basal insulin?

- Metformin - Surely yes
- Gliclazide – usually continued initially / review dose and need to continue at follow up
- Pioglitazone – Stop as fluid retaining properties unless specialist approved for severe insulin resistance

Strategies to help him lose weight

- Diet and Exercise- Take insulin to match lifestyle and not vice-versa
- Eating for fear of hypo- Educate
- Pharmacotherapy- Orlistat
- Review OHA use with insulin
- MDT approach- Dietitian/ Psychologist
- Bariatric surgery

Clinical guidelines for weight management in New Zealand adults, children and young people

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This paper summarises the treatment algorithms (Figures 1 and 2) and key messages from the *Clinical Guidelines for Weight Management in New Zealand Adults, Children and Young People* prepared for the Ministry of Health. The guidelines aim to provide support to weight management providers in primary care and the community. The full guidelines and methods can be downloaded from the Ministry website (<http://www.moh.govt.nz>).

Weight management in adults (Figure 1)

- Overweight and obesity increase the risk of mortality and morbidity, particularly from cardiovascular disease, some cancers, type 2 diabetes as well as other comorbidities.
- Reducing the risks of excess weight is about changing lifestyle and behaviour.

STEP 1: Engage and raise awareness

- Engage with the person. Measure body mass index (BMI) as part of routine practice for estimate of risk (see Table 1 below).

STEP 2: Identify need and context for action

If the person is in a high-risk category, assess the person's lived realities and clinical need.

- Consider the person's:
 - family/whānau, culture, work, community, beliefs and values
 - weight-related concerns and previous experiences with weight loss
 - nutrition and activities of choice
 - age, sex, and ethnicity (Māori, Pacific and South Asian population groups)
 - family history of cardiovascular disease
 - smoking status

Table 1. Body mass index and estimate of risk

Classification	Body mass index (kg/m ²)	Disease risk	
		Waist ♂ 94–102 cm ♀ 80–88 cm	Waist ♂ > 102 cm ♀ > 88 cm
Normal	18.5–24.9	–	–
Overweight	25.0–29.9	+	++
Obese I	30.0–34.9	++	+++
Obese II	35.0–39.9	+++	+++
Obese III	40.0+	++++	++++

+ Increased risk; ++ High risk; +++ Very high risk; ++++ Extremely high risk.

Note: BMI may not be as accurate in highly muscular people or in ethnic groups with smaller body stature. (Therefore, in South Asians, for example, consider lowering the treatment threshold in the presence of central fatness or additional risk factors.)

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And remember, other risk factors matter too....

CVD Risk Assessment

for people with type 2 diabetes in New Zealand

INPUT

Age: 30

Duration of Diabetes: 5 years

Sex: ☒ Male ☐ Female

Smoker: Currently smoke

Systolic BP: 150 mmHg

HbA1c: 9 ☐ mmol/mol ☒ %

Ethnicity: Indian

Total Cholesterol: 6 mmol/L

HDL: 0.9 mmol/L

Albuminuria: ☐ Normo ☒ Micro ☐ Macro

BP lowering medication: ☒ Yes ☐ No ☐ Unknown

Calculate

Reset

OUTPUT

5 year CVD Risk: 11.9 %

5 year MI Risk: 3.3 %

0%

10%

15%

20%

30%

100%

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FACULTY OF MEDICAL AND HEALTH SCIENCES

New Zealand Society

NZSSD

for the Study of Diabetes



 hrc
Health Research Council of New Zealand

Sick day management

Meet Alex



- 58 year old man
- Diagnosed T2DM 13 years ago
- Two nights ago – vomiting and diarrhoea; couldn't keep food down yesterday
- Hasn't vomited for 12 hours; diarrhoea watery
- BGL this morning : 18 mmol/L
- Leaving in 6 days to go overseas for 1 month

Medications

- Metformin 1 g daily
- Insulin glargine 40 units evening
- Atorvastatin 40 mg daily
- Ramipril 10 mg daily
- Amlodipine 10 mg daily
- Aspirin 100 mg daily





Examination

- BMI 28.2 kg/m²
- BP: 145/90 mmHg
- No abdominal tenderness, guarding or rebound
- Most recent Cr (1 month ago): 110 mmol/L (eGFR 58 mL/min)

What would you ask Alex at this point?

Think of four questions that would help you get a better idea of what was going on

What advice would you give Alex about his diabetes medications?

Consider insulin/ metformin/ rest medications

What sort of dietary advice would you give
Alex?

Alex must have a sick day management
plan in place

What should it include?

Sick day plan



- ☐ When to call the doctor
- ☐ How often to measure blood glucose and urinary ketones
- ☐ What medicines to take
- ☐ How to eat
- ☐ Instructions for managing low blood glucose levels
- ☐ When to seek medical help.

1. Do you routinely discuss and develop a sick day management plan for your patients with diabetes?
2. When should sick day education occur?
3. What particular information do you stress to patients?

How does BG change during illness?

What should the sick day plan say about BG monitoring?



What advice should be given if
BGLs are persistently HIGH
during the illness?

What advice should be given if
BGLs are persistently LOW
during the illness?

Develop a sick day plan for Alex

Sick day Action Plan	Date
Any special instruction for when to commence using guidelines.	
Details of who to contact.	
Action to take if unable to contact numbers above.	
Any special instructions for diabetes medications.	
Any special instructions for types of fluids to have.	
Instructions for use of insulin.	
Instructions for managing low blood glucose levels.	
When to seek medical care.	
Other.	

SAMPLE SICK DAY PLAN

This sick day plan below shows the type of information that should be included for a patient like Alex, on basal insulin. Every situation varies so the suggestions provided may need to be adapted for each individual patient.

Any special instruction for when to commence using guidelines	Start using this home-based sick day plan when you are feeling unwell or notice that you are beginning to feel unwell and/or ... Your blood glucose (BG) is >15 mmol/L on two consecutive readings (e.g. within an 8–12 hour time frame) If your condition deteriorates or does not respond to this plan, you must seek medical attention in a supervised environment. When you are unwell it is very important that you test your blood glucose (sugars) more frequently, every 2–4 hours; more frequently if BG <4.0 mmol/L. Continue your usual diet if possible. Test any time you are feeling unwell, particularly if you: • have a fever, • have diarrhoea and/or vomiting • are taking reduced amounts of food or drink
Details of who to contact	When your BG is >20 mmol/L, contact a family member on Pht: <insert phone number> and then contact the practice on Pht: <insert phone number> to speak to the nurse or diabetes educator.
Action to take if unable to contact numbers above	After hours contact: Pht: <insert phone number> Attend the <insert local hospital> or call 000 for an ambulance if it is an emergency.
Any special instructions for diabetes medications	Continue taking your basal insulin. If you experience hypoglycaemia, you may require a reduction in your dose. Contact your healthcare professional as above. Stop metformin if you are experiencing: • diarrhoea and/or vomiting or • your fluid intake has decreased and you have a fever of over 38.5°C

Alex recovers and is now to go on holidays abroad to scale the heights of Mt Kilimanjaro.....

- 5895 m above sea
- Mt Everest 8848 m
- Mt Cook 3754 m
- High altitude 3000-5000
- Extreme altitude >5000



What travel advice will you give him?

- Advice on flight travel/ Time zone and insulin timing adjustment
- Insulin dose adjustment
- Enough supplies of insulin/ testing strips/ hypo treatments/ emergency contacts etc
- Where does he keep his insulins/ testing kit? Cabin or hold baggage and why?
- Need for a letter from doctor etc....

Specific issues when climbing extreme heights...

Insulin stability

- Freezing temp >3000 m/ -15 to -30 C at extreme altitudes
- 2-8 C is normally advised for storage
- Also caution with sunlight exposure
- Keep next to skin
- Ensure enough supplies
- Check for bubbles/ Emphasise correct insulin injection technique
- Keep travel company/ companions informed

And what about BG meters?

- Both under and overestimation by as much as 37%
- Failure to function
- Battery failure
- May be an idea to carry visual testing strips

Other height specific issues....

High Alt Ret Hge

- Uncommon at <5000 m (<4% in normal subjects)
- Significant increase above 5000 m though
- Preexisting retinopathy at increased risk

Other relative contraindications

- PVD: Frost bite
- CAD: Increase HR and BP

Plan, plan and keep planning.....

Supplies	Numbers/amount
Insulin supplies	
Insulin	Three times the amount anticipated for each type of insulin, stored at nonextreme temperatures
Insulin pens and needles (if applicable)	One extra pen and three times the anticipated number of needles
Pump supplies (if applicable)	Three to five times the amount anticipated
Syringes	Enough to cover the entire trip if on the pen or pump; two to three times the anticipated requirement if using syringes alone
Glucose meter	Two different meters with extra batteries for each
Glucose strips and lance/lancets	Three times anticipated number of strips for each meter, two lances, and three times the anticipated number of lancets; a supply of visually read strips should also be taken as a backup in the event of meter failure
Ketone strips	Two packages
Carbohydrates	
Dextrose tablets ("rapid-acting carbohydrate")	One package (50 g) per day
Dried fruit and cookies ("slower-acting carbohydrate")	Several individually wrapped packages per day
Glucagon kit (this must be protected from breakage and from freezing of the vehicle)	Two kits
Intravenous set up	One complete kit
Single-use sterile needles and syringes	Several 18-g and 10-cm ³ syringes, respectively, in the event that medical treatment is required in a hospital or clinic with limited resources
Insulated packs	Enough to carry all supplies
Letter from physician	Listing supplies and their necessity, for international border crossings

Supplies should be packed and carried in a minimum of two independent sites (e.g., carried personally at all times by two people, or by one person with the second set in a separate travel bag and/or at a nearby hotel or embassy/consulate).

