Breaking down barriers to initiating insulin

Insulin prescription pad

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Many patients with type 2 diabetes mellitus (T2DM) require insulin therapy to achieve and maintain glycemic control.[1] Family physicians provide most of the care for these patients and are usually the first point of contact in the insulin conversation. Therefore, it is important that family physicians have the knowledge and skills to initiate and titrate insulin, and any additional tools they can use to assist them in the process would be beneficial. In this article, we describe a practical and educational tool to aid primary care physicians and diabetes specialists in insulin initiation and titration in patients with T2DM.

Barriers to insulin initiation

Optimizing glycemic control by starting insulin therapy can be delayed owing to a number of real and perceived barriers on the part of the patient, the health care provider, and the health care system.[2] Patients often perceive insulin initiation as a failure[3] in their management of diabetes, leading to self-blame and feelings of guilt and anxiety. Patients are also often deterred by the perceived inconvenience and lack of portability of insulin.[4] Other patient and physician barriers include the fear of hypoglycemia, fear of weight gain, lack of understanding of the need for insulin, discomfort with insulin dosing and titration, and lack of time and resources, to name a few.

Identifying potential barriers and addressing concerns through counseling (including education about modern insulin-delivery devices) might improve patient acceptance.[4,5] An interprofessional approach can facilitate this transition to insulin therapy through education and empowerment of the patient to engage in self-management. Fear of hypoglycemia can be addressed by recognizing and modifying risk factors for hypoglycemia, such as type and timing of insulin, missed meals, alcohol intake, and physical activity. Weight gain can be minimized through an interprofessional approach, promoting regular exercise, modifying diet, and selecting an appropriate insulin regimen. Lack of understanding of the need for insulin can be addressed through proper education about the benefits of improved glycemic control, including reduced microvascular and macrovascular complications.[6] As for the barrier of discomfort with insulin dosing and titration, the insulin prescription pad (**Figures 1** and **2**)[7] can serve as an educational and functional tool.

Insulin prescription pad

The insulin-specific prescription pad (**Figures 1** and **2**),[7] developed by the Canadian Diabetes Association and adapted from the Insulin Prescription Tool of the Ontario College of Family Physicians and the New Brunswick Diabetes Task Group, can be found at the Canadian Diabetes Association website (**guidelines.diabetes.ca**) and can be used free of charge. This tool is both educational and practical, facilitating the process of insulin initiation and titration.

Front page. The front page of the tool is the prescription component (**Figure 1**).[7] To begin, a practitioner chooses the type of insulin—each section represents a type of insulin (basal, bolus, premixed). Then the practitioner selects a specific brand of insulin—manufacturer names are presented in alphabetical order and divided into columns. After selecting the specific insulin and delivery method (vial, cartridge, or prefilled pen device), the practitioner then completes the starting dose and titration schedule according to the template provided. With this tool, the physician can prescribe not only the type of insulin but also the pen device and other supplies, such as pen needles, test strips, and lancets, that are required when initiating therapy. This page can be maintained on file to monitor changes in insulin requirements and can serve as a quick guide to monitoring trends in insulin requirements.

Back page. The back of the insulin prescription pad (**Figure 2**)[7] provides information on the 3 commonly used insulin regimens in patients with T2DM: basal, basal-bolus, and premixed insulin. With each regimen, recommendations are made with respect to target levels, starting doses, appropriate titration doses, and timing. Dosing and titration are further explained with example cases in the right-hand column.

It is often preferable to start with basal insulin because it is simple to use, causes less weight gain, and is associated with a reduced risk of hypoglycemia compared with premixed or basal-bolus regimens. Insulin combined with oral antihyperglycemic agents compared with insulin alone has similar effects on glycemic control and better effects on weight gain, lower insulin requirements, and hypoglycemia.[2] The tool provides guidance on which non-insulin antihyperglycemic agents should be stopped for each regimen. Continuing metformin therapy, unless contraindicated,

Figure 1. Insulin-specific prescription pad: *Front page.*

Insulin Prescription

Choose insulin(s) from one of the columns and then complete the dosing and titration column.

Prescriber's Name: | **Patient's Name:**
Address: | Address:
Tel: Fax: | Tel:

STEP 1: Choose Insulin Type				STEP 2: Dosing and Titration
BASAL **Long-acting analogues** (Clear)		☐ **Levemir®** ☐ Cartridge ☐ FlexTouch® (prefilled)	☐ **Lantus®** ☐ Cartridge ☐ Vial ☐ SoloSTAR® (prefilled)	**Starting dose:** _____ units at bedtime Increase dose by _____units every night until fasting blood glucose has reached the patient's individual target of _____mmol/L.
Intermediate-acting (Cloudy)	☐ **Humulin® N** ☐ Cartridge ☐ Vial ☐ Kwikpen™ (prefilled)	☐ **Novolin® ge NPH** ☐ Cartridge ☐ Vial		
PRANDIAL (BOLUS) **Rapid-acting analogues** (Clear) Give 0-10 minutes before meal.	☐ **Humalog®** ☐ Cartridge ☐ Vial ☐ Kwikpen™ (prefilled)	☐ **NovoRapid®** ☐ Cartridge ☐ Vial ☐ FlexTouch® (prefilled)	☐ **Apidra®** ☐ Cartridge ☐ Vial ☐ SoloSTAR® (prefilled)	**Starting dose:** _____ units ac breakfast _____ units ac lunch _____ units ac supper
Short-acting (Clear) Give 30 minutes before meal.	☐ **Humulin® R** ☐ Cartridge ☐ Vial	☐ **Novolin® ge Toronto** ☐ Cartridge ☐ Vial		
PREMIXED **Premixed analogues** (Cloudy) Give 0-10 minutes before meal.	☐ **Humalog® Mix25™** ☐ Cartridge ☐ Kwikpen™ (prefilled) ☐ **Humalog® Mix50™** ☐ Cartridge ☐ Kwikpen™ (prefilled)	☐ **NovoMix® 30** ☐ Cartridge		**Starting doses:** _____ units ac breakfast _____ units ac supper Increase breakfast dose by _____units every day until pre-supper blood glucose has reached the target of _____mmol/L. Increase pre-supper dose by _____units every day until fasting blood glucose has reached the target of _____mmol/L. Beware of hypoglycemia post-breakfast or post-supper. Stop increasing dose if hypoglycemia occurs.
Premixed regular (Cloudy) Give 30 minutes before meal.	☐ **Humulin® 30/70** ☐ Cartridge ☐ Vial	☐ **Novolin® ge 30/70** ☐ Cartridge ☐ Vial ☐ **Novolin® ge 40/60** ☐ Cartridge ☐ **Novolin®ge 50/50** ☐ Cartridge		
PEN DEVICE Required if insulin cartridges selected. Insulin pen should match the insulin brand.	☐ **HumaPen® Savvio™** ☐ **HumaPen LUXURA® HD** ☐ **HumaPen® MEMOIR™**	☐ **NovoPen® 4** ☐ **NovoPen Echo®**	☐ **ClikSTAR™**	
OTHER SUPPLIES	☐ **Pen needles (if using a pen):** Check needle size (refer to back for information): ☐ 4mm ☐ 5mm ☐ 6mm ☐ 8mm **OR** ☐ At discretion of pharmacist ☐ Glucose test strips ☐ Lancets ☐ Insulin Syringe (if using vials) ☐ Glucagon Kit (if applicable) ☐ Ketone Strips (if applicable)			
QUANTITY and REPEATS	**Insulin** Mitte: _____ boxes Repeats x _____		**Supplies** Mitte: _____ boxes Repeats x _____	

Signature: Date:
Print Name: License #:

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Canadian Diabetes Association

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is encouraged to allow for improved glycemic control and less risk of weight gain and hypoglycemia. Further glucose lowering can also be achieved with combination therapy with dipeptidyl peptidase 4 inhibitors and glucagonlike peptide 1 receptor agonists. Sulfonylurea therapy can be continued with basal insulin use, but stopped when bolus insulin is added.[8]

The final row of the back page provides recommendations for the selection of a pen needle.

In practice

Using the insulin prescription pad in our practice has removed the uncertainty around selecting a starting insulin regimen and has provided a rational approach to titrating insulin therapy. Owing to its function as a prescription that can be completed with a few check marks and numbers, it has also increased efficiency and clarity when prescribing insulin types and the required supplies.

The insulin prescription tool is an evidence-based,[9] effective, and time-saving means of starting insulin therapy in patients with T2DM. With its rational approach to titrating insulin therapy, the tool can be adapted to any patient, and patients themselves can titrate their own therapy with support from their health care providers. This tool is also great for teaching trainees. We hope that this insulin prescription tool will ease the initiation of insulin therapy and will facilitate the process of choosing an appropriate insulin regimen.

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Competing interests

Dr Cheng has received honoraria for speaking at or attending advisory board meetings of the following: AstraZeneca, Boehringer Ingelheim, Eli Lilly, Sanofi, Janssen, Merck, Novo Nordisk, Servier, and Takeda.

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Figure 2. Insulin-specific prescription pad: *Back page.*

Insulin Initiation and Titration Suggestions for Type 2 Diabetes

People starting insulin should be counseled about the prevention, recognition and treatment of hypoglycemia.

The following are suggestions for insulin initiation and titration. Clinical judgment must always be used as the suggestions may not apply to every patient.

Basal Insulin (only) as an add-on to Antihyperglycemic Agents (Lantus®, Levemir®, Humulin® N, Novolin® ge NPH)

- Target fasting blood glucose (BG) of 4-7 mmol/L.
- Most patients will need 40-50 units at bedtime to achieve target but there is no maximum dose.
- Start at a low dose of 10 units at bedtime (may start at lower dose [0.1 -0.2 units/kg] for lean patients [<50 kg]).
- Patient should gently self-titrate by increasing the dose by 1 unit every 1 night until fasting BG target of 4-7 mmol/L is achieved.
- If fasting hypoglycemia occurs, the dose of bedtime basal should be reduced.
- Metformin and the secretagogue are usually maintained when basal insulin is added.
- If daytime hypoglycemia occurs, reduce the oral antihyperglycemic agents (especially secretagogues).
- Lantus® or Levemir® can be given at bedtime or in the morning.

Dosing and Titration

Starting dose 10 units at bedtime.

Increase dose by 1 unit every 1 night until fasting blood glucose has reached the target of 4-7 mmol/L (usual target).

Basal + Bolus Insulins

- When basal insulin added to antihyperglycemic agents is not enough to achieve glycemic control, bolus (prandial) insulin should be added before meals. The regimens below incorporate bolus (prandial) insulin. There is the option of only adding bolus insulin to the meal with the highest postprandial BG as a starting point for the patient who is not ready for more injections.
- Typically, insulin secretagogues are stopped and only metformin is continued when bolus (prandial) insulin is added.
- For current basal insulin users, maintain the basal dose and add bolus insulin with each meal at a dose equivalent to 10% of the basal dose. For example, if the patient is on 50 units of basal insulin, add 5 units of bolus insulin with each meal.
- For new insulin users starting a full Basal + Bolus regimen, calculate Total Daily Insulin dose (TDI) as 0.3 to 0.5 units/kg, then distribute as follows:
  - 40% of TDI dose as basal insulin (Lantus®, Levemir®, Humulin® N, Novolin®ge NPH) at bedtime.
  - 20% of TDI dose as prandial (bolus) insulin prior to each meal.
  - Rapid-acting insulin analogues (Apidra®, Humalog®, NovoRapid®) should be given 0-10 minutes before eating.
  - Short-acting insulin (Humulin® R, Novolin® ge Toronto) should be given 30 minutes before eating.
- An alternative distribution is 50% basal insulin (at bedtime) and 50% bolus insulin (distributed among the meals of the day).
- Adjust the dose of the basal insulin to achieve the target fasting BG level (usually 4-7 mmol/L).
- Adjust the dose of the bolus (prandial) insulin to achieve postprandial BG levels (usually 5-10 mmol/L) or pre-prandial BG levels for the subsequent meal (usually 4-7 mmol/L).

Dosing Example (100kg person)

Total daily insulin = 0.5 units/kg:
0.5 x 100kg (TDI)
- TDI = 50 units

Basal insulin = 40% of TDI:
40% x 50 units
- Basal bedtime = 20 units

Bolus insulin = 60% of TDI:
60% x 50 units
- Bolus = 30 units

= 10 units with each meal

Premixed Insulin Before Breakfast and Before Dinner
(Humalog® Mix25™, Humalog® Mix50™, NovoMix® 30, Humulin® 30/70, Novolin®ge 30/70)

- Target fasting and pre-supper BG levels of 4-7 mmol/L.
- Most patients with type 2 diabetes will need 40-50 units twice a day to achieve target but there is no maximum dose.
- Start at a low dose of 5 to 10 units twice daily (before breakfast and before supper).
- Patient can gently self-titrate by increasing the breakfast dose by 1 unit every day until the pre-supper BG is at target.
- Patient can gently self-titrate by increasing the supper dose by 1 unit every day until the fasting BG target is at target.
- Beware of hypoglycemia post-breakfast or post-supper. Stop increasing dose if this occurs.
- Premixed analogue insulins (Humalog® Mix25™, Humalog® Mix50™, NovoMix® 30) should be given 0 to 10 minutes before eating.
- Premixed regular insulins (Humulin® 30/70, Novolin® ge 30/70) should be given 30 minutes before eating.
- Continue Metformin and consider stopping secretagogue.

Dosing and Titration

10 units ac breakfast , 10 units ac supper.

Increase breakfast dose by 1 unit every 1 day until pre-supper blood glucose has reached the target of 4-7 mmol/L (usual target).

Increase supper dose by 1 unit every 1 day until fasting blood glucose has reached the target of 4-7 mmol/L (usual target).

Selection of Pen Needle

- Forum for Injection Technique (FIT) Canada recommends that 4, 5, and 6mm needles are suitable for all people with diabetes regardless of BMI. In addition, there is no clinical reason for recommending needles longer than 8mm. Initial insulin therapy should start with the shorter needle length (Berard L, et al. FIT Forum for Injection Technique Canada. Recommendations for Best Practice in Injection Technique. October 2011).

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