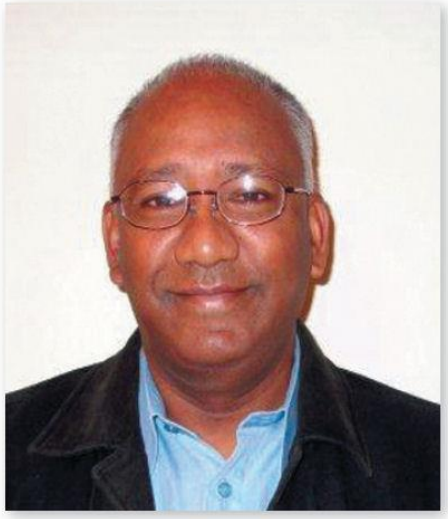
Dr Helen Lunt

Diabetes Physician

Clinical Associate Professor, University of Otago, Christchurch



Mr Rab Burtun

Diabetes Nurses Specialist

Waitakere Hospital, Waitemata DHB

Thursday, August 11, 2016

(Room 3)

8:30 - 10:30 WS #5: Starting Insulin in Primary Care

11:00 - 13:00 WS #11: Starting Insulin in Primary Care (Repeated)

Barriers to Insulin

Average HbA1c of ≥ 75mmol/mol (9%) for up to 2 years before starting…

Patient:

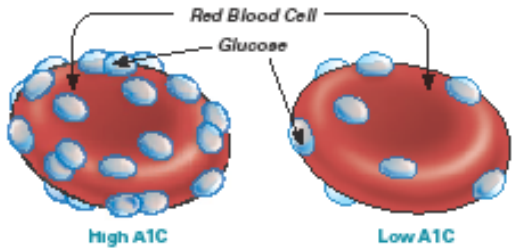
- Fear/ inconvenience of injections
- Social/ work issues
- Hypoglycaemia
- Fear of ‘inevitable end stage of disease’
- Perception of failure
- Weight gain

Doctor:

- Benefit to patient unclear
- Doing harm (hypos/ weight gain)
- Time and resources
- Expertise/ confidence

How to prevent complications?

What is A1C?



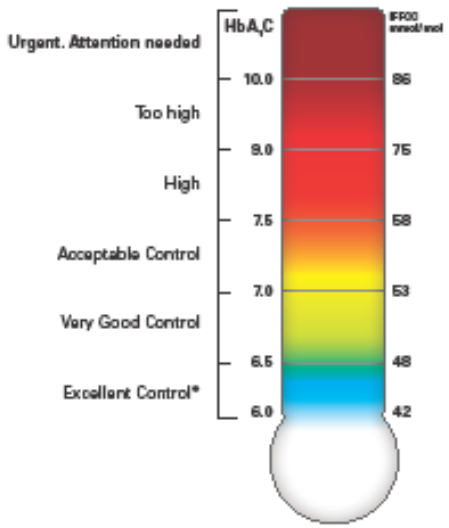
Work on your A1C

American Diabetes Association. Implications of the United Kingdom prospective diabetes study. Diabetes Care 2003; 26(Suppl. 1): S28-32

1% Reduction in A1C = **35%** Reduction in risk of complications

Diabetic Control

HbA_1C Thermometer



*The targets for everyone is less than 7% or 53 mmol/mol though targets should be individualised. **Caution should be taken with targets lower than 7 for those on insulin and sulphonylureas due to risk of hypoglycaemic events.**

HbA_1C is the best test of overall diabetic control.

If your HbA_1C is 8% or 64 mmol/mol or more, please contact your nurse or doctor.

Being in control or intensive management* can prevent diabetes-related complications

Eyes
69% reduced risk of developing retinopathy with tight control

Kidneys
34% reduced risk of developing nephropathy with tight control

Nerves
69% reduced risk of developing neuropathy at 5 years with tight control

Brain
12% reduced risk of stroke

Heart
14% reduced risk of heart attack

Individualise the target

DCCT % HbA_1C	IFCC mmol/mol	
6 - 6.5%	42 - 48	Excellent*
6.5 - 7%	48 - 53	Very Good
7 - 7.5%	53 - 58	Acceptable
7.5 - 9%	58 - 75	Bit high
9 - 10%	75 - 86	Too high
10+%	86 and above	Urgent. Attention needed

Developed by:
Rab Burton, Diabetes Nurse Specialist

Overcoming the Barriers

You've got to be a good salesperson!

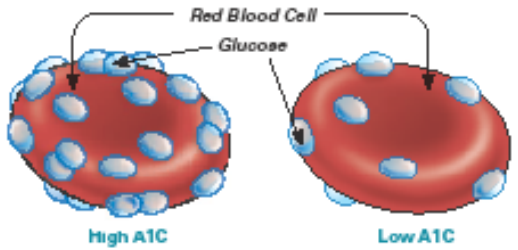
- Introduce concept of insulin deficiency early
- Tell the patient they are not "failures" for needing insulin

  .(*Explain UKPDS study showing , declining beta cells function over time ,50% initially at diagnosis then 4% decline every year therefore 50% of pts need Insulin after about 7 yrs ….)*

- Newer pens - "easy", 4mm needles – "painless"
- Not complicated !!!!Disposable pens !!!
- Use simple regimens to start *with (just one shot before bed helps to sleep better…..)*
- Emphasise the benefits of improved glycaemic control, including *"feeling better/ more energy, less infections, less trips to toilets , less thirsty, benefits of or 11 mmols lowering Hba1c by 1% reduces complications by35 % UKPDS study "*

How to prevent complications?

What is A1C?



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Diabetic Control

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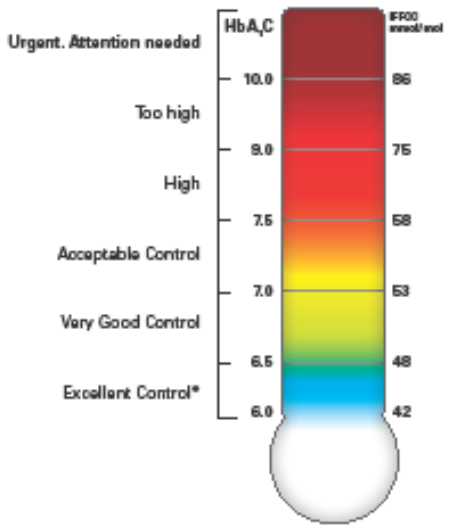

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Developed by:
Rab Burton, Diabetes Nurse Specialist

When to start insulin?

<u>Start when:</u>

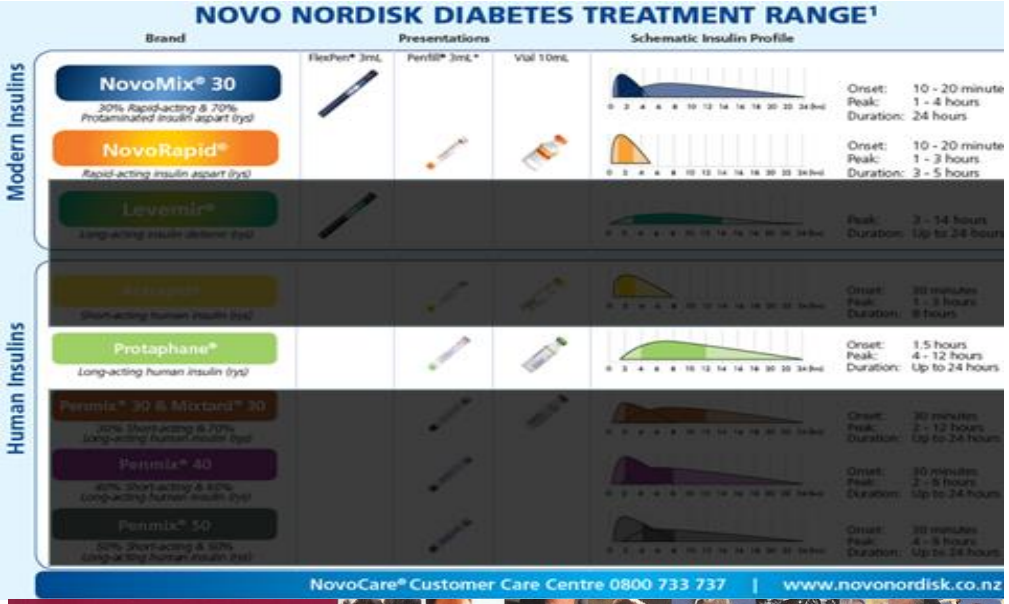
- Lifestyle optimised and oral agents maximised, persistently high HbA1c:
    * ≥ 60-65 mmol/mol in younger
    * ≥ 65-70 mmol/mol in older

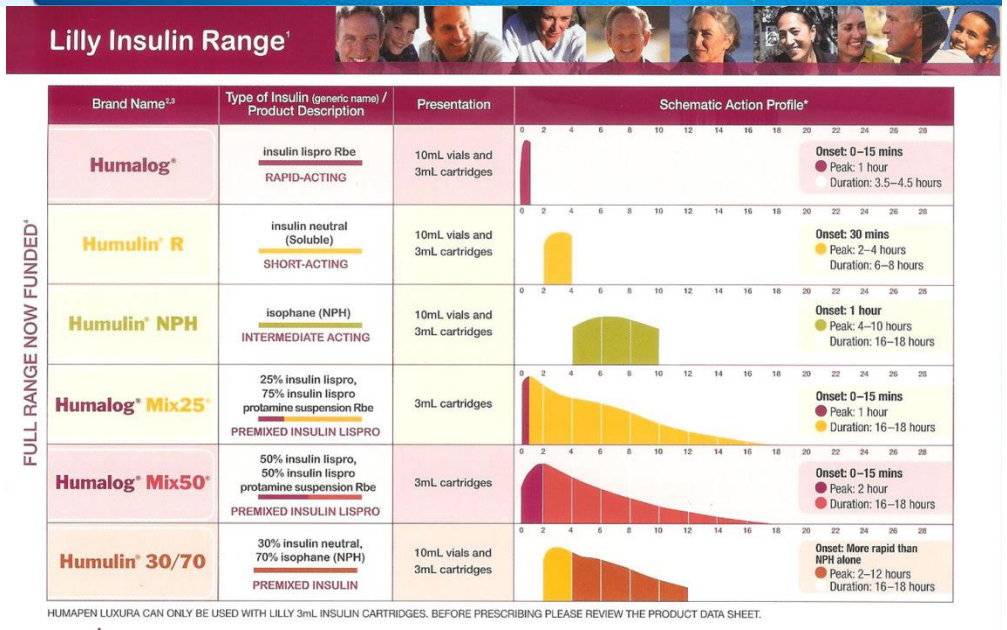
Also consider starting insulin if:

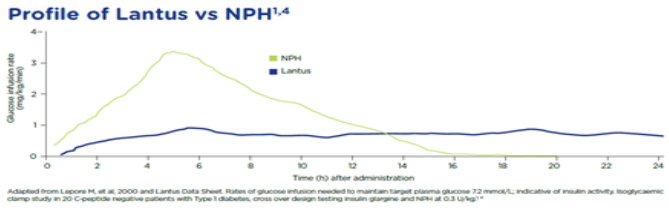
- HbA1c very high (>95mmol/mol) even if lifestyle/ oral treatment naïve
- Long duration of disease on near/maximum metformin (+/- sulphonylurea) with HbA1c >75mmol/mol

Insulins available on the Market

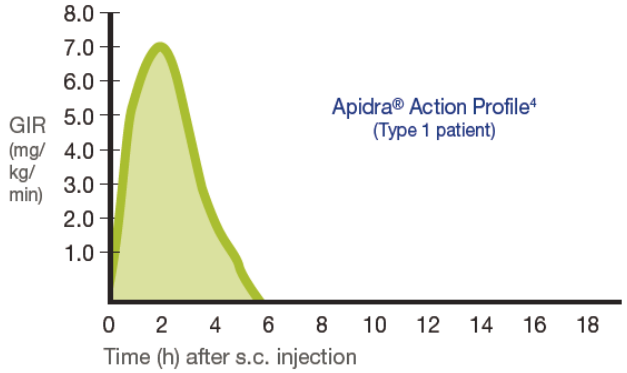
Lantus®(insulin glargine)







Lepore M et al. Diabetes2000;49:2142-2148



GIR - Glucose Infusion Rate

How to start?

More than one way to skin a cat!

1. Conventional approach:

- **Bedtime basal insulin** (10 units of Protaphane / Humulin NPH / Glargine(Lantus), titrate dose up with an aim to normalise (4-7mmol/L) fasting glucose

- Particularly appropriate in those waking up with raised fasting glucose

How to start?

More than one way to skin a cat!

2. Alternative approach:

- **Pre-dinner premixed insulin**:

  e.g. 12 units of NovoMix30 or HumalogMix25

- Good for those with high post prandial glucoses, large dinners, unlikely to manage more than 2 injections a day

How to start?

More than one way to skin a cat!

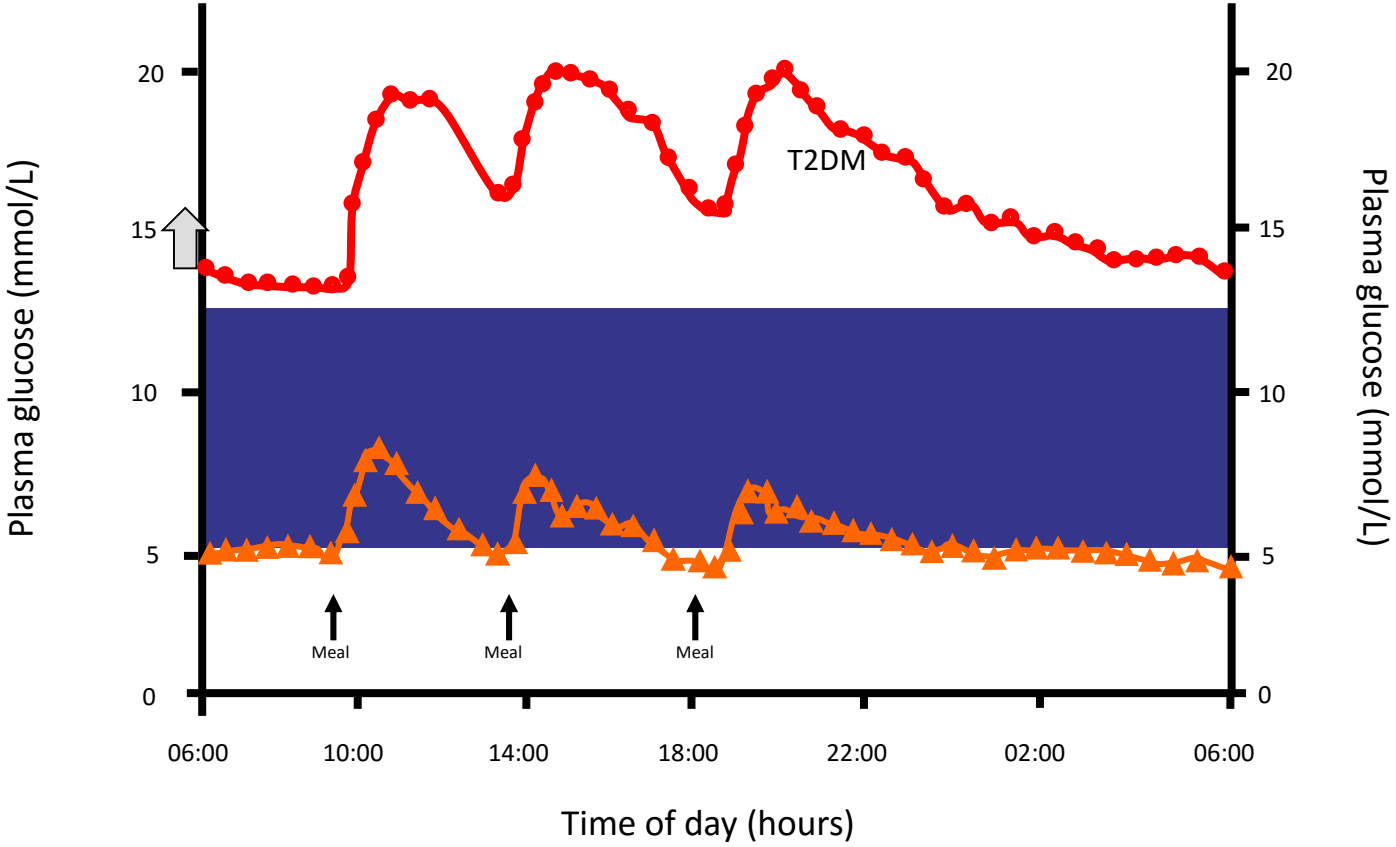
3. ***Other approaches***:

- **BD premixed insulin**: consider in those with high post prandial glucoses, likely minimal β-cell function +/- very poor glycaemic control >95mmol/mol (11%).(*No need to be on a sulphonylrueas but continue Metformin)*

- **Prandial** (3x rapid acting insulin with meals) **or Basal bolus insulin** (Basal + prandial rapid acting insulin) – almost never used when initiating insulin in *T2DM(No need to be on Sulphonylrueas but continue Metformin)*

Why start with basal insulin?

Comparison of 24-hour glucose levels in untreated vs treated patients with diabetes



Adapted from Hirsch I *et al. Clin Diabetes* 2005; 23: 78–86.

Dose adjustment – first fix fasting

Two dose adjustment schedules possible:

1. SLOW SCHEDULE (CAN BE PATIENT-LED)

   Increase by 2 units of insulin every 3 days

   continue until fasting BGL is ≤6.0 mmol/L

Increase dose only if FBG >4 mmol/L and accordingly decrease dose if FBG is <4 mmol/L.
Titration reviewed by HCPs at each contact.

Adapted from RACGP 2009/10 and Davies et al 2005.

Dose adjustment – first fix fasting

2. FAST SCHEDULE (PHYSICIAN-MANAGED)

Increase by 2–8 units of insulin depending on fasting BGL over previous 2–3 days

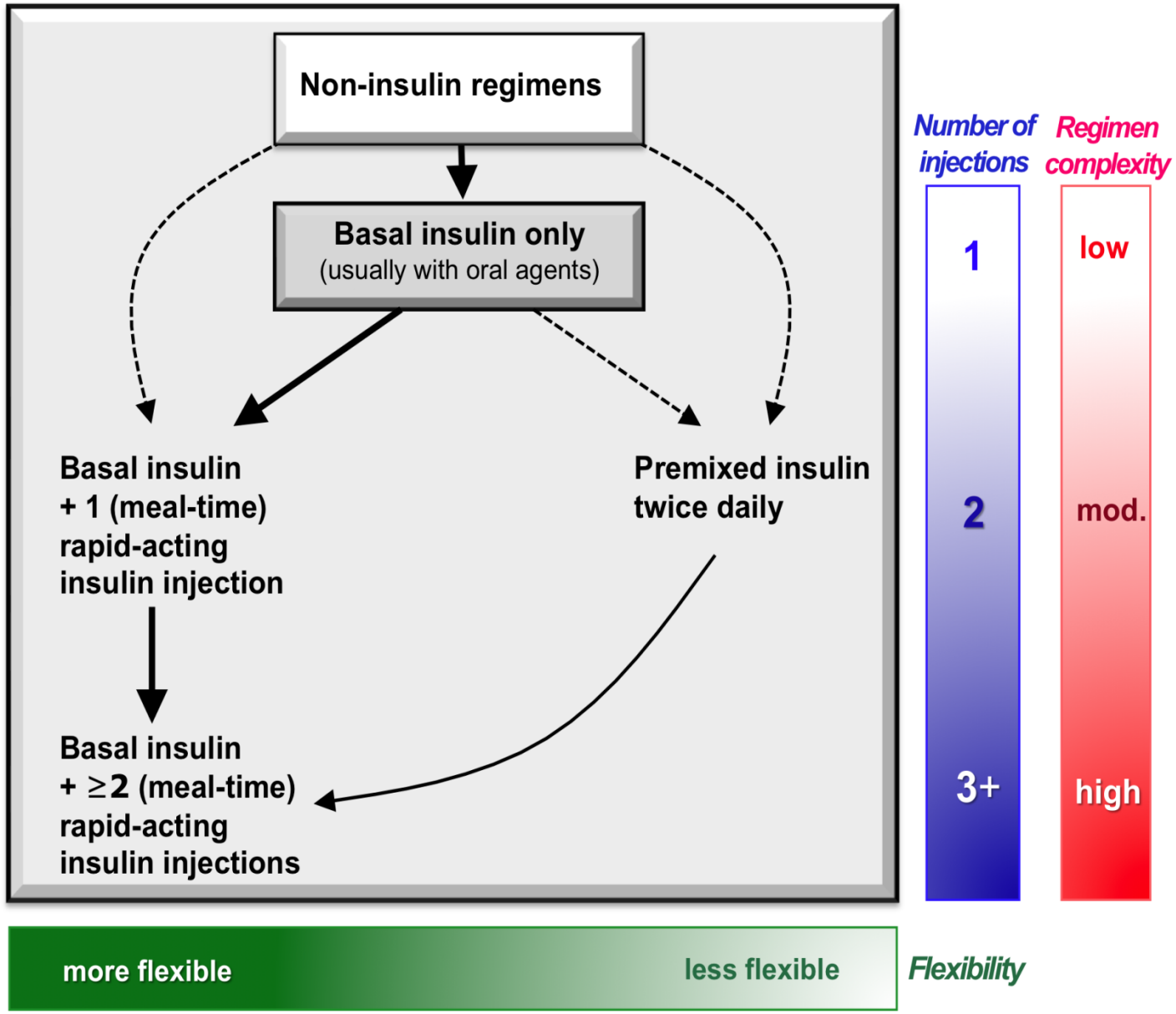
Mean fasting blood glucose (mmol/L)	Increase in insulin dose
<4	* See below
4−5.9	No change
6−6.9	2 units
7−7.9	4 units
8−10	6 units
>10	8 units

Starting dose 10 units, adjust dose twice weekly to reach the target FBG of <6mmol/L
Insulin dose may be decreased (small decreases of 2 to 4 units) if there is severe hypoglycaemia (requiring assistance) or if BGL <3.0 mmol/L in preceding week.
Do not increase insulin dose if fasting BGL <4 mmol/L at any time in preceding week.

Adapted from Phillips PJ. *Medicine Today* 2007; 8(3): 23–34.

Practice points

- Don’t delay insulin initiation
- Keep it simple for you and patient – 10 units basal insulin (almost always at bedtime)
- Titrate dose up - Fix the fasting first, then look for hypers at other times

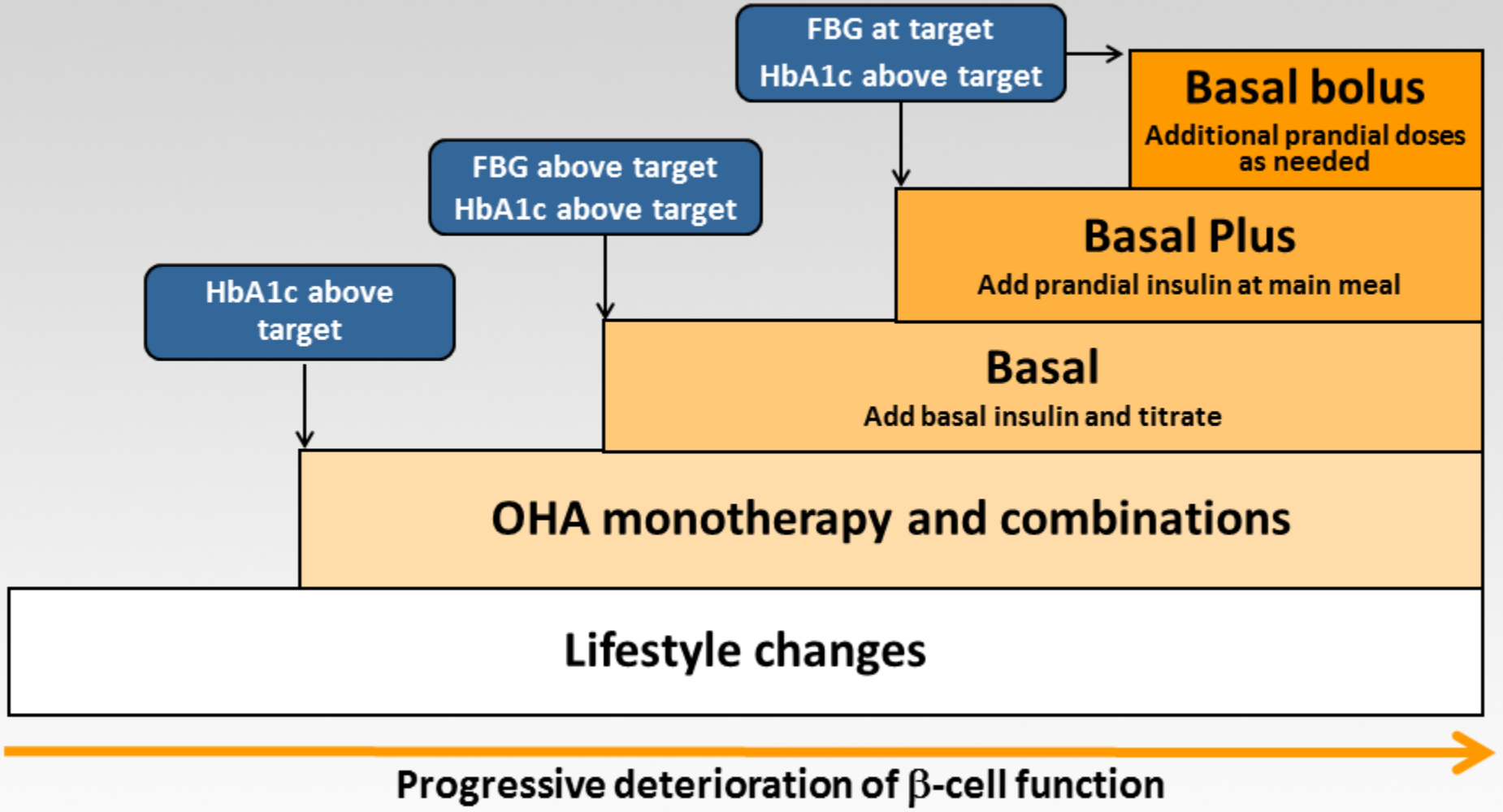


Sequential Insulin Strategies in T2DM

Diabetes Care, Diabetologia. 19 April 2012 [Epub ahead of print]

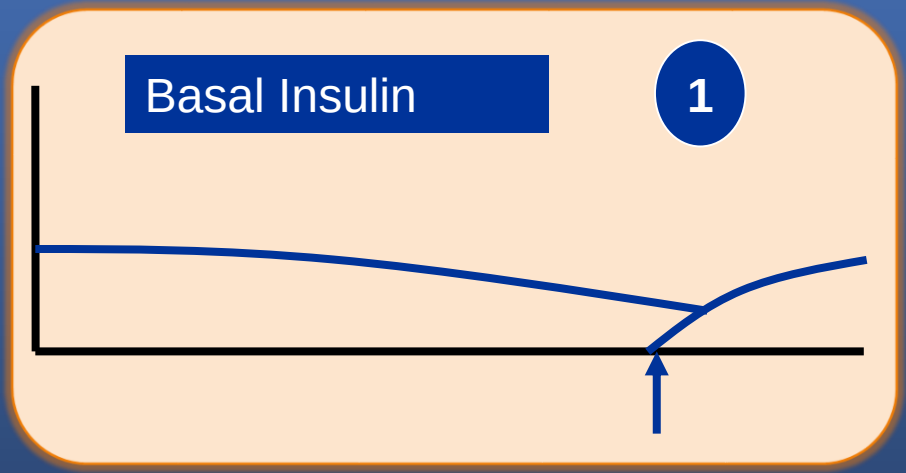
The Basal/Basal Plus Strategy for T2DM

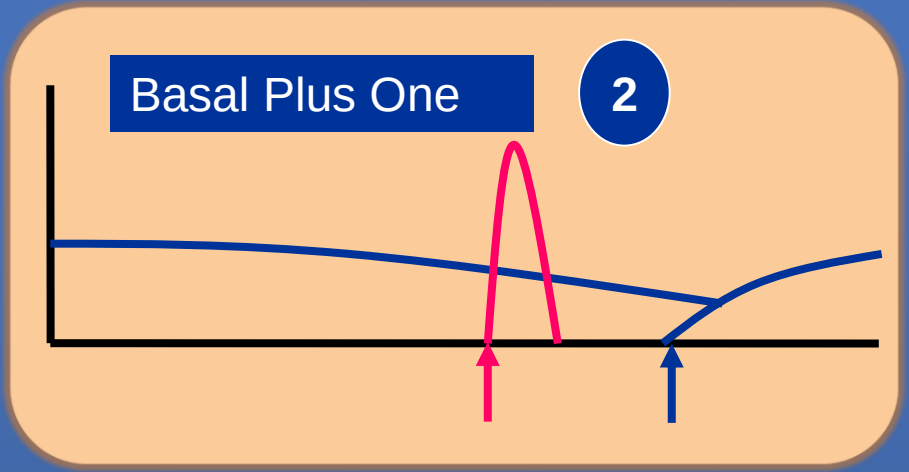
Stepwise intensification of treatment for continuity of control

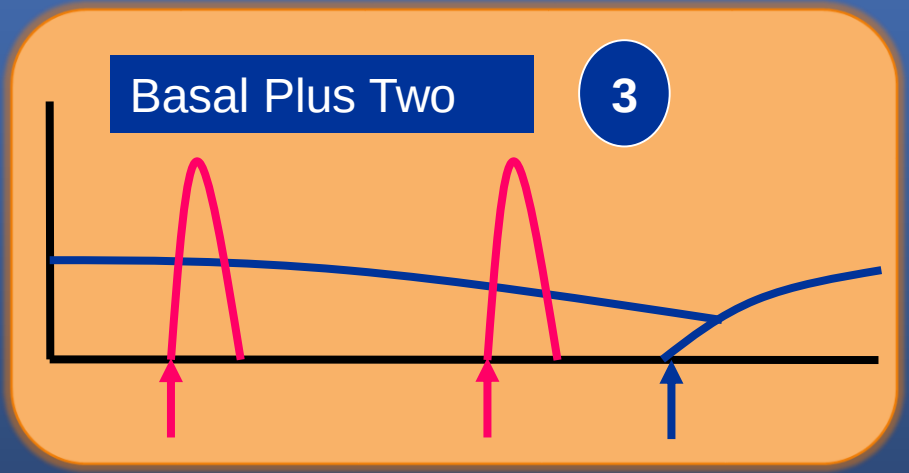


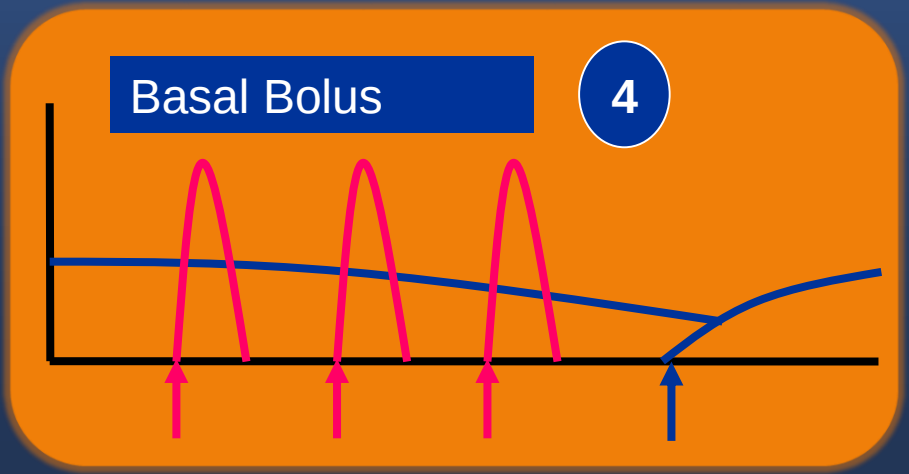
Adapted from Raccah D, et al. *Diabetes/Met Res & Rev.* 2007;23(4):257-624.

Basal Plus Strategy: Stepwise Intensification





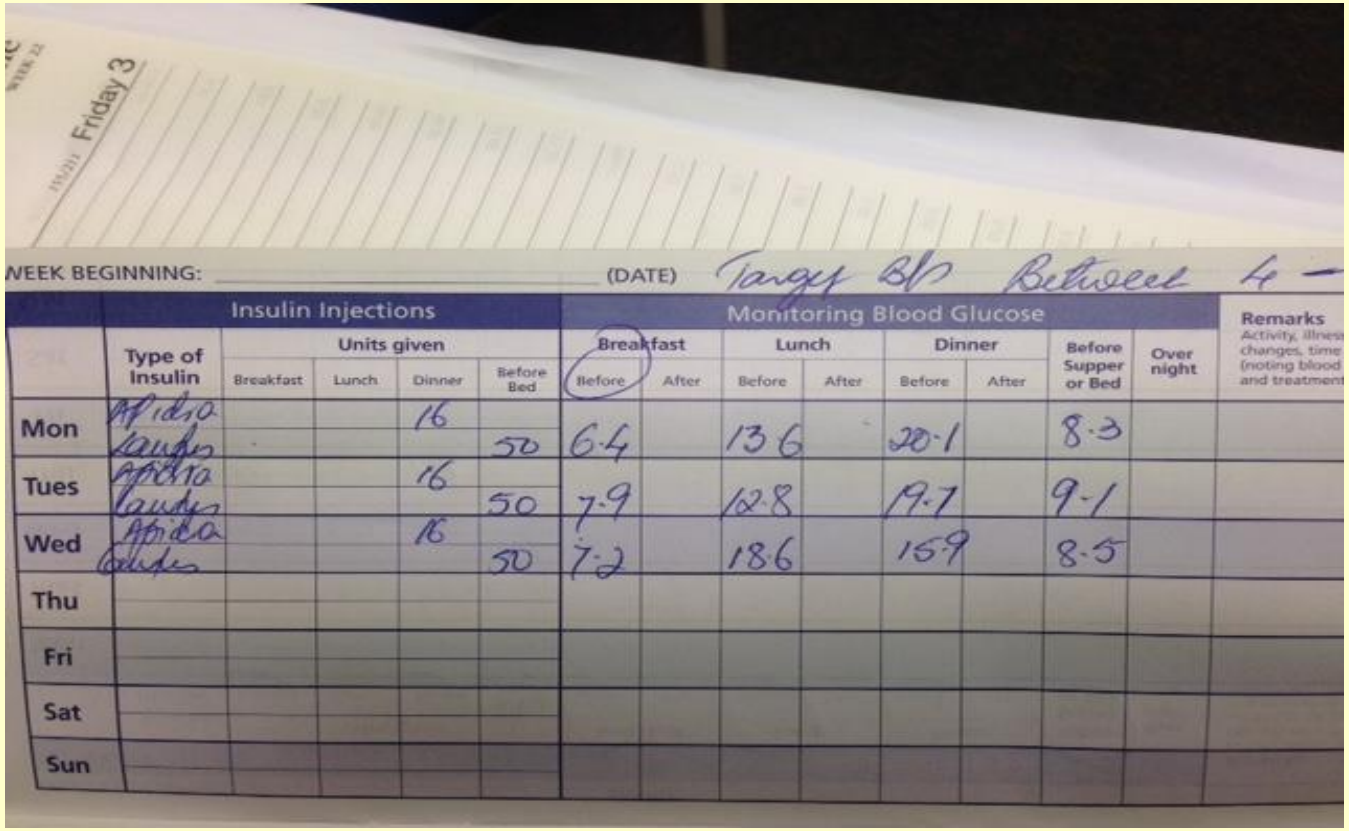




Case 1 - Mr x

Persistent hyperglycaemia (HbA1c 89) on Lantus 50u nocte, Apidra 16u pre-dinner, Metformin 1.5g BD, Pioglitazone 45mg daily

What next??



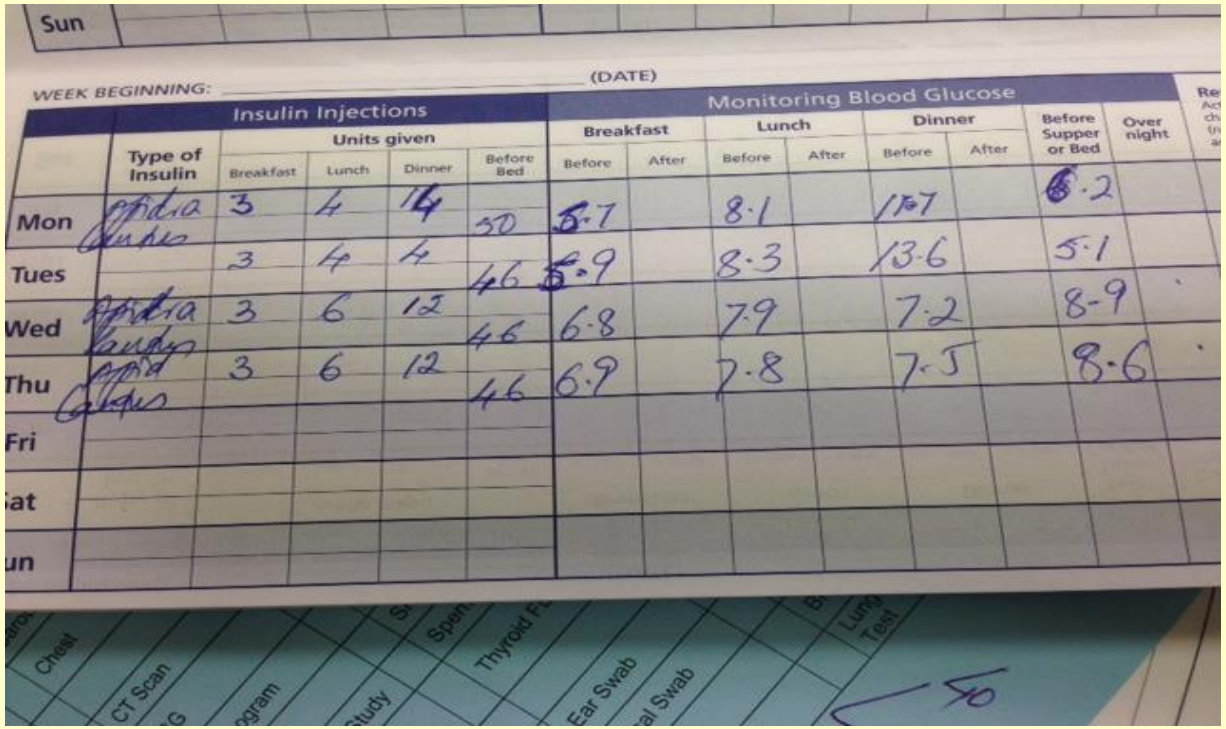
Friday 3

WEEK BEGINNING: _____ (DATE) Target BS Between 4 –

	Insulin Injections					Monitoring Blood Glucose								Remarks
	Type of Insulin	Units given				Breakfast		Lunch		Dinner		Before Supper or Bed	Over night	Activity, illness changes, time (noting blood and treatment
		Breakfast	Lunch	Dinner	Before Bed	Before	After	Before	After	Before	After			
Mon	Apidra			16		6.4		13.6		20.1		8.3		
	Lantus				50									
Tues	Apidra			16		7.9		12.8		19.7		9.1		
	Lantus				50									
Wed	Apidra			16		7.2		18.6		15.9		8.5		
	Lantus				50									
Thu														
Fri														
Sat														
Sun														

Case 1 - Mr x

- Added Apidra 3 units pre-breakfast and pre-lunch
- Persistent high CG's (~10-15) at pre-lunch/dinner - Titrated fron 4 units to 6 units,
- BS low bef bed so reduced the dinnertime Apidra
- BS too low fasting reduced the lantus to 46 units
- Off Pioglitazone, continued on Metformin, latest HbA1c 67 mmol/mol (CGs 3.5 – 15 mmol/L)



	Type of Insulin	Insulin Injections: Units given: Breakfast	Lunch	Dinner	Before Bed	Monitoring Blood Glucose: Breakfast: Before	Breakfast: After	Lunch: Before	Lunch: After	Dinner: Before	Dinner: After	Before Supper or Bed	Over night
Mon	Apidra Lantus	3	4	14	50	5.7		8.1		15.7		6.2	
Tues		3	4	4	46	5.9		8.3		13.6		5.1	
Wed	Apidra Lantus	3	6	12	46	6.8		7.9		7.2		8.9	
Thu	Apid Lantus	3	6	12	46	6.9		7.8		7.5		8.6	
Fri													
Sat													
Sun													

Case 2 - Mr T

- 46 yr old man with 17 year hx of T2DM, on combination of metformin (1.5g BD), pioglitazone (30mg daily) and Lantus 30u nocte (formerly on other insulins)

- Poor HbA1c, mostly >78 mmol/mol in preceding 2 years

Blood tests Diary

Date	Insulin	Ins Am	Ins Lunch	Ins Dinner	Ins bed	Bef BKfast	Bef Lunch	Bef dinner	Bef Bed	
Mon	Lantus				30	9.8	7.8	8.3	15.3	
Tues	Lantus				30	10.2	6.9	8.9	18.9	
Wed					30	7.9	7.7	7.8	16.9	
Thur					30	7.2	7.7	6.8	18.2	
Fri										

Case 2 - Mr T

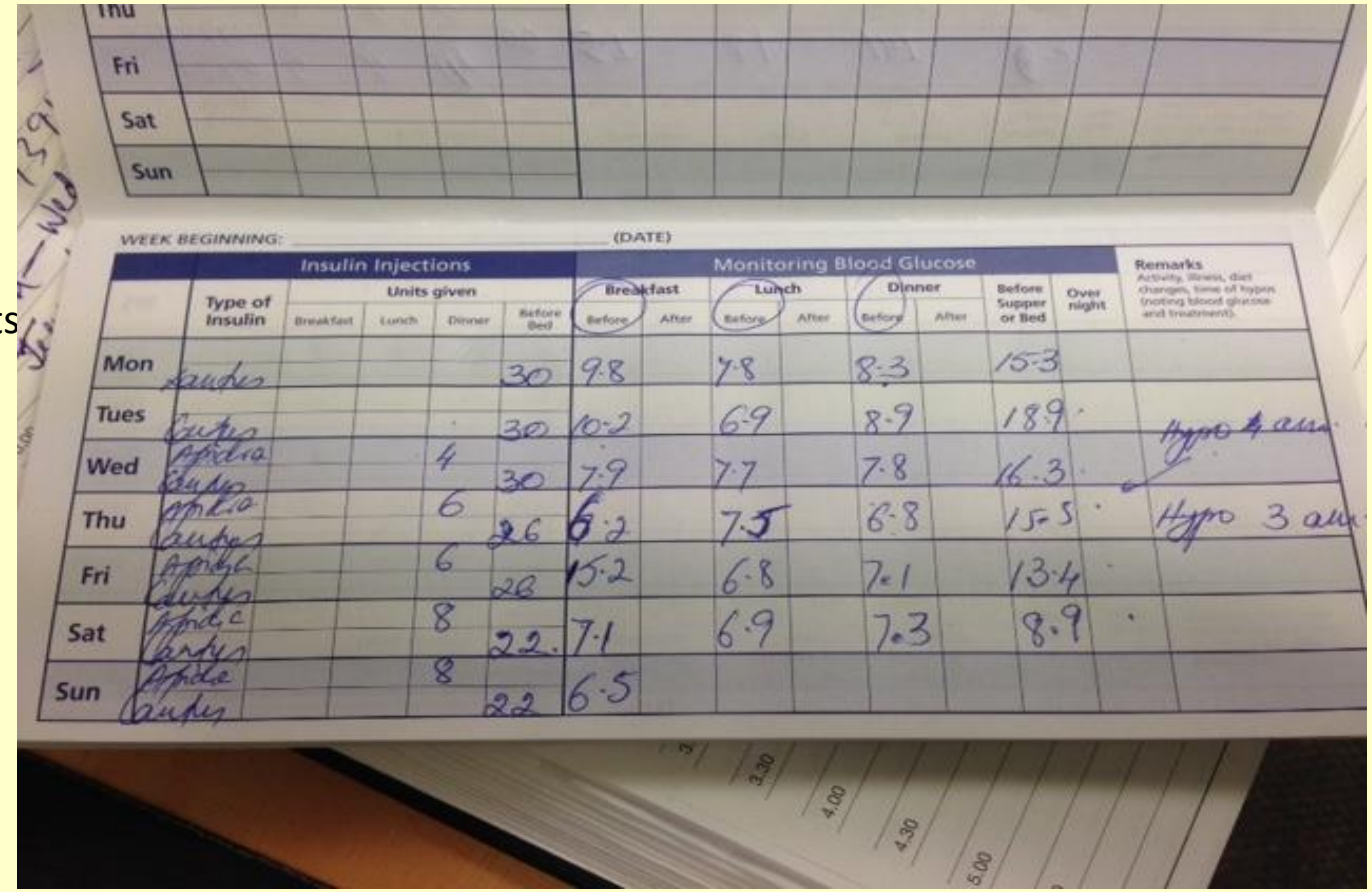
What was done:

- Introduced rapid acting insulin (Apidra) - 4 units at pre-dinner

- Lantus reduced to to 26 units then 22 units units nocte due to hypos ,

pre-dinner Apidra titrated gradually up to 8 units

- Pioglitazone increased to 45mg daily



WEEK BEGINNING: _____ (DATE)

	Insulin Injections					Monitoring Blood Glucose								Remarks
	Type of Insulin	Units given				Breakfast		Lunch		Dinner		Before Supper or Bed	Over night	Activity, illness, diet changes, time of hypos (noting blood glucose and treatment).
		Breakfast	Lunch	Dinner	Before Bed	Before	After	Before	After	Before	After			
Mon	Lantus				30	9.8		7.8		8.3		15.3		
Tues	Lantus				30	10.2		6.9		8.9		18.9		Hypo 4 am
Wed	Apidra			4										
	Lantus				30	7.9		7.7		7.8		16.3		
Thu	Apidra			6										
	Lantus				26	6.2		7.5		6.8		15.5		Hypo 3 am
Fri	Apidra			6										
	Lantus				26	15.2		6.8		7.1		13.4		
Sat	Apidra			8										
	Lantus				22	7.1		6.9		7.3		8.9		
Sun	Apidra			8										
	Lantus				22	6.5								

Case 3: Ms A

52 yr old woman with T2DM for 23 yrs, chronic poor control, HbA1c >80 for over a year

Metformin 1g TDS + on basal insulin since 5 years ago – Protaphane at bedtime, dose gradually increased to 48 units

Long history of patchy compliance, occasional CG testing, mostly fasting 8 - 15, pre-dinner 10 - 20 mmol/L

Ms Blood sugar Diary

Date	Insulin	am	Lunch	Bed	Bef Bkfast	Bef Lunch	Bef Dinner	Bef Bed
Mon	Protaphane			48	8.9	12.4	8.2	14.5
Tues					8.2	13.1	7.9	18.2
Wed					10.2			
Thurs								

Case 3: Ms A

Management?

- Lifestyle intervention?
- Add/ adjust oral agents?
- **Optimise/ intensify insulin**
- - Increase protaphane dose?

  - Add prandial insulin?

  - Switch to twice daily premixed insulin?

Case 3 Mrs A

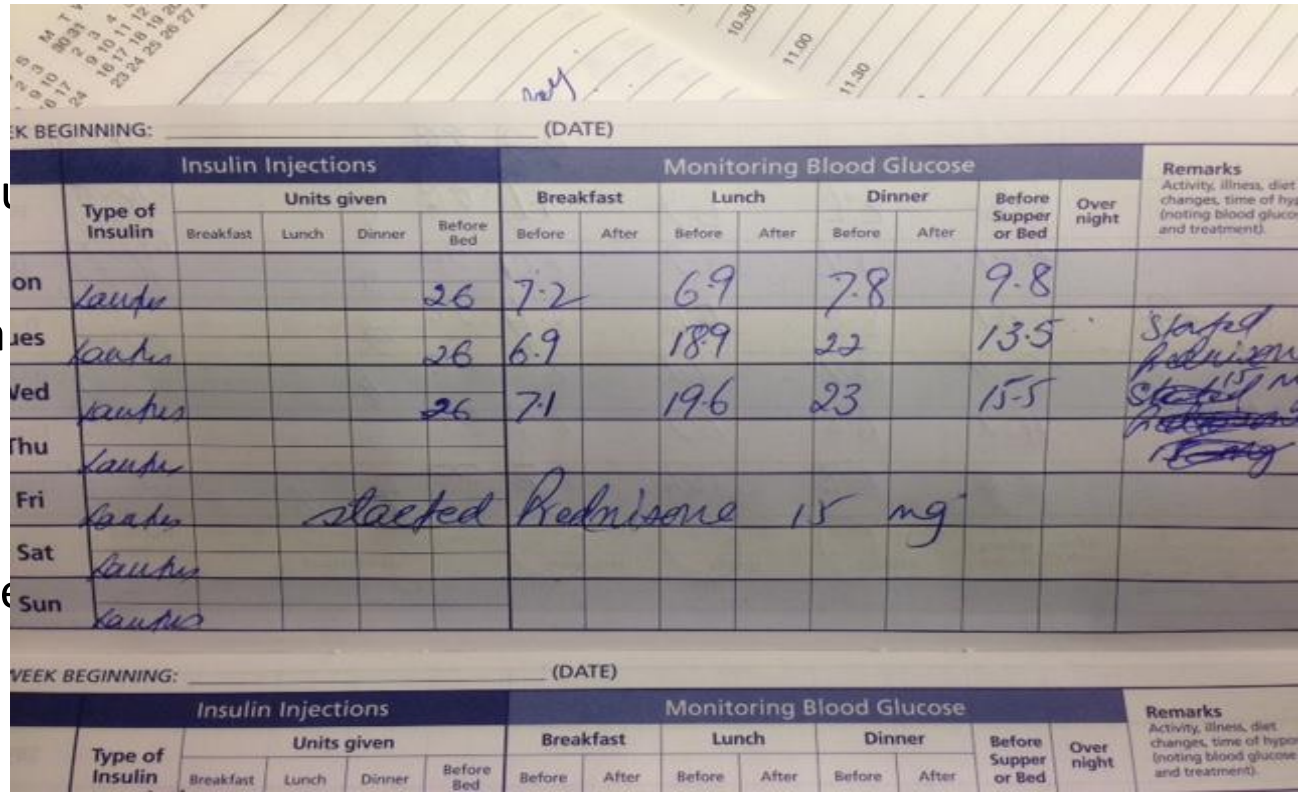
- Simplify Metformin to 1.5g BD
- Switched insulin to premix (NovoMix30) – 20 units pre-breakfast and 20 units pre-dinner
- Got her to test CG's more intensively; pre-breakfast and pre-dinner, with a follow up phone call the following week
- Increase morning Novomix to 24 units continue 20 units at dinner

Date	Insulin	Breakfast Dose	Dinner Dose	CG Bef Breakfast	CG Bef Lunch	CG Bef Dinner	CG Bef bed	Comments	
Mond	Novomix 30/70	20 units	20 units	7.2	10.2	10.4	9.3		
Tues				8.5	10.8	11.1	9		
wed				8.9	12.2	13.7	8.9		
Thurs				7.5	11.6	14	9.7		
Friday	Novomix 30/70	24	20	7.2	7.8	7.6	8.9		
				6.8					

Steroids

Case 4 Mrs P

- 67 yrs old lady on metformin 1 gm bd + Gliclazide 80 mg bd + lantu 26 units nocte
- Fairly well controlled Hba of 62 mmols
- Recently started on Prednisone 15 mg for asthma since then BS gone crazy!!!



K BEGINNING: _____ (DATE)

	Insulin Injections					Monitoring Blood Glucose								Remarks
	Type of Insulin	Units given				Breakfast		Lunch		Dinner		Before Supper or Bed	Over night	Activity, illness, diet changes, time of hyp (noting blood gluco and treatment).
		Breakfast	Lunch	Dinner	Before Bed	Before	After	Before	After	Before	After			
on	Lantus				26	7.2		6.9		7.8		9.8		
ues	Lantus				26	6.9		18.9		22		13.5		Started Prednisone
Wed	Lantus				26	7.1		19.6		23		15.5		Started 15 m
Thu	Lantus													
Fri	Lantus		started			Prednisone			15	mg				
Sat	Lantus													
Sun	Lantus													

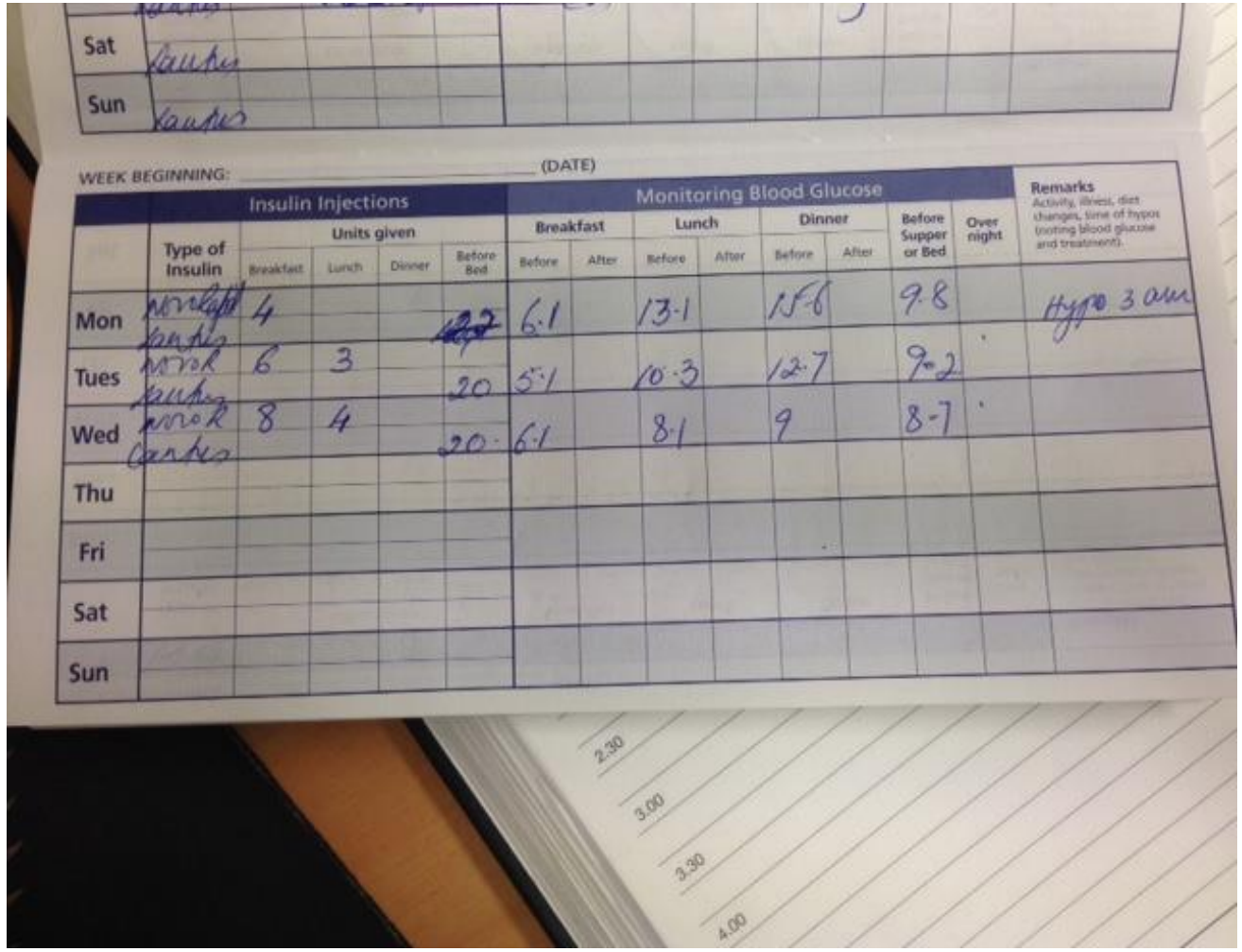
VEEK BEGINNING: _____ (DATE)

	Insulin Injections					Monitoring Blood Glucose								Remarks
	Type of Insulin	Units given				Breakfast		Lunch		Dinner		Before Supper or Bed	Over night	Activity, illness, diet changes, time of hypo (noting blood glucose and treatment).
		Breakfast	Lunch	Dinner	Before Bed	Before	After	Before	After	Before	After			

Steroids

Case 4 Mrs P

- Stop Gliclazide
- Start on 4 units of Novorapid then titrate up
- Add 3 units of Novorapid at lunch titrate



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	Type of Insulin	Units given				Breakfast		Lunch		Dinner		Before Supper or Bed	Over night	Activity, illness, diet changes, time of hypos (noting blood glucose and treatment).
		Breakfast	Lunch	Dinner	Before Bed	Before	After	Before	After	Before	After			
Mon	Novolapid Lantus	4			22	6.1		13.1		15.6		9.8		Hypo 3 am
Tues	Novo Lantus	6	3		20	5.1		10.3		12.7		9.2		
Wed	Novo Lantus	8	4		20	6.1		8.1		9		8.7		
Thu														
Fri														
Sat														
Sun														

Sat Lantus

Sun Lantus

2.30

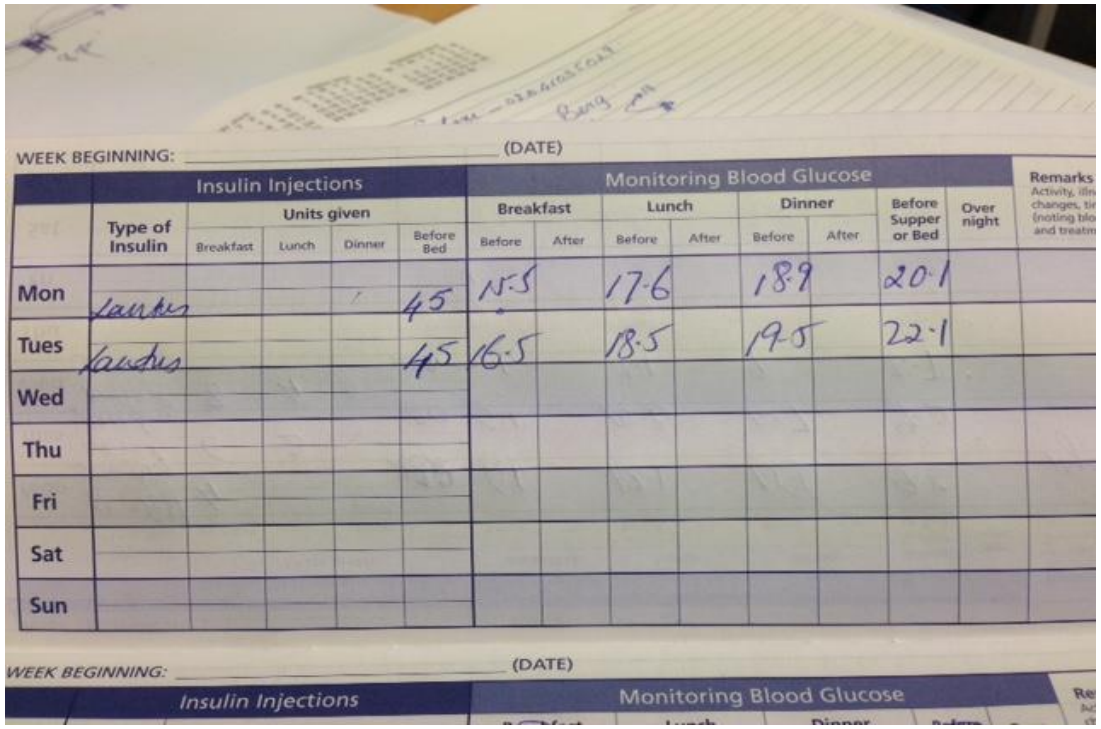
3.00

3.30

4.00

Case 5 ,Mr BD

- Mr BD 65 yrs old ,BMI 39 fairly Insulin resistant,Type 2 for 12 yrs ,fairly well controlled on Metformin 1 gm tds + Gliclazide 80 mg bd +Lantus 45 units nocte.
- Hba1c was around 60-65 mmols for the last few yrs until 3 months ago Hba1c gone up to 89mmols since Metformin was stopped
- Due to declining renal function eGFR now 17 ml/min



WEEK BEGINNING: _____ (DATE)

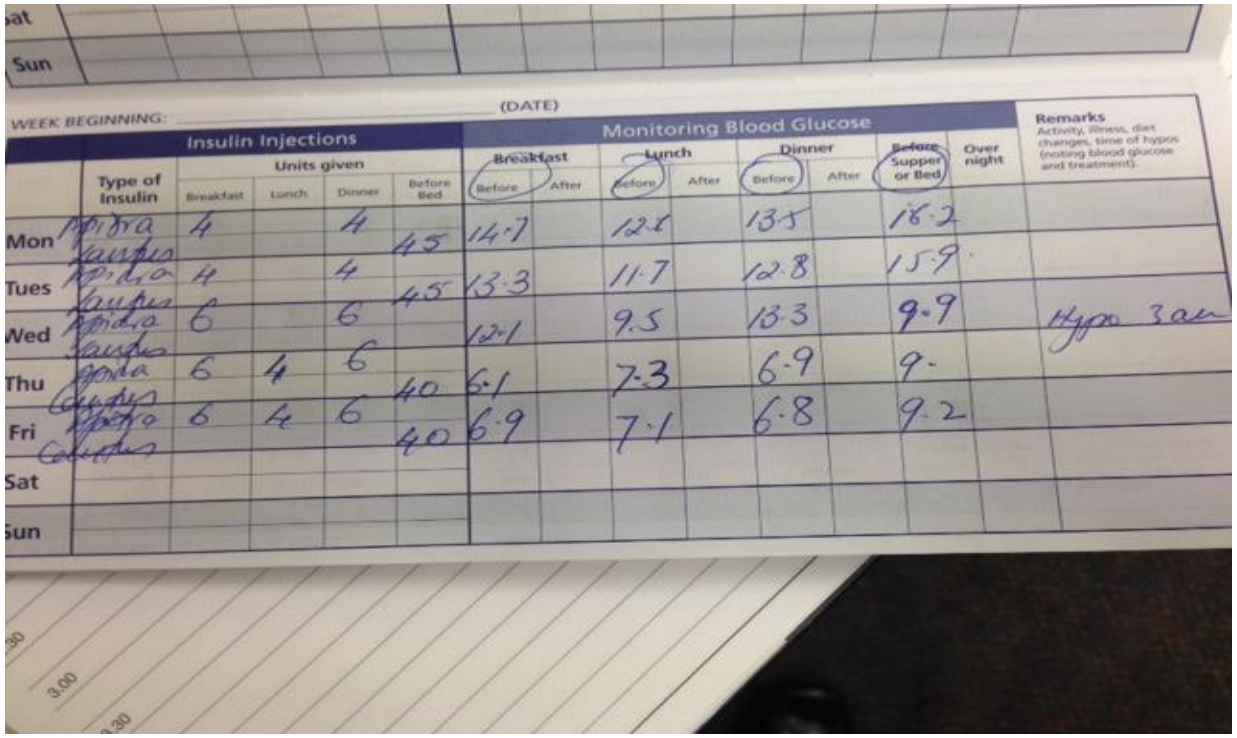
	Insulin Injections					Monitoring Blood Glucose								Remarks
	Type of Insulin	Units given				Breakfast		Lunch		Dinner		Before Supper or Bed	Over night	
		Breakfast	Lunch	Dinner	Before Bed	Before	After	Before	After	Before	After			
Mon	Lantus				45	15.5		17.6		18.9		20.1		
Tues	Lantus				45	16.5		18.5		19.5		22.1		
Wed														
Thu														
Fri														
Sat														
Sun														

WEEK BEGINNING: _____ (DATE)

Insulin Injections | Monitoring Blood Glucose

Case 5 MR BD

- Continue metformin 500 mg OD
- Stop Gliclazide
- Start 4 units of Apidra with Breakfast and dinner
- Titrate Insulin dose until BS stabilises
- Ended up on Apidra 6 units amm, 4 units at lunch and 6 units at dinner
- Lantus reduced to 40 units nocte .



WEEK BEGINNING: _____ (DATE)

	Insulin Injections					Monitoring Blood Glucose								Remarks
	Type of Insulin	Units given				Breakfast		Lunch		Dinner		Before Supper or Bed	Over night	Activity, illness, diet changes, time of hypos (noting blood glucose and treatment).
		Breakfast	Lunch	Dinner	Before Bed	Before	After	Before	After	Before	After			
Mon	Apidra Lantus	4		4	45	14·7		12·2		13·5		18·2		
Tues	Apidra Lantus	4		4	45	13·3		11·7		12·8		15·9		
Wed	Apidra Lantus	6		6		12·1		9·5		13·3		9·9		Hypo 3am
Thu	Apidra Lantus	6	4	6	40	6·1		7·3		6·9		9·		
Fri	Apidra Lantus	6	4	6	40	6·9		7·1		6·8		9·2		
Sat														
Sun														

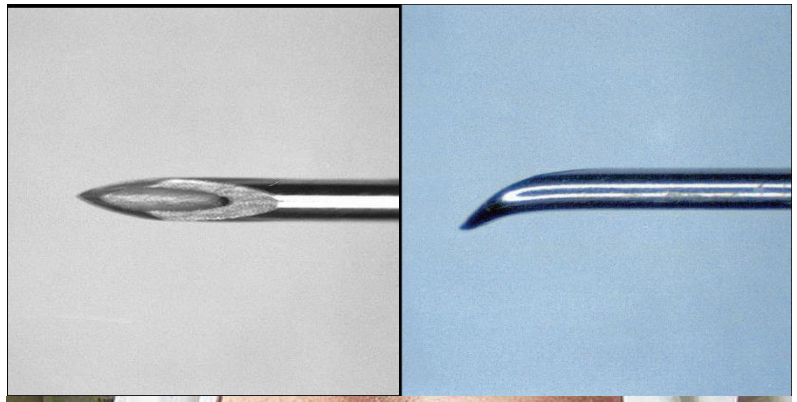
Insulin doses in T2D

- Requirements depend on insulin (body) resistance
- Duration of DM will affect remaining beta cell function
- Correct dose of insulin is when you achieve target blood sugars.

Insulin doses in T2D
When might changes need to be made?

- Hypos
- BGLs consistently > 15 mmol/L
- Illness
- Steroids/medications causing hyperglycaemia
- HbA1c not on target

Pen needles



- Needles-100 needles for 3 months

After 2nd Use

- ☆ **First use: Lubricant removed**
- ☆ **Needle hooking second time**
- ☆ **After 6 uses~**
  - ☆ **fishing anyone?**

Hypoglycaemia

"Blood glucose a little low, honey?"

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Need to explain what Hypoglycaemia is!!!!!!

Pt can freak out!!!

- *Was insulin taken at appropriate time?*
- *Are they missing doses and then overcompensating later?*
- *Are they missing meals?*
- *Are they changing quantity or quality of food in order to lose weight-without changing the dose?*
- *Are hypos occurring on particular days of the week, i.e at week ends??*
- *Was Alcohol a factor??*
- *Was exercise a factor?/ delayed hypo due to exercise during the day??*
- *Pre and post menstrual changes in BS levels??*
- *Have injection sites been checked for signs of lipohypertrophy??*
- *Rotating sites frequently??*
- *Mixing insulin correctly??*
- *Hot weather/Hot bath ??*
- *Do they need to review their diet??*
- *Is the Insulin regimens right for the patient??*

Hypoglycaemia

Caused by the body's initial reaction (trying to increase BGL)	From the brain
Irritability	Inability to concentrate
Anxiety	Weakness, dizziness
Hunger/ feeling sick	Headache
Paleness	Confusion
Shakiness	Blurred or double vision
Heart pounding	Odd behaviour
Sweating	Slurred speech
Numbness – fingers, lips, toes	Lack of coordination/ unsteady
	Lapses in consciousness
	Convulsions

HYPOGLYCAEMIA - Treatment

STEP 1 – 15-20g of fast acting carbohydrate.

Regular fizzy drinks, jellybeans (6-8), glucose

tablets, 3 teaspoons of sugar. [**NOT** chocolate,

cakes or biscuits!]

STEP 2 – Retest blood sugar if back above 4mmol then move to step 3, if not repeat step 1.

STEP 3 – Meal if due or 15-20g of slow acting carbohydrate. Piece of fruit, slice of bread, 2 plain biscuits

SICK DAYS – KEY MESSAGES for T2DM

Key Messages:

- Tell someone, anyone (family, friend, work colleague) that you are sick
- TEST FREQUENTLY (3-4x daily or more)
- Continue your diabetes medications, do not reduce them without advice. (However, do not take Metformin if vomiting and or diarrhoea).
- Have plenty to drink . Replace meals with drinks (May need sweet drinks / soft foods if necessary).
- Contact GP or diabetes team for further advice
- Go to hospital if feeling drowsy & confused, experiencing breathing difficulties, stomach pain, vomiting, bsl's >15mmol consistently or unable to keep bsl's >4.0

Drury, P. & Gatling, W. (2005). *Diabetes: Your questions answered*. Edinburgh, New York: Churchill Livingstone.

Travel

Preparation & precautions:

- Vaccinations
- Customs letter detailing all medication
- Customs (200mls maximum rule for liquids)
- Hypo treatment
- All diabetes supplies i.e. Meds, insulin, pens, needles and testing equip MUST be in hand luggage.
- First aid kit
- Sick day action plan
- Consider Insulin storage while away
- Possible changes in lifestyle practices while away.

Everyone starting insulin MUST be made aware of

their responsibilities regarding driving.

Regular testing and hypo management / avoidance is of the utmost importance.

Any Type 2 patients on insulin who wish to hold a passenger license, heavy vehicle license or driving instructor license are likely to require :

1. **Six-monthly medical certificate from a GP documenting:**
   - adherence to treatment
   - proof of regular self-testing of blood glucose with satisfactory levels
   - the absence of hypoglycaemic episodes or unawareness
   - the absence of significant diabetic complications
2. **A regular pattern of shifts with adequate meal breaks**
3. **A satisfactory annual specialist review**

Reference: New Zealand Transport Agency. (2009). *Medical aspects of fitness to drive*.

SHARPS DISPOSAL

- Lancets and pen needles are sharps that need safe disposal.
- Advise patients to speak with their pharmacist about safe disposal options.
- Diabetes Auckland or Comprehensive Care provide sharp containers for $5.00 (1 L) and $8.70 (1.5L) for sharps disposal.
- Auckland now can dispose of sharps in any Chemists

Take home messages

- Start insulin in a timely fashion, employ techniques for a smooth initiation
- Early intensive CG testing with up-titration of dose
- Expect insulin regimen intensification with time – initially dose escalation of single daily injection, later more regular injections
- Individualise glycaemic targets and insulin regimen

Thank you

Questions