Insulin Initiation, titration & Insulin switch in the Primary Care-KISS

Rotorua GP CME 9 June 2012

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&
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Natural History of T2DM

- Beta-cell function
- Insulin secretion
- Insulin resistance
- Postprandial glucose
- Fasting glucose

Years from diagnosis:
- 10 years before diagnosis
- 5 years before diagnosis
- Diagnosis
- 5 years after diagnosis
- 10 years after diagnosis
- 15 years after diagnosis

Microvascular complications
Macrovascular complications
Prediabetes
Type 2 diabetes

Linda

- 51-year-old laboratory technician (works day shifts)
- Presents for annual review
- **Diagnosed with T2D 6 years ago**
- Married with two sons
Examination

Height: 1.60 m

Weight: 84 kg

BMI: 33 kg/m²

Waist: 99 cm

BP: 135/90 mmHg

Feet: Sensation adequate, pulses easily felt

Urinanalysis: No abnormalities noted
## Pathology results

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA$_{1c}$</td>
<td>10.2%</td>
</tr>
<tr>
<td>TC</td>
<td>4.3 mmol/L</td>
</tr>
<tr>
<td>TG</td>
<td>2.1 mmol/L</td>
</tr>
<tr>
<td>HDL</td>
<td>1.1 mmol/L</td>
</tr>
<tr>
<td>LDL</td>
<td>2.7 mmol/L</td>
</tr>
<tr>
<td>eGFR</td>
<td>&gt;60 mL/min</td>
</tr>
<tr>
<td>ACR</td>
<td>40 mg/mmol</td>
</tr>
<tr>
<td>Microalbuminuria</td>
<td>40 µg/24 h</td>
</tr>
<tr>
<td>Medications</td>
<td>Dose</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Metformin</td>
<td>1000 mg bd</td>
</tr>
<tr>
<td>Gliclazide</td>
<td>160 mg bd</td>
</tr>
<tr>
<td>Aspirin</td>
<td>100 mg daily</td>
</tr>
<tr>
<td>Atorvastatin</td>
<td>40 mg daily</td>
</tr>
<tr>
<td>Cilazapril</td>
<td>5mg daily</td>
</tr>
</tbody>
</table>
You previously set an A1c target of ≤7% with Linda, but her A1c has been slowly creeping up.
Setting an A1C target

• 1% fall in A1C reduces microvascular complications by 37%,¹ but risk of:²
  – Hypoglycaemia ↑
  – Weight gain (approx 2kg) ↑

Initiating insulin therapy

You think you need to start Linda on insulin because of her very elevated A1c, however you decide to check a few other things first.
# NOVO NORDISK - BALANCING INSULIN AND DELIVERY

<table>
<thead>
<tr>
<th>Brand</th>
<th>Presentation</th>
<th>Schematic Time-Action Profile</th>
<th>Insulin Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>NovoRapid®</td>
<td>3mL Penfill®</td>
<td>Onset: 10-20 minutes</td>
<td>190 units/mL</td>
</tr>
<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 1-1.5 hours</td>
<td>190 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 3.5-4 hours</td>
<td>190 units/mL</td>
</tr>
<tr>
<td>Levemir®</td>
<td>FlexPen®</td>
<td>Onset: 3-4 hours</td>
<td>150 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peak: 3-14 hours</td>
<td>150 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: Up to 24 hours</td>
<td>150 units/mL</td>
</tr>
<tr>
<td>Actrapid®</td>
<td>3mL Penfill®</td>
<td>Onset: 30 minutes</td>
<td>100 units/mL</td>
</tr>
<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 1-3 hours</td>
<td>100 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 8 hours</td>
<td>100 units/mL</td>
</tr>
<tr>
<td>Protaphane®</td>
<td>3mL Penfill®</td>
<td>Onset: 1.5 hours</td>
<td>100 units/mL</td>
</tr>
<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 4-12 hours</td>
<td>100 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 24 hours</td>
<td>100 units/mL</td>
</tr>
<tr>
<td>PenMix® 30 &amp; Mixtard® 30 (10mL)</td>
<td>3mL Penfill®</td>
<td>Onset: 30 minutes</td>
<td>100 units/mL</td>
</tr>
<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 2-8 hours</td>
<td>100 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 24 hours</td>
<td>100 units/mL</td>
</tr>
<tr>
<td>PenMix® 10</td>
<td>3mL Penfill®</td>
<td>Onset: 30 minutes</td>
<td>75 units/mL</td>
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<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 2-8 hours</td>
<td>75 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 24 hours</td>
<td>75 units/mL</td>
</tr>
<tr>
<td>PenMix® 20</td>
<td>3mL Penfill®</td>
<td>Onset: 30 minutes</td>
<td>50 units/mL</td>
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<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 2-8 hours</td>
<td>50 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 24 hours</td>
<td>50 units/mL</td>
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<tr>
<td>PenMix® 40</td>
<td>3mL Penfill®</td>
<td>Onset: 30 minutes</td>
<td>30 units/mL</td>
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<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 2-8 hours</td>
<td>30 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 24 hours</td>
<td>30 units/mL</td>
</tr>
<tr>
<td>PenMix® 50 &amp; Mixtard® 50 (10mL)</td>
<td>3mL Penfill®</td>
<td>Onset: 30 minutes</td>
<td>30 units/mL</td>
</tr>
<tr>
<td></td>
<td>10mL Vial</td>
<td>Peak: 2-8 hours</td>
<td>30 units/mL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration: 24 hours</td>
<td>30 units/mL</td>
</tr>
</tbody>
</table>

Please review Data Sheet before prescribing. Full Data Sheet is available from the Novo Nordisk Customer Care Centre 0800 733 737. © Clinical practice, the duration of insulin action may be shorter or longer than the durations specified. Variations between and within patients may occur depending upon injection site and technique, insulin dosage, as well as diet and exercise. © Registered trademark of Novo Nordisk A/S. Novo Nordisk Pharmaceuticals Ltd PO Box 31661 Pakuranga, Auckland. www.novonordisk.co.nz

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### Lilly Insulin Range

<table>
<thead>
<tr>
<th>Brand Name**</th>
<th>Type of Insulin (generic name)</th>
<th>Product Description</th>
<th>Presentation</th>
<th>Schematic Action Profile</th>
<th>Onset: 3-15 mins</th>
<th>Peak: 1 hour</th>
<th>Duration: 15-18 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humalog®</td>
<td>insulin lispro</td>
<td>Rapid-Acting</td>
<td>10mL vials and 3mL cartridges</td>
<td>2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30</td>
<td>3-4 mins</td>
<td>1 hour</td>
<td>15-18 hours</td>
</tr>
<tr>
<td>Humulin® R</td>
<td>insulin regular</td>
<td>Short-Acting</td>
<td>10mL vials and 3mL cartridges</td>
<td>2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30</td>
<td>30 mins</td>
<td>4-6 hours</td>
<td>15-18 hours</td>
</tr>
<tr>
<td>Humulin® NPH</td>
<td>isophane (NPH)</td>
<td>Intermediate Acting</td>
<td>5mL vials and 3mL cartridges</td>
<td>2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30</td>
<td>1 hour</td>
<td>1-2 hours</td>
<td>15-18 hours</td>
</tr>
<tr>
<td>Humalog® Mix25</td>
<td>insulin lispro</td>
<td>Premixed</td>
<td>3mL cartridges</td>
<td>2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30</td>
<td>1-2 hours</td>
<td>1-2 hours</td>
<td>15-18 hours</td>
</tr>
<tr>
<td>Humalog® Mix50</td>
<td>insulin lispro</td>
<td>Premixed</td>
<td>3mL cartridges</td>
<td>2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30</td>
<td>1-2 hours</td>
<td>1-2 hours</td>
<td>15-18 hours</td>
</tr>
<tr>
<td>Humalog® 30/70</td>
<td>insulin lispro</td>
<td>Premixed</td>
<td>5mL vials and 3mL cartridges</td>
<td>2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30</td>
<td>1-2 hours</td>
<td>1-2 hours</td>
<td>15-18 hours</td>
</tr>
</tbody>
</table>

NPH: NPH can only be used with Lilly 3mL insulin cartridges. Before prescribing, please review the Product Data Sheet.

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Selecting an insulin

**RACGP & ADA/EASD guidelines state…**

- Start with **single daily dose** (10 units) of **bedtime intermediate-acting insulin** or **morning or bedtime long-acting insulin**

- **Rapid-acting insulin** is **not** necessarily needed at initiation

- **Premixed insulin** is **not** recommended during dosage adjustment period

- Insulin regimens should be designed taking **lifestyle** and **meal schedule** into account

Why start with basal insulin?

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

## Which basal insulin?

<table>
<thead>
<tr>
<th></th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
<th>Funded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intermediate-acting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isophane (OD/BD)</td>
<td>1 – 2 h</td>
<td>4 – 12 h</td>
<td>16 – 24 h</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Long-acting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glargine (OD)</td>
<td>2 – 4 h</td>
<td>None</td>
<td>24 h</td>
<td>Yes</td>
</tr>
<tr>
<td>Detemir (OD/BD)</td>
<td>1 – 2 h</td>
<td>6 – 12 h</td>
<td>20 – 24 h</td>
<td>No</td>
</tr>
</tbody>
</table>

Adapted from Clinical Practice Guidelines: Type 1 Diabetes in Children and Adolescents by Australian Paediatric Endocrine Group. p58
Linda’s BGLs during past week (before starting insulin)

<table>
<thead>
<tr>
<th>Date</th>
<th>Breakfast Before</th>
<th>Lunch</th>
<th>Dinner Before</th>
<th>Bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON</td>
<td></td>
<td></td>
<td>BGL mmol/L</td>
<td></td>
</tr>
<tr>
<td>TUE</td>
<td></td>
<td></td>
<td>BGL mmol/L</td>
<td></td>
</tr>
<tr>
<td>WED</td>
<td></td>
<td></td>
<td>BGL mmol/L</td>
<td></td>
</tr>
<tr>
<td>THU</td>
<td></td>
<td></td>
<td>BGL mmol/L</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
Timing of single insulin dose

Morning or evening is acceptable
Timing depends on blood glucose profile:

- If fasting BGL is high → give at bedtime
- If fasting BGL on target but evening BGL high → give in morning
- If both are high → give bd NPH or once daily glargine

Add basal insulin to OHAs
Aim to achieve fasting BGL of ≤6.0 mmol/L*

Starting dose:
10 units morning or at bedtime
OHAs continued at same doses

Monitor Fasting BGL

* Usually the fasting BG target is ≤6.0mmol/L; however, targets may vary from one person to the next.

Linda’s summary to this point

- Elevated A1C on optimal doses of two (2) OHAs
- Lifestyle measures reviewed, no secondary causes of hyperglycaemia
- Insulin therapy is appropriate
- Basal insulin is most appropriate at this time
- Bedtime injection of 10 U insulin NPH/ Glargine to reduce Linda’s fasting BGL

☆ Up-titration to be self-managed in consultation with Practice Nurse

- Linda to return for review in 3 months with lab tests completed prior to visit
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**

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

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.
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

<table>
<thead>
<tr>
<th>Mean fasting blood glucose (mmol/L)</th>
<th>Increase in insulin dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4</td>
<td>* See below</td>
</tr>
<tr>
<td>4–5.9</td>
<td>No change</td>
</tr>
<tr>
<td>6–6.9</td>
<td>2 units</td>
</tr>
<tr>
<td>7–7.9</td>
<td>4 units</td>
</tr>
<tr>
<td>8–10</td>
<td>6 units</td>
</tr>
<tr>
<td>&gt;10</td>
<td>8 units</td>
</tr>
</tbody>
</table>

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.

Linda: 3 month review after starting insulin

• Medication:
  Insulin NPH  30 U at bedtime
  Metformin   1000 mg bd
  Gliclazide  120 mg morning
  Aspirin     100 mg daily
  Atorvastatin 40 mg daily
  cilazapril  10 mg daily
Review: 3 months
Linda’s A1c is 8.9% (down from 10.2%) – been on ‘slow’ titration schedule

18 August

Units of basal insulin
Before Breakfast
After Breakfast
After Lunch
Before Bed
Before Breakfast
Before Bed
Next steps

You organise for the Practice Nurse to work with Linda to more rapidly uptitrate the dose of insulin NPH to achieve a FBG of $\leq 6.0$ mmol/L.

You also ask the Practice Nurse to discuss hypoglycaemia and sick day management with Linda. Linda is requested to return to you in 3 months time.
Review: 6 months

- Linda’s FBG readings ≤6 mmol/L
- OHAs unchanged
- Insulin NPH 45 U
- Her BP, urinalysis – all okay
- Pathology results:
  - A1c 7.7%
  - No evidence of microalbuminuria, and a satisfactory lipid profile
**Review: 6 months**

Linda’s A1c is **7.7%** (down from **8.9%**) – been on ‘fast’ titration schedule

---

<table>
<thead>
<tr>
<th>Date</th>
<th>Units of basal insulin</th>
<th>Before Breakfast</th>
<th>Before Lunch</th>
<th>Before Bed</th>
<th>Before Breakfast</th>
<th>After Lunch</th>
<th>Before Dinner</th>
<th>Before Bed</th>
<th>After Lunch</th>
<th>Before Dinner</th>
<th>Before Bed</th>
<th>Carb serves/gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>MON</td>
<td>45</td>
<td>5.8</td>
<td></td>
<td></td>
<td>9.1</td>
<td>5.5</td>
<td>6.9</td>
<td>10.1</td>
<td>4.9</td>
<td>6.5</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>TUE</td>
<td>45</td>
<td>BGL mmol/L</td>
<td></td>
<td></td>
<td>6.9</td>
<td>6.8</td>
<td>6.2</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>WED</td>
<td>45</td>
<td>BGL mmol/L</td>
<td></td>
<td></td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>THU</td>
<td>45</td>
<td>BGL mmol/L</td>
<td></td>
<td></td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>FRI</td>
<td>45</td>
<td>BGL mmol/L</td>
<td></td>
<td></td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
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</tr>
<tr>
<td>SAT</td>
<td>45</td>
<td>BGL mmol/L</td>
<td></td>
<td></td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>SUN</td>
<td>45</td>
<td>BGL mmol/L</td>
<td></td>
<td></td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
<td></td>
</tr>
</tbody>
</table>

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20 November
Reviewing OHA use

Linda is doing well on basal insulin and had no problems with the rapid up-titration process. Linda is now stable at 45 units of basal insulin daily. Linda asks if she still needs her OHAs.
Linda’s OHAs

• Don’t stop OHAs immediately
  – Stopping OHAs may require more insulin
  – Get A1c under control and consider stopping OHAs later

• Understand what each drug does
  – Metformin [& glitazones] = insulin sensitisers
    • should be continued
  – Sulphonylureas = insulin secretagogues
    • will need to be removed when ß-cells stop secreting insulin

• Discontinue if side effects are an issue
  – Metformin:
  – SU:

• Glitazone: fluid retention, weight gain, cardiovascular risks

Find hidden hypers

Fasting preprandial BGL on target (4 – 6 mmol/L)

2 hour postmeal BGL on target (4 – 8 mmol/L)

Is A1C 6-12 weeks later at target?

Yes → Continue with current schedule

No → Find and fix the hidden hyperglycaemia

a) check 2 hours after breakfast & before bed to check for morning and evening postprandial hyperglycaemia

b) check during the night (only if really necessary!)
Review: another 3 months later
Linda’s A1c remains elevated at 7.6%

10 Feb

<table>
<thead>
<tr>
<th>Day</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units of basal insulin</td>
<td>Before Breakfast</td>
<td>After Breakfast</td>
<td>After Lunch</td>
<td>Before Bed</td>
<td>Before Breakfast</td>
</tr>
<tr>
<td>MON</td>
<td>45</td>
<td>48</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>TUE</td>
<td>45</td>
<td>48</td>
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<tr>
<td>WED</td>
<td>45</td>
<td>48</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>THU</td>
<td>45</td>
<td>48</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
</tbody>
</table>

Notes:
Improving glycaemic control

You inform Linda that her BGLs 2 hours after breakfast are consistently high indicating hyperglycaemia after breakfast.
Adjusting insulin therapy

You discuss options with Linda and agree that modifying the insulin schedule is the best option for her.
Then Tackle The Meal Responsible for the Greatest Glycaemic Excursion
Starting prandial insulin

You discuss treatment options and you both agree that adding a single dose of prandial insulin prior to the meal contributing most to hyperglycaemia would be appropriate as she finds it difficult to change her morning eating habits and exercise schedule.
Start prandial insulin at 4 Units

Step 1:
Add prandial insulin to meal most contributing to hyperglycaemia

Starting dose: 4 units1-4§ to meal most contributing

Monitor Postprandial BGLs

Step 2:
If BGL off target (high)
Adjust prandial insulin

Titrate dose
Increase by 2 U every 2 – 3 days
Until postprandial for next meal is 4.0 – 7.7 mmol/L.5

Step 3:
If A1C not at target after 3/12
Add prandial insulin to other meals*

Once prandial insulin is added, insulin secretagogues may be discontinued

§ These dosing guidelines are based on recommendations from a number of authors. They are provided for guidance only. All insulin dosing and titration / adjustments require professional judgment and should be individualised to patient circumstances.

Reviewing BGLs: 4 weeks later
Linda shows you her BGL readings after 4 weeks of prandial insulin (15U) at breakfast.
Linda: summary

• Linda self-titrated insulin dose from 10 U to 45 U (slow titration schedule initially and changed to rapid titration)

• 6 months after starting basal insulin Linda’s fasting BGLs were on target

• Hidden hyperglycaemia suspected with A1C slightly elevated

• Post-breakfast hyperglycaemia identified with more regular BGL testing

• Prandial insulin considered appropriate treatment

• 15 U at breakfast improved glycaemic control

☆ Regular review with Practice Nurse

• Linda to return for review in 3 months
Practice points

• Don’t delay insulin initiation

• Keep it simple for you and patient – 10 units basal insulin

• Ensure patient has expectation that basal dose will increase and what the dose may end up at

• Titrate! Fix the fasting first! Then look for hidden hypers
Insulin Switch- NPH to Long acting analogues (Glargine or Detemir)

- From once daily NPH
  1 unit of NPH = 1 unit of Long acting analogue

- From twice daily NPH
  80% of total daily (NPH) dose = Units of Long acting analogue
25 units premixed insulin twice daily (50U) 
(30:70)

30% of 50 units is rapid-acting insulin 
15 units

70% of 50 units is basal insulin 
35 units

Reduce dose by 20%
0.8 x 35 units
= 28 units/day long-acting basal
Converting from premixed to long-acting basal insulin

- Premixed once daily
  - Use 100% of total basal dose once daily*
- Premixed twice daily
  - Use 70-80% of total basal dose once daily*

*Fix the fasting BG then review the need for prandial insulin

Insulin Switch- NPH to Twice daily preMix insulins
eg; Penmix 30/70, HumalogMix 25/75

- If already on twice daily NPH dose, initiate same dose of Premix insulin dose twice daily

- If on once a day NPH insulin, you may consider splitting the dose twice daily.

- Either 2/3\textsuperscript{rd} in the morning and 1/3\textsuperscript{rd} in the evening with meals

eg; Patient is on 60 units of NPH insulin, therefore you can split the dose as 40 units of premix insulin mane and 20 units of premix insulin in the evening.
Insulin Switch- Twice daily PreMix insulins to Basal –bolus regimen

• Calculate Basal Insulin dose (eg; Glargine/Detemir)

  1. Determine Total daily dose of NPH

  eg: Patient on Penmix 30 insulin 50 units twice daily
   ( NPH 35 units and Regular insulin 15 units twice daily)
   Lantus/Levemir dose would be =80% of 70 Units of NPH=56 units

• Calculate bolus insulin dose (eg; Apidra, Novorapid or Humalog)

  Above patient will need = total daily dose of regular insulin
  \[ \div 3, \ 30/3=10 \text{ units} \]
Insulin Switch-
Basal insulin to Twice daily PreMix insulins
eg; Penmix 30 or HumalogMix 25

- Calculate the total daily basal insulin dose
  2 options;
  ► give 2/3rd in the morning with breakfast and 1/3rd with dinner meal
  or
  ► give ½ with breakfast and ½ with dinner meal

eg: Patient takes 46 units of NPH at night and 34 units of NPH at breakfast

Therefore, either 40 units twice daily or 54 units mane and 26 units evening of Premix insulin
“The healthiest part of a donut is the hole. Unfortunately, you have to eat through the rest of the donut to get there!”
Thank you.

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