

# Diabetes Management: Medications 101

Session Seven  
Diabetes 101 Education Series

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# Outline

- Prevalence of Diabetes
- Prevention and Management
- Importance of Pharmacological Interventions
- Hemoglobin A1C
- Pharmacologic Glycemic Management of Type 2 Diabetes in Adults
- Insulin
- Injection Techniques
- Glucose Lowering Medications
- Resources
- Questions
- Evaluation

## National Age-Adjusted Prevalence of Diabetes by Population



On-Reserve FN



Off-Reserve FN



Metis



Non-Indigenous



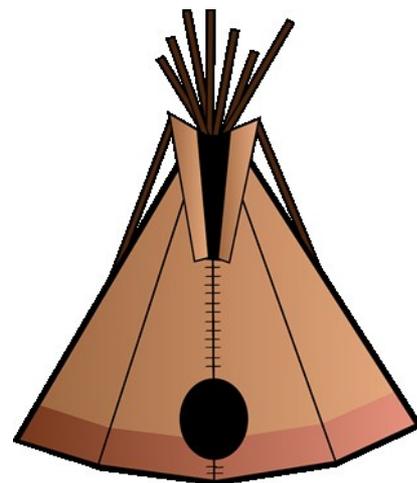
Inuit

(Institute of Health Economics, 2017)

# Prevention and Management

- In diabetes, the steps you take to prevent diabetes are the same steps you take to manage diabetes.
- This idea is helpful when you plan programs and/or talk to clients.
- The basics of diabetes prevention and management are: Nutrition, Active Living and Medications.
- Culture is at the core of prevention and management.

Medications



Nutrition

Active Living

# Importance of Medication Management

The goals for all people with diabetes are:

- To maintain or improve the individual's quality of life
- To attain optimal glycemic control for the individual
- To prevent or delay the onset and progression of complications
- To minimize potential adverse events related to treatment

# How Effective is Diabetes Management?

Nutrition



**A1C by 1 – 2%**

Active Living



**A1C by 0.4 – 0.9%**

Medications



**A1C by 0.5 – 1.5%**

# Hemoglobin A1C

## A1C and estimated average blood glucose

<b>6%</b>	<b>7.0</b>
<b>7%</b>	<b>8.6</b>
<b>8%</b>	<b>10.2</b>
<b>9%</b>	<b>11.8</b>
<b>10%</b>	<b>13.4</b>
<b>11%</b>	<b>14.9</b>
<b>12%</b>	<b>16.5</b>

# AT DIAGNOSIS OF TYPE 2 DIABETES

Start healthy behavior interventions (nutritional therapy, weight management, physical activity) +/- metformin

A1C < 1.5% above target

A1C ≥ 1.5% above target

Symptomatic hyperglycemia and/or metabolic decompensation

If not at glycemic target (3 months)

Start / Increase metformin

Start metformin immediately  
Consider a second concurrent antihyperglycemic agent

Initiate insulin +/- metformin

If not at glycemic targets

Clinical CVD?

YES

NO

Start anti-hyperglycemic agent with demonstrated CV benefit  
Empagliflozin  
Liraglutide  
Canagliflozin

Add additional anti-hyperglycemic agent best suited to the individual based on the following:

Clinical Considerations

Choice of Agent

Avoidance of hypoglycemia and/or weight gain with adequate glycemic efficacy

DPP-4 inhibitor, GLP-1 receptor agonist or SGLT2 inhibitor

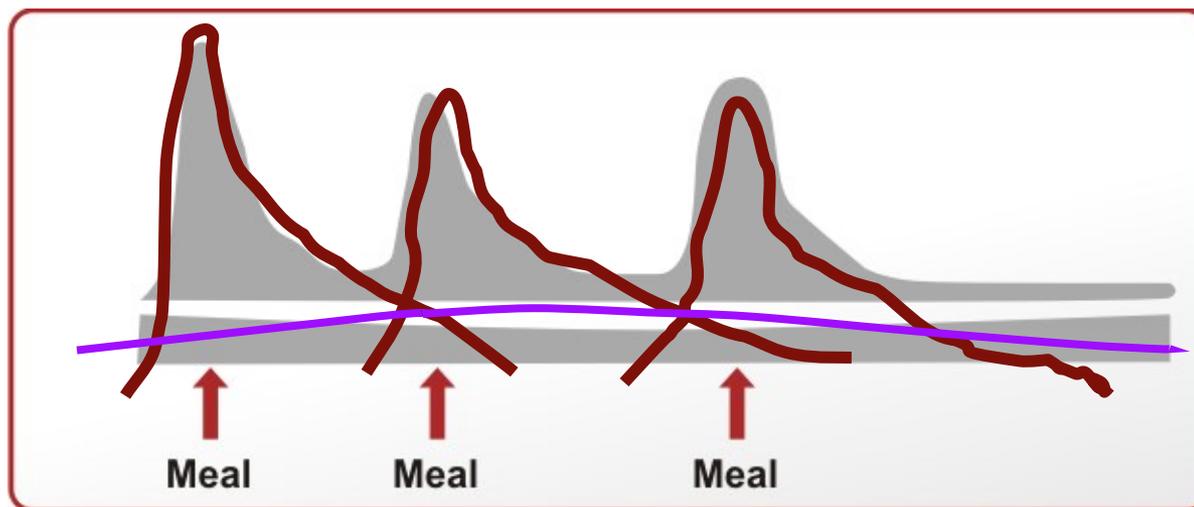
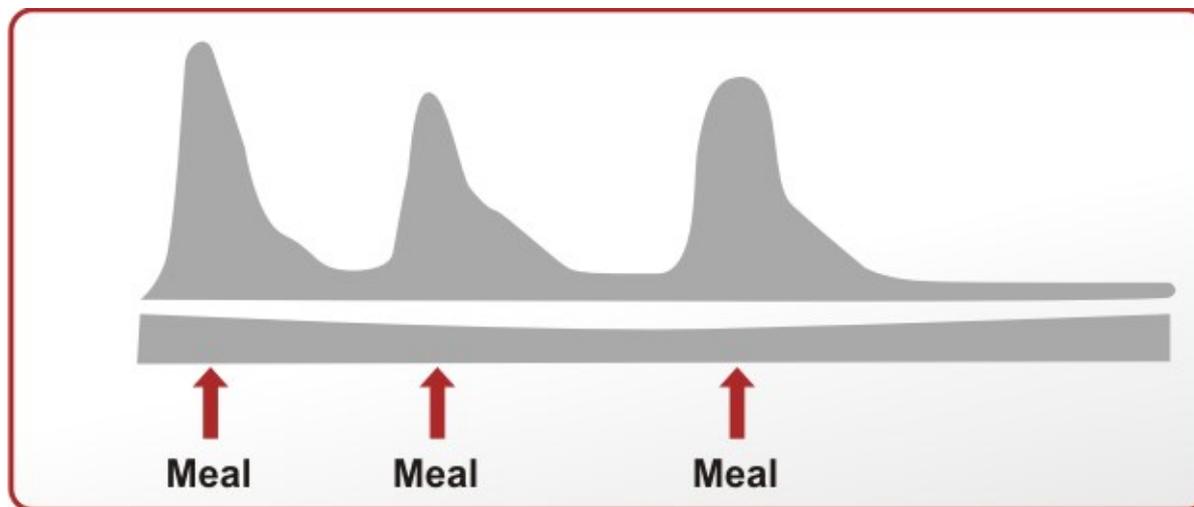
If not at glycemic target

Other considerations:

See additional agents

Healthy Behaviour Interventions

# Insulin



# Types of Insulin



Contents lists available at ScienceDirect

Canadian Journal of Diabetes

journal homepage:  
www.canadianjournalofdiabetes.com

**DIABETES  
CANADA**



## Appendix 6

### Types of Insulin

Types of insulin			
Insulin type (trade name)	Onset	Peak	Duration
<b>Bolus (preprandial or mealtime) insulins</b>			
Rapid-acting insulin analogues (clear)			
• Insulin aspart (NovoRapid®)	9–20min	1–1.5h	3–5h
• Insulin glulisine (Apidra®)	10–15min	1–1.5h	3.5–5h
• Insulin lispro (Humalog®) U-100 U-200	10–15min	1–2h	3–4.75h
• Faster-acting insulin aspart (Fiasp®)	4min	0.5–1.5h	3–5h
Short-acting insulins (clear)			
• Insulin regular [Humulin®-R, Novolin® ge Toronto]	30min	2–3h	6.5h
• Insulin regular [Entuzity® (U-500)]	15min	4–8h	17–24h
<b>Basal insulins</b>			
Intermediate-acting (cloudy)			
• Insulin neutral protamine Hagedorn (Humulin® -N, Novolin® ge NPH)	1–3h	5–8h	Up to 18h
Long-acting insulin (clear)			
• Insulin detemir (Levemir®)	90min	Not applicable	U-100 glargine 24h, detemir 16–24h U-300 glargine >30h degludec 42h
• Insulin glargine U-100 (Lantus®)			
• Insulin glargine U-300 (Toujeo®)			
• Insulin glargine biosimilar (Basaglar®)			
• Degludec U-100, U-200 (Tresiba®)			
<b>Premixed insulins</b>			
Premixed regular insulin –NPH (cloudy)			
• Humulin® 30/70	A single vial or cartridge contains a fixed ratio of insulin		
• Novolin® ge 30/70, 40/60, 50/50			
Premixed insulin analogues (cloudy)			
• Biphasic insulin aspart (NovoMix® 30)	(% of rapid-acting or short-acting insulin to % of intermediate-acting insulin)		
• Insulin lispro/lispro protamine (Humalog® Mix25 and Mix50)			
Data represents estimations derived from pooled data analysis using various experimental conditions. There is significant inter- and intra-individual variation in pharmacokinetics and pharmacodynamics depending on a variety of clinical factors, including dose.			
Physicians should refer to the most current edition of <i>Compendium of Pharmaceuticals and Specialties</i> (Canadian Pharmacists Association; Ottawa, Ontario, Canada) and product monographs for detailed information.			

# Types of Insulin

TYPE	NAME	ONSET	PEAK	DURATION
<b>Basal Long-acting analogues (clear)</b>	Basaglar			42 h
	Levemir	90min		16 – 24 h
	Tresiba		n/a	24 h
	Lantus			>30 hours
	Toujeo			
<b>Intermediate- acting (cloudy)</b>	Humulin N Novolin NPH	1 – 3 h	5 – 8 h	Up to 18 h
<b>Bolus Rapid Acting analogues (clear)</b>	lispro (Humalog) U-100, U-200	10 – 15 min 9 – 20 min	1 – 2 h 1 - 1.5 h	3 – 4.75 h 3 – 5 h
	aspart (Novorapid)	4 min	0.5 – 1.5 h	3 – 5 h
	faster acting aspart (Fiasp)	10 – 15 min	1 – 1.5 h	3.5 – 5 h
	glulisine (Apidra)			
<b>Short acting (clear) Give 30 minutes before meal</b>	Regular (Humulin R, Novolin Toronto)	30 min	2 – 3 h	6.5 h
	Entuzity U-500	15 min	4 – 8 h	17 – 24 h
<b>Premixed analogues (cloudy)</b>	Humalog Mix 25 Humalog Mix 50 Novomix 30	% of rapid-acting or short-acting insulin to % of intermediate-acting insulin.		
<b>Premixed regular (cloudy)</b>	Humulin 30/70 Novolin 30/70 Novolin 40/60 Novolin 50/50	A single vial or cartridge contains a fixed ratio of insulin.		

# Insulin Prescription

## Insulin Prescription

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

Prescriber's Name: \_\_\_\_\_

Address: \_\_\_\_\_

Tel: \_\_\_\_\_

Fax: \_\_\_\_\_

Patient's Name: \_\_\_\_\_

Address: \_\_\_\_\_

Tel: \_\_\_\_\_

STEP 1: Choose Insulin Type			STEP 2: Dosing and Titration	
<b>BASAL</b> <b>Long-acting analogues</b> (Clear)	<input type="checkbox"/> <b>Basaglar™</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Kwikpen® (prefilled)	<input type="checkbox"/> <b>Levemir®</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> FlexTouch® (prefilled) <input type="checkbox"/> <b>Tresiba®</b> <input type="checkbox"/> FlexTouch® 100 U/mL (prefilled) <input type="checkbox"/> FlexTouch® 200 U/mL (prefilled)	<input type="checkbox"/> <b>Lantus®</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial <input type="checkbox"/> SoloSTAR® (prefilled) <input type="checkbox"/> <b>Toujeo™</b> <input type="checkbox"/> SoloSTAR® (prefilled)	<b>Starting dose:</b> _____ units at _____  Increase dose by _____ units every _____ until fasting blood glucose has reached the patient's individual target of _____ mmol/L.
<b>Intermediate-acting</b> (Cloudy)	<input type="checkbox"/> <b>Humulin® N</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial <input type="checkbox"/> Kwikpen® (prefilled)	<input type="checkbox"/> <b>Novolin® ge NPH</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial		
<b>PRANDIAL (BOLUS)</b> <b>Rapid-acting analogues</b> (Clear)	<input type="checkbox"/> <b>Humalog®</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial <input type="checkbox"/> Kwikpen® (prefilled) <input type="checkbox"/> <b>Humalog® 200 units/mL</b> <input type="checkbox"/> Kwikpen® (prefilled)	<input type="checkbox"/> <b>Fiasp®</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial <input type="checkbox"/> FlexTouch® (prefilled) <input type="checkbox"/> <b>NovoRapid®</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial <input type="checkbox"/> FlexTouch® (prefilled)	<input type="checkbox"/> <b>Apidra®</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial <input type="checkbox"/> SoloSTAR® (prefilled)	<b>Starting dose:</b> _____ units ac breakfast _____ units ac lunch _____ units ac supper
<b>Short-acting</b> (Clear) Give 30 minutes before meal.	<input type="checkbox"/> <b>Humulin® R</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial	<input type="checkbox"/> <b>Novolin® ge Toronto</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial		
<b>PREMIXED</b> <b>Premixed analogues</b> (Cloudy)	<input type="checkbox"/> <b>Humalog® Mix25™</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Kwikpen® (prefilled) <input type="checkbox"/> <b>Humalog® Mix50™</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Kwikpen® (prefilled)	<input type="checkbox"/> <b>NovoMix® 30</b> <input type="checkbox"/> Cartridge		<b>Starting doses:</b> _____ 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.
<b>Premixed regular</b> (Cloudy) Give 30 minutes before meal.	<input type="checkbox"/> <b>Humulin® 30/70</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial	<input type="checkbox"/> <b>Novolin® ge 30/70</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> Vial <input type="checkbox"/> <b>Novolin® ge 40/60</b> <input type="checkbox"/> Cartridge <input type="checkbox"/> <b>Novolin® ge 50/50</b> <input type="checkbox"/> Cartridge		
<b>PEN DEVICE</b> Required if insulin cartridges selected. Insulin pen should match the insulin brand.	<input type="checkbox"/> <b>HumaPen® Savvio™</b> <input type="checkbox"/> <b>HumaPen LUXURA® HD</b>	<input type="checkbox"/> <b>NovoPen® 4</b> <input type="checkbox"/> <b>NovoPen Echo®</b> <input type="checkbox"/> <b>NovoPen® 5</b>	<input type="checkbox"/> <b>ClikSTAR™</b>	
<b>OTHER SUPPLIES</b>	<input type="checkbox"/> <b>Pen needles (if using a pen):</b> Check needle size (refer to back for information): <input type="checkbox"/> 4mm <input type="checkbox"/> 5mm <input type="checkbox"/> 6mm <input type="checkbox"/> 8mm <b>OR</b> <input type="checkbox"/> At discretion of pharmacist <input type="checkbox"/> Glucose test strips <input type="checkbox"/> Lancets <input type="checkbox"/> Insulin Syringe (if using vials) <input type="checkbox"/> Glucagon Kit (if applicable) <input type="checkbox"/> Ketone Strips (if applicable)			
<b>QUANTITY and REPEATS</b>	<b>Insulin</b> Mitte: _____ boxes Repeats x _____	<b>Supplies</b> Mitte: _____ boxes Repeats x _____		

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Date: \_\_\_\_\_

License #: \_\_\_\_\_

This tool was developed by the Ontario College of Family Physicians and the New Brunswick Diabetes Task Group and was re-produced with permission by Diabetes Canada. Diabetes Canada will keep this tool updated and available at guidelines.diabetes.ca. Updated December 2017 / 416584

guidelines.diabetes.ca  
 diabetes.ca | 1-800-BANTING (226-8464)



# Insulin Prescription 2

Insulin Initiation and Titration Suggestions for Type 2 Diabetes	
<p><b>People starting insulin should be counseled about the prevention, recognition and treatment of hypoglycemia.</b> The following are suggestions for insulin initiation and titration. Clinical judgment must always be used as the suggestions may not apply to every patient.</p>	
<p><b>Basal Insulin (only) as an add-on to Antihyperglycemic Agents</b> (Basaglar™, Lantus®, Levemir®, Toujeo™, Tresiba®, Humulin® N, Novolin® ge NPH)</p> <ul style="list-style-type: none"> <li>Target fasting blood glucose (BG) of 4-7 mmol/L. The fasting BG target can be changed to 4-5.5 mmol/L if not achieving adequate overall glycemic control.</li> <li>Most patients will need 40-50 units a day to achieve target but there is no maximum dose.</li> <li>Start at a low dose of 10 units at bedtime (may start at lower dose [0.1 -0.2 units/kg] for lean patients [<math>&lt;50</math> kg]).</li> <li>If using Tresiba®, the dose can be increased by 2-4 units every week until fasting BG target is achieved.</li> <li>If using other basal insulin, patient should self-titrate by increasing the dose by 1 unit every 1 night until fasting BG target is achieved.</li> <li>If fasting hypoglycemia occurs, the dose of bedtime basal should be reduced.</li> <li>Metformin and the secretagogue are usually maintained when basal insulin is added.</li> <li>If daytime hypoglycemia occurs, reduce the oral antihyperglycemic agents (especially secretagogues).</li> <li>Lantus®, Levemir®, Toujeo™ or Tresiba® can be given at bedtime or in the morning.</li> </ul>	<p><b>Dosing and Titration Example</b></p> <p>Starting dose 10 units at bedtime.</p> <hr/> <p>Increase dose by 1 unit every 1 night until fasting blood glucose has reached the target of 4-7 mmol/L.</p>
<p><b>Basal + Bolus Insulins</b></p> <ul style="list-style-type: none"> <li>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.</li> <li>Typically, insulin secretagogues are stopped and only metformin is continued when bolus (prandial) insulin is added.</li> <li>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.</li> <li>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: <ul style="list-style-type: none"> <li>40% of TDI dose as basal insulin (Lantus®, Levemir®, Toujeo™, Humulin® N, Novolin®ge NPH) at bedtime.</li> <li>20% of TDI dose as prandial (bolus) insulin prior to each meal. <ul style="list-style-type: none"> <li>Rapid-acting insulin analogues (Apidra®, Fiasp®, Humalog®, NovoRapid®) should be given 0-10 minutes before eating.</li> <li>Short-acting insulin (Humulin® R, Novolin® ge Toronto) should be given 30 minutes before eating.</li> </ul> </li> </ul> </li> <li>An alternative distribution is 50% basal insulin (at bedtime) and 50% bolus insulin (distributed among the meals of the day).</li> <li>Adjust the dose of the basal insulin to achieve the target fasting BG level (usually 4-7 mmol/L).</li> <li>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).</li> </ul>	<p><b>Dosing Example (100kg person)</b></p> <p><b>Total daily insulin</b> = 0.5 units/kg; 0.5 x 100kg (TDI) • TDI = 50 units</p> <hr/> <p><b>Basal insulin</b> = 40% of TDI: 40% x 50 units • Basal bedtime = 20 units</p> <hr/> <p><b>Bolus insulin</b> = 60% of TDI: 60% x 50 units • Bolus = 30 units = 10 units with each meal</p>
<p><b>Premixed Insulin Before Breakfast and Before Dinner</b> (Humalog® Mix25™, Humalog® Mix50™, NovoMix® 30, Humulin® 30/70, Novolin®ge 30/70)</p> <ul style="list-style-type: none"> <li>Target fasting and pre-supper BG levels of 4-7 mmol/L.</li> <li>Most patients with type 2 diabetes will need 40-50 units twice a day to achieve target but there is no maximum dose.</li> <li>Start at a low dose of 5 to 10 units twice daily (before breakfast and before supper).</li> <li>Patient can gently self-titrate by increasing the breakfast dose by 1 unit every day until the pre-supper BG is at target.</li> <li>Patient can gently self-titrate by increasing the supper dose by 1 unit every day until the fasting BG target is at target.</li> <li>Beware of hypoglycemia post-breakfast or post-supper. Stop increasing dose if this occurs.</li> <li>Premixed analogue insulins (Humalog® Mix25™, Humalog® Mix50™, NovoMix® 30) should be given 0 to 10 minutes before eating.</li> <li>Premixed regular insulins (Humulin® 30/70, Novolin® ge 30/70) should be given 30 minutes before eating.</li> <li>Continue Metformin and consider stopping secretagogue.</li> </ul>	<p><b>Dosing and Titration Example</b></p> <p>10 units ac breakfast , 10 units ac supper.</p> <hr/> <p>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).</p> <hr/> <p>Increase supper dose by 1 unit every 1 day until fasting blood glucose has reached the target of 4-7 mmol/L (usual target).</p>
<p><b>Selection of Pen Needle</b></p> <ul style="list-style-type: none"> <li>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).</li> </ul>	

# Basal Insulin Start

## Insulin Matters

## Basal Insulins

### Selecting a Basal Insulin in T2D

The choice of basal insulin may depend on access, cost, and clinical judgment with respect to the patient's individual needs and lifestyle<sup>3</sup>.

BASAL INSULINS <sup>1</sup>						
Insulin Classification		Peak	Duration of Action	CV Safety	Relative Risk of Hypoglycemia <sup>#</sup>	Considerations
Intermediate-acting (cloudy)	<b>NPH</b> (Humulin <sup>®</sup> -N; Novolin <sup>®</sup> ge NPH)	5 - 8 h	~18h	--	+++	<ul style="list-style-type: none"> <li>Needs resuspension</li> <li>Administered usually twice daily</li> </ul>
Long-acting (clear)	<b>Detemir</b> (Levemir <sup>®</sup> )	NA	16-24h	--	++	<ul style="list-style-type: none"> <li>Administered once or twice daily</li> </ul>
	<b>Gla-100</b> (Lantus <sup>®</sup> , Basaglar <sup>™</sup> )	NA	~24h	Demonstrated (Neutral)	++	<ul style="list-style-type: none"> <li>Administered once daily, same time of day</li> <li>Available in a fixed-ratio combination with lixisenatide<sup>‡</sup></li> </ul>
Next generation (clear)	<b>Gla-300 (U300)</b> (Toujeo <sup>™</sup> )	NA	~30h**	Demonstrated* (Neutral)	+	<ul style="list-style-type: none"> <li>Smaller volume (U300)</li> <li>Administered once daily</li> <li>Flexible +<sup>14</sup></li> </ul>
	<b>Degludec (U100, U200)</b> (Tresiba <sup>®</sup> )	NA	~30h**	Demonstrated (Neutral)	+	<ul style="list-style-type: none"> <li>Option of smaller volume (U200)</li> <li>Administered once daily</li> <li>Flexible ++<sup>15</sup></li> <li>U100 available in a fixed-ratio combination with liraglutide</li> </ul>

Gla-100, glargine 100 U/mL; Gla-300, glargine 300 U/mL

\*Based on results from ORIGIN with Gla-100; \*\*PK/PD studies at 0.4 U/kg; <sup>‡</sup>Titratable combination not yet available in Canada

# + Insulins with least risk of hypoglycemia; ++ Insulins with moderate risk of hypoglycemia; +++ Insulins with highest risk of causing hypoglycemia

\***Intermediate-acting (NPH)**: Approximately 10 confirmed episodes of hypoglycemia per year

\***Long-acting (Gla-100 and detemir)**: from most studies GLA-100 and detemir have reduced risk of hypoglycemia of up to 50%, especially nocturnal, compared to NPH

\***Next generation long-acting (Gla-300 and degludec)**: from most studies Gla-300 and degludec have a reduced risk of hypoglycemia of ~25-50%, especially nocturnal, compared to GLA-100

*This educational tool was developed by the Insulin Matters panel of experts with financial support from sanofi-aventis Canada Inc., and is for health care professionals only.*

References: See reverse side

1

# Insulin start checklist

Topic	Instruction date & initials	Comments
<b>1. Cognitive Assessment</b>		
<b>2. Insulin delivery</b>		
• loading		
• appropriate mixing		
• priming shot		
• dialing up dose		
• delivery of insulin		
<b>3. Insulin</b>		
• type/action time		
• frequency/timing		
• injection sites		
• needle length		
• storage/expiry		
<b>4. Return demonstration</b>		
<b>5. Hypoglycemia</b>		
• signs/symptoms		
• causes/preventions		
• treatment		
• diabetes identification		
<b>6. Glucose checks</b>		
• recommend a monitoring schedule		
<b>7. Sharps disposal</b>		
<b>8. Snacks</b>		
<b>9. Driving</b>		
<b>10. Instructions for oral medication</b>		
<b>11. Follow-up</b>		
• dose adjustment		
• A1c every 3 months		

# Injection Technique



Optimizing  
injection technique  
in diabetes

### 2.0 The correct use of devices

#### 2.1 Use of syringes with an insulin vial

- 1 Proper syringe selection is crucial. The decision regarding which syringe is appropriate should be based on the amount of insulin to be administered (volume: U-30, U-50 or U-100 syringes) and length of needle. Due to the need to pierce the insulin vial stopper, the current shortest available needle length of an insulin syringe is 6 mm.

The use of a 6-mm needle is recommended with or without a skin lift, depending on assessment of the site and amount of subcutaneous tissue. Ensure a skin lift with an 8-mm needle.(22) The use of 12-mm or 12.7-mm needles is not recommended, due to an increased risk of intramuscular injection.



Figure 3. Preparing an insulin syringe

- 2 When preparing to draw up the insulin, the air equivalent to the dose should be drawn up first and injected into the vial, to facilitate easier withdrawal (Figure 3).
- 3 If air bubbles are seen in the syringe, hold it with the needle pointed upwards, tap the barrel to bring them to the top, and then remove the bubbles by pushing the plunger to expel the air.
- 4 When using an 8-mm needle, injections should be administered into a skin lift at a 90-degree angle (Figure 4). To prevent intramuscular injection, lean individuals may need to inject into a skin lift at a 45-degree angle (Figure 5).(23-26)

This method may also be required with a 6-mm needle in particularly lean individuals.

- 5 When administering injections, the following steps should be taken if a skin lift is required:(27,28)
  - Insert the needle completely into the skin lift.
  - Depress the plunger completely.
  - Remove the syringe quickly, at the same angle that it was inserted.
  - Release the skin lift.
- 6 Syringes should be used only once.(29-31)

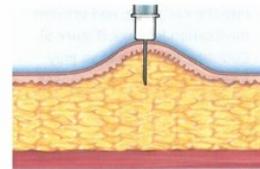


Figure 4. Proper injection into a skin lift at a 90-degree angle

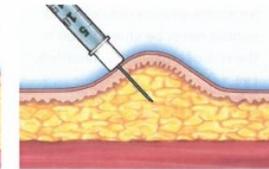
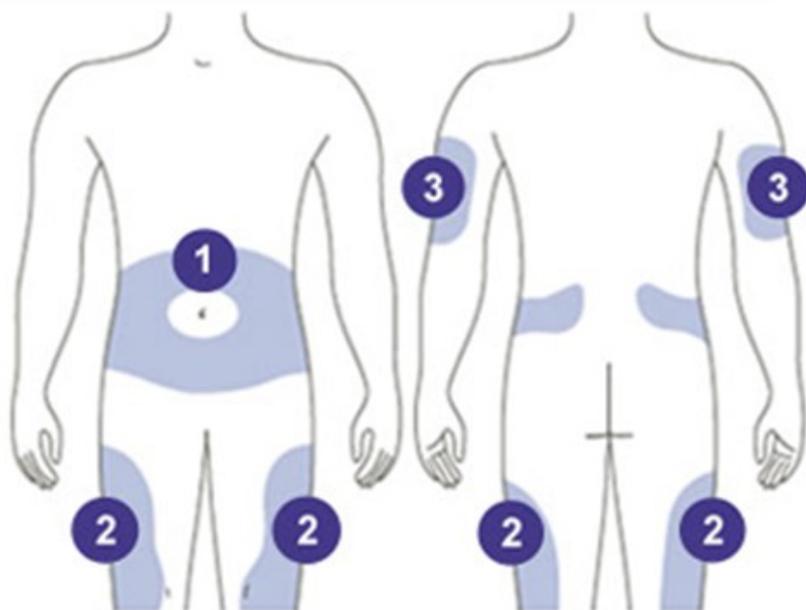


Figure 5. Proper injection into a skin lift at a 45-degree angle

# Lipohypertrophy



## 8.0 Injection area

The abdomen offers the most consistent absorption of regular and NPH insulin.(5)

The arm is not a preferred area for self-injection, due to difficulty accessing the correct zone, difficulty in handling the delivery device to achieve the necessary 90-degree angle and the lessened thickness of subcutaneous fat, which could create a greater potential for intramuscular injection. (4,5,106,113-115)

## 9.0 Lipohypertrophy

### 9.1 Identification of lipohypertrophy

Lipohypertrophy is the most common lipodystrophy found at injection sites.(116) Lipohypertrophic areas can develop under the skin where the same injection or infusion site is used repeatedly. Described as thickened or rubbery lesions (Figure 12),(2,6) lipohypertrophic areas may vary in size and shape; some are visually apparent, while others may require palpation for detection. Recent research suggests that some areas of lipohypertrophy may be detected only via ultrasound.(10,117)

When palpated with the fingertips, lipohypertrophic areas may feel dense and hard.(9,118-121) These lesions can also be identified by pinching the skin: while healthy skin can be pinched together tightly, lipohypertrophic lesions cannot (Figure 13).



Figure 12. Lipohypertrophic lesions

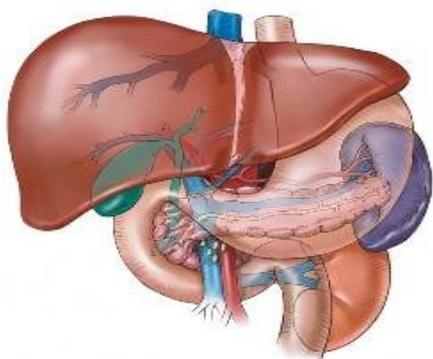


Figure 13. The pinch characteristics of normal (left) vs. lipohypertrophic (right) tissue(120)

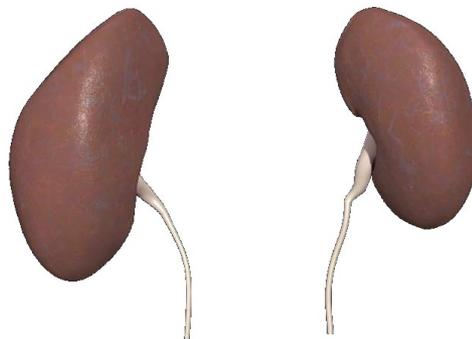
# Site rotation



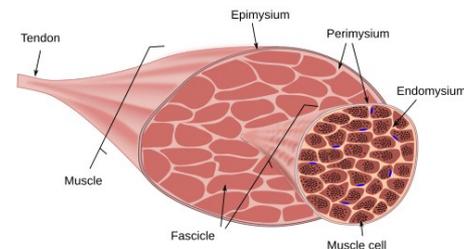
# Where medications work



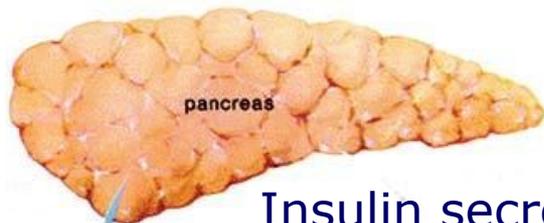
Liver – increased hepatic  
Glucose production



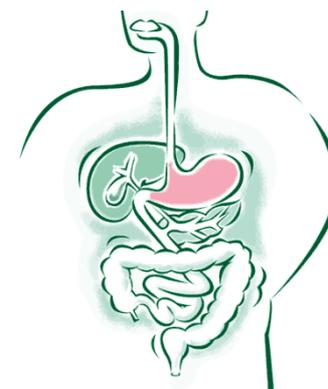
Kidney - Excreting  
glucose into the urine



Muscle and Fat Cells  
Insulin resistance

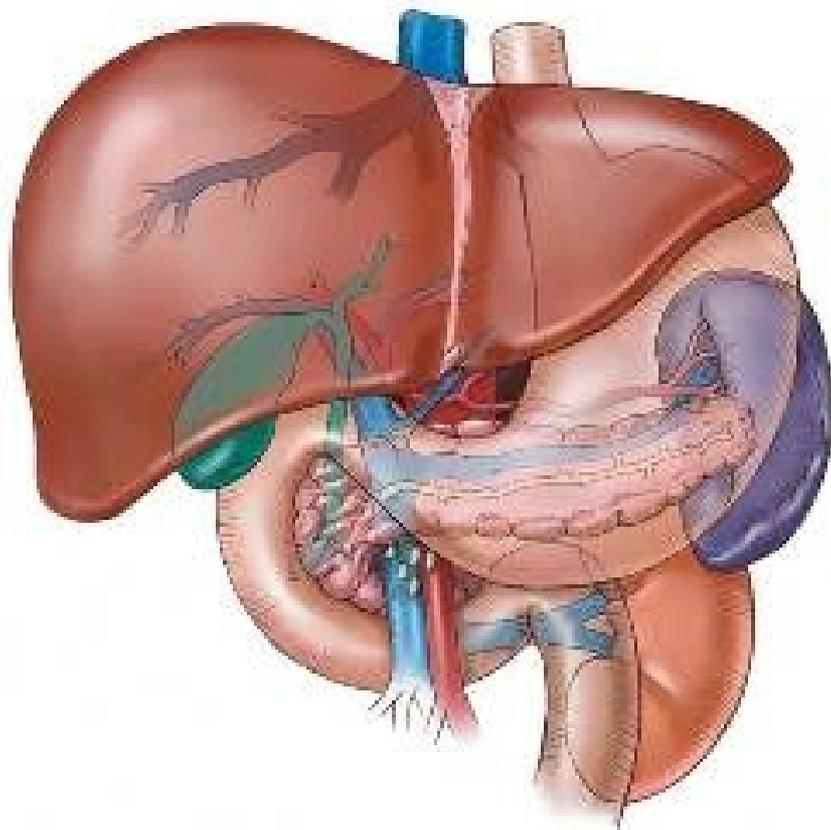


Insulin secretion



Gut Carbohydrate  
Delivery and absorption

# Medications that work with the LIVER

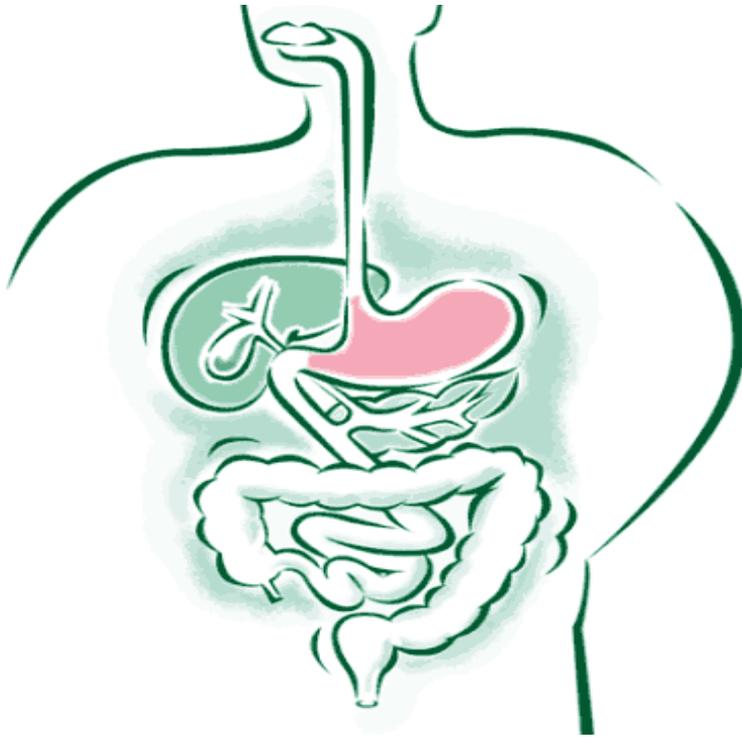


## **Biguanides**

Metformin (Glucophage)

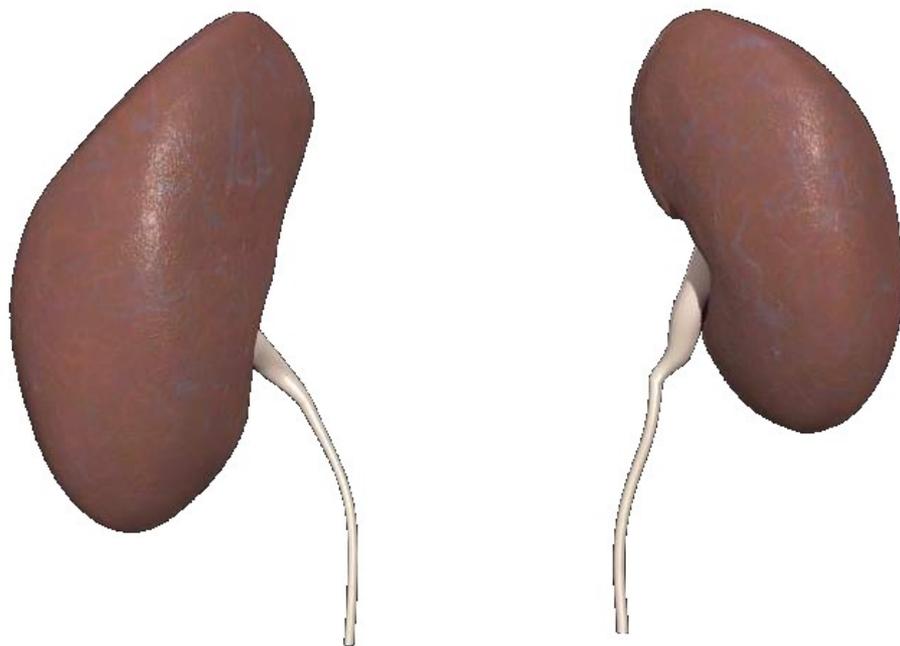
Metformin XR (Glumetza)

# Medications that work with the GUT



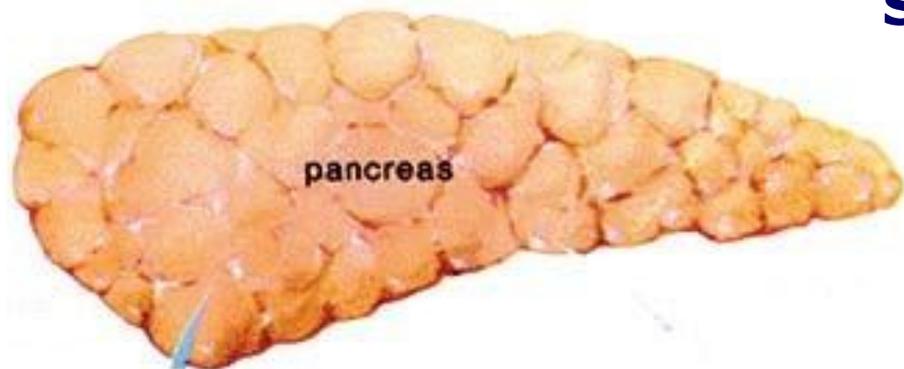
**GLP-1 receptor agonists**  
**DPP-4 Inhibitors**  
**Alpha-glucosidase Inhibitors**

# Medication that works with the KIDNEY



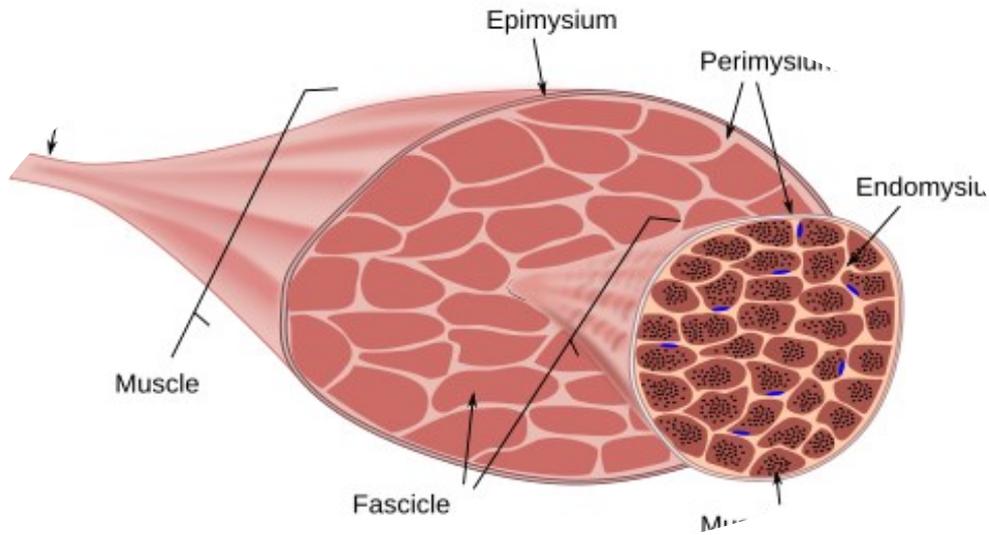
**SGLT2 Inhibitors**

# Medications that work with the PANCREAS



**Sulfonylurea Secretagogues**  
**Meglitinides**

# Medications that work with the MUSCLE /CELLULAR



**Tiazolidinediones (TZDs)**  
**Biguanides**  
**Insulin Therapy**

# Resources

**Diabetes Canada** – [www.diabetes.ca](http://www.diabetes.ca)

2018 Clinical Practice Guidelines: <http://guidelines.diabetes.ca/>

**FIT Injection Canada** <http://fit4diabetes.com/>

## **Alberta Health Services**

**Regional Diabetes Program**, Service providers include dietitians, registered nurses (RNs)

Health Care Professionals can contact this service at 780-735-1050

General Public can contact this services at 780-735-1051

Telephone support available Monday to Friday 9:00 am to 4:00 pm (excludes statutory holidays).

**Health Link:** Call 811 or visit [www.MyHealth.Alberta.ca](http://www.MyHealth.Alberta.ca)



## Diabetes

In 2009, there were almost 206,000 Albertans living with diabetes, which is more than double the number from 15 years previous. Today, more than nine million Canadians, or one in four, live with diabetes or pre-diabetes — a condition that, if left unchecked, is a risk factor for developing type 2 diabetes.

### Provider Resources & Education

#### Provincial

- [Insulin Pump Info for Health Professionals - ipumpit](#)
- [Insulin Pump Therapy](#)
- [Diabetes Foot Care Clinical Pathway](#)
- [Diabetes Update \(14 e-Modules\)](#)
  - [Online course](#) (login required): Do you have questions about diabetes? Find the answers in the 14 new Diabetes Update modules available on the PHC Learning Portal. These web-based courses cover a range of topics such as healthy eating for diabetes management, pharmacotherapy and physical activity. Courses range from 15 – 45 minutes in length to complete.
  - AHS staff should visit MyLearningLink.

#### Edmonton Zone

- [Better Choices, Better Health](#) ©  
Self-management program for patients
- [Diabetes Program](#) – Additional Supports for Health Care Providers and Patients
  - [Diabetes Information and Advice Line \(DIAL\)](#) – 1-866-735-1051
- [Education for Health Care Professionals](#) – Diabetes Parts 1, 2 and 3 (revised course material)
- [Edmonton Zone Diabetes Resource Working Group](#)
- [Zone - Course Calendar](#)

#### Calgary Zone

- [Diabetes Centre Calgary - Endocrinology & Metabolism Program](#)

# Overview of Diabetes 101 Series

- *What is Diabetes? – January 23, 2019*
- *Diabetes Complications – February 28, 2019*
- *History Plays a Part in our Health Today – March 7 , 2019*
- *Diabetes Prevention and Management: Nutrition 101 – March 21, 2019*
- *Diabetes Prevention and Management: Active Living 101 – April 11, 2019*
- *Meaningful Conversations – April 25, 2019*
- **Diabetes Prevention and Management: Medications 101**– May 9, 2019
- **Diabetes in Special Populations: Diabetes in Pregnancy** – May 23, 2019
- **Diabetes in Special Populations: Diabetes and Youth** – June 6, 2019

## References

- Institute of Health Economics. (2017). *Diabetes in Indigenous Populations in Canada: An examination of the burden of disease, economic costs, and factors influencing care*. Edmonton, AB: Institute of Health Economics. Retrieved from [www.ihe.ca](http://www.ihe.ca)
- Crowshoe, L., Dannenbaum, D., Green, M., Henderson, R., & M., H. (2018). Type 2 Diabetes and Indigenous People. *Canadian Journal of Diabetes*, 42, S296-S306.

# Questions?

# Thank you for attending Medications 101!

- Please fill out the Attendance and Evaluation forms for your site. The forms can be found on [www.fntn.ca](http://www.fntn.ca).
- This information helps us plan additional sessions or new series.
- Please send by fax to 780-495-7338 or scan and email to [kathleen.gibson@canada.ca](mailto:kathleen.gibson@canada.ca)
- Please join us on May 23 for Diabetes in Pregnancy!

