

# Diabetes Medication Update: Insulin

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# Diabetes Review

## *Type 1*

- ▶ Absolute insulin deficiency due to beta cell failure
- ▶ Insulin via injections or pump is essential for life
- ▶ Lack of insulin results in DKA, which may lead to coma and death if not promptly recognized and treated
- ▶ Insulin regimen during hospitalization
  - ▶ SQ injections with basal AND mealtime insulin
  - ▶ IV insulin
  - ▶ Insulin pump

## *Type 2*

- ▶ Relative insulin deficiency
- ▶ Several physiologic changes
  - ▶ Decreased beta cell function
  - ▶ Insulin resistance
  - ▶ Increased hepatic glucose production
  - ▶ Decreased gut hormones that help to regulate glucoses
  - ▶ Increased glucagon secretion
- ▶ Treatment
  - ▶ Diet only, oral, insulin, non-inulin injectables - often combination
- ▶ Hospitalization - medication regimen changes are common

# Types of Insulin

## ▶ *Rapid-Acting*

- ▶ Humalog (lispro U-100 and U-200)
- ▶ Novolog (aspart U-100)
- ▶ Fiasp-(ultra fast aspart U-100)
- ▶ Apidra (glulisine U-100)

## ▶ *Short-Acting*

- ▶ Regular

## ▶ *Intermediate-Acting*

- ▶ NPH
- ▶ Humulin R U-500

## ▶ *Long-Acting*

- ▶ Lantus (glargine U-100)
- ▶ Basaglar (glargine U-100)
- ▶ Toujeo (glargine U-300)
- ▶ Levemir (detemir U-100)
- ▶ Tresiba (degludec U-100 and U-200)

# Rapid Acting Insulins

- ▶ Onset: 5-15 min
- ▶ Peak: 30-90 min
- ▶ Duration: 2-4 hours
  
- ▶ Humalog and Humalog U-200 (lispro)
  - ▶ Dispensed: Vial, cartridge or KwikPen; KwikPen Jr/Luxura pen delivers ½ unit amounts
  - ▶ Humalog U-200 only comes in KwikPen
  
- ▶ Novolog (aspart)
  - ▶ Dispensed: Vial, cartridge or FlexPen; NovoPen Echo delivers ½ unit amounts
  - ▶ Fiasp is Novolog (aspart) with a quicker onset of 2.5-5 minutes
  
- ▶ Apidra (glulisine)
  - ▶ Dispensed: Vial or Apidra SoloStar pen



# Rapid Acting Insulins

## ▶ Nursing Considerations

- ▶ NPO status
  - ▶ Hold meal insulin to prevent hypoglycemia
- ▶ Wait to give meal insulin until tray has arrived and patient is ready to eat
  - ▶ Delay in food intake may lead to hypoglycemia if insulin is given too early.
- ▶ Administer insulin 5-15 minutes before the meal if possible
  - ▶ Fiasp (fast acting aspart) is approved to administer at the time of eating or up to 20 minutes post eating.
- ▶ Meal and sliding scale insulin should be the same type
  - ▶ Example: Novolog ordered for meals and Regular ordered for sliding scale.
  - ▶ Contact provider and ask if the same insulin type can be used for both meals and sliding scale.
  - ▶ Different insulin types can potentially lead to medication errors and are often not necessary.
  - ▶ Be sure patient is not discharged with both rapid acting and Regular insulin

# Fast Acting Insulin - Regular

- ▶ Onset: 30-60 minutes
- ▶ Peak: 2-3 hours
- ▶ Duration: 3-5 hours
- ▶ Only insulin that can be used in an IV insulin infusion
- ▶ Dispensed: Vial
- ▶ Does not require a prescription to purchase
- ▶ Walmart ReliOn Regular -\$25 per vial; option if no insurance or high co-pay



# Intermediate Acting Insulin - NPH

- ▶ Onset: 1-2 hours
- ▶ Peak: 4-10 hours
- ▶ Duration: 12-16 hours
- ▶ Dispensed: Vial and NPH KwikPen
- ▶ Does not require a prescription to purchase
- ▶ Walmart ReliOn NPH -\$25 per vial; option if no insurance or high co-pay
- ▶ Patients should not take NPH with long acting insulins (Lantus, Levemir, Tresiba, Toujeo). Check with provider if both are ordered.



# Intermediate Acting Insulin - R U-500

- ▶ 5 times the concentration of Regular U-100
- ▶ Used for patients on large insulin doses
- ▶ Similar onset, peak and duration as NPH
- ▶ Usually dosed BID or TID
- ▶ Dispensed
  - ▶ Humulin R U-500 pen - easiest and safest for home use
  - ▶ Vial
    - ▶ Use with BD green cap U-500 insulin syringe
    - ▶ If standard U-100 syringe is used, calculations need to be done for correct dosing. Not recommended due to potential for medication errors. Need to involve Pharmacist.





# Long Acting Insulins



- ▶ Levemir (detemir), Lantus (glargine), Basaglar (glargine)

- ▶ Onset: 2-4 hours    Peak: None    Duration: 24 hours

- ▶ Dispensed: Vial; Levemir FlexPen, Lantus SoloStar pen and Basaglar KwikPen



- ▶ Toujeo (glargine U-300)

- ▶ Onset: 6 hours    Peak: None    Duration: 36 hours

- ▶ Dispensed: Toujeo SoloStar pen



- ▶ Tresiba (degludec U-100 and U-200)

- ▶ Onset: 1 hour    Peak: None    Duration: 42 hours

- ▶ Dispensed: Tresiba FlexTouch pen



# Premixed Insulins

- ▶ Humulin and Novolin 70/30
  - ▶ 70% NPH and 30% Regular insulin
  - ▶ Dispensed: Vial and pen
  - ▶ Give 30-60 minutes before meals
- ▶ Humalog Mix 75/25
  - ▶ 75% NPL (similar to NPH) and 25% Humalog
  - ▶ Dispensed: Vial and pen
  - ▶ Give 5-15 minutes before meals
- ▶ Humalog Mix 50/50
  - ▶ 50% NPL (similar to NPH) and 50% Humalog
  - ▶ Dispensed: Vial and pen.
  - ▶ Give 5-15 minutes before meals



# Premixed Insulins

- ▶ Novolog 70/30
  - ▶ 70% NPH and 30% Novolog
  - ▶ Dispensed: Vial and pen
  - ▶ Give 5-15 minutes before meals



- ▶ Ryzodeg Mix 70/30
  - ▶ 70% Tresiba and 30% Novolog
  - ▶ Dispensed: pen only
  - ▶ Give 5-15 minutes before meals



- ▶ Premixed insulins are often discontinued during hospitalization and single types of insulin are used instead.

# Insulin Pumps in Acute Care

- ▶ Pumps use rapid acting insulin only - NovoLog, Humalog, Apidra, Fiasp
- ▶ Basal rate: Delivers insulin continuously
- ▶ Bolus: Delivered before meals, sometimes before snacks and to correct hyperglycemia
- ▶ To continue insulin pump during hospitalization patient must:
  - ▶ Be able to operate pump independently or have support person present at all times
  - ▶ Provide own pump supplies
  - ▶ Communicate with nursing staff and providers about all insulin given via pump
- ▶ Refer to facility specific policy/patient agreement



# Insulin Pumps in Acute Care

- ▶ Document each shift:
  - ▶ Location and appearance of infusion site
  - ▶ All meal and correction boluses
  - ▶ Site/infusion set/insulin change (done every 2-3 days)
  - ▶ Any times pump was suspended
- ▶ If pump is discontinued, document:
  - ▶ Time discontinued
  - ▶ Where pump was placed (i.e. locked box in patient room, sent home w/ family)
- ▶ If patient condition changes and he/she is no longer able to operate pump independently, contact provider for orders to switch to IV or SQ insulin

# Insulin in the Acute Care Setting

- ▶ Admission Assessment - factors affecting glucose control
  - ▶ Insulin type, dose and administration times at home
  - ▶ Use of vial/syringe or pen
  - ▶ Insulin administration sites, rotation pattern and frequency
  - ▶ Visualize and palpate injection sites (lipodystrophy)
  - ▶ Independent or requires assistance
  - ▶ Syringe/pen needle - does patient reuse and if so, how often?
  - ▶ Duration of vial/pen use
  - ▶ Home insulin storage
  - ▶ Vision, dexterity and cognition
- ▶ Formulary insulin may be different than what patient takes at home - educate as needed

# Insulin in the Acute Care Setting

- ▶ New to insulin - Patient education
  - ▶ Obtain provider order for diabetes education (if required)
  - ▶ Begin education as soon as possible
  - ▶ Recommend teaching vial/syringe, as insurance coverage for pens varies greatly
  - ▶ Switch to pens can be done on outpatient basis
  - ▶ Key teaching points:
    - ▶ Drawing up and injecting
    - ▶ Site selection
    - ▶ Site rotation
    - ▶ Insulin storage; length of time vial/pen can be used
    - ▶ Home regimen - type(s), dose(s), administration time(s)
  - ▶ If possible, order vial from Pharmacy and have pt draw up/give insulin with nursing supervision until discharge. Send vial home with patient

# Hypoglycemia - Nursing Care

- ▶ Be aware of insulin onset, peak and duration and when patient is at risk for hypoglycemia
- ▶ Avoid hypoglycemia by contacting provider when:
  - ▶ Patient is NPO
  - ▶ Patient has poor oral intake
  - ▶ Supplemental nutrition is discontinued
- ▶ Remember that home caloric intake and insulin doses may be much different than in the hospital
- ▶ Encourage patient to report hypoglycemia symptoms immediately
- ▶ Treat with Rule of 15: 15 grams carb, wait 15 minutes, retreat with 15 grams carb if symptoms have not improved
- ▶ Administer D50 or Glucagon per orders if patient is unable to take oral carbohydrate



# Hypoglycemia - Patient Education

- ▶ Causes of hypoglycemia
  - ▶ Increased activity without eating extra or taking less insulin
  - ▶ Too much insulin
  - ▶ Not enough food for amount of insulin given
- ▶ Symptoms
- ▶ Treatment
  - ▶ Rule of 15
  - ▶ Carry fast acting carbohydrate at all times
- ▶ Prevention
  - ▶ Check glucose frequently, especially before driving
  - ▶ Plan ahead for increased activity
  - ▶ Don't ignore symptoms
  - ▶ Be alert for hypoglycemia unawareness

# Insulin in the Acute Care Setting - Discharge Planning

- ▶ Verify intended home insulin regimen with provider before day of discharge; provide additional education as needed
- ▶ Determine if patient has insurance coverage for insulin
  - ▶ Medicare does not cover insulin; pt needs Part D prescription plan
  - ▶ Private insurance coverage varies and many do not cover pens
  - ▶ Remember Walmart ReliOn Regular and NPH if no/poor coverage
  - ▶ Patient assistance programs are available, but process can take several weeks; patient must have SS# to qualify
  - ▶ Consult Social Worker/Case Mgr if additional resources are needed
- ▶ Ensure RX sent to pharmacy for insulin vial/syringes or pen/needles.
- ▶ Be aware of discharge time, pharmacy hours and if patient can get RXs filled that day.

# Insulin Patient Assistance Programs

- ▶ Insulin company web sites
  - ▶ Lilly - [lillycares.com](http://lillycares.com)
  - ▶ NovoNordisk - [novocare.com](http://novocare.com)
  - ▶ Sanofi - [sanofipatientconnection.com](http://sanofipatientconnection.com)
- ▶ [Needymeds.org](http://Needymeds.org)
- ▶ [Covermymeds.com](http://Covermymeds.com)

# Avera Professional Resources

- ▶ Type 2 Diabetes Insulin Algorithm
- ▶ Type 2 Diabetes Treatment Algorithm

Access: Knowledgenet → Avera Medical Group →  
Diabetes Treatment & Prevention Resources →  
Click on document title (highlighted in green)

**Glycemic Targets:** Individualized to minimize hypoglycemia

**HbA1c:** < 7 – 8%

**Glucose:** Pre-meal 80 – 130 mg/dL  
2 hour post-meal <180 mg/dL

## Education, Self-Management, Nutrition, Exercise, & Mental Health

### Education / Healthy Body & Mind

- Initial education for all patients
- Annual education refresher

### Self-Management

- Refer to diabetes education program
- Self-monitoring of glucose with regular reporting to provider for medication titration

### Medical Nutrition Therapy & Activity

- Meal plan prepared by Registered Dietitian
- Walk / Aerobic activity 30 min – 5d/week
- Resistance training 2d/week

### Mental Health

- Psychosocial support
- Depression/Anxiety screening
- PHQ9 at every visit

**Initiate Insulin if...**

### Newly Diagnosed

FBS > 300 → Long acting insulin + oral medication(s)

or

A1c > 10 → Long acting insulin + oral medication(s)

### Established Diagnosis

Ongoing treatment for > 6 months and not to target → Long acting insulin + oral medication(s)

For additional options consult Avera Type 2 Diabetes Treatment Algorithm

**If not to Target...**

After 6 months of ongoing adjustments (done every 4-6 weeks), consider:

- Start rapid-acting insulin at meals
- Add GLP-1 agonist (in addition to current medications)
- Endocrinology referral

## Patient Home Glucose Testing Frequency Options

Currently using long-acting insulin in evening

→ Check fasting glucose level daily; consider before noon & evening meals

Currently using short (Regular) or rapid acting insulin at meals

→ Check fasting glucose level daily, alternate before noon, evening meal & HS.  
*Optional:* To fine tune dosing, check glucose level 2 hours post meal.

Patient Vocabulary: Define fasting for patient. Consider "...check when you wake-up, before breakfast or any beverage with calories..."

**Review 4-5 days of glucose levels before making insulin dose adjustments**

### Reminders:

- Be sure to prescribe pen needles with insulin pen, insulin syringes with insulin vial, & test strips + lancets with meter
- All patients beginning insulin should receive formal education (DSMES) or if there is concern with self-management skills

SEE SIDE 2 FOR MEDICATION DETAIL

INSULIN TYPE	HOW SUPPLIED	ONSET/PEAK	DURATION	ADMINISTRATION TIMING	IN-USE EXPIRATION***
<b>Long-acting/Basal*</b>					
Degludec (Tresiba)	Tresiba U-100 & Tresiba U-200 FlexTouch pen	30-90 min/Peakless	42 hours	HS/once daily	56 days
Determir (Levemir)	Vial; Levemir FlexTouch pen	1-2 hrs/6-8 hrs	8-24 hours	HS/once daily**	42 days
Glargine (Lantus/Basaglar)	Lantus vial; Lantus SoloStar pen; Basaglar Kwikpen	1-1.5 hrs/Peakless	24 hours	HS/once daily**	28 days
Glargine U-300 (Toujeo)	Toujeo SoloStar U-300 pen	6 hrs />24 hrs	36 hours	HS/once daily	42 days
<b>Intermediate Acting - NPH</b>					
	Novolin/Humulin/Reli-on NPH vial ( <b>ReliOn best option if no/poor insurance coverage</b> ); Humulin NPH KwikPen	1-2 hrs/4-12 hrs	12-16 hours	Once daily; may be dosed BID	Vial: Humulin N 31 days Novolin & ReliOn N 42 days; NPH Kwikpen 14 days
<b>Short Acting - Regular</b>					
	Novolin/Humulin/ReliOn Regular vial ( <b>ReliOn best option if no/poor insurance coverage</b> )	30-60 min/2-5 hrs	5-8 hours	30 minutes before meal	Humulin R 31 days Novolin & ReliOn R 42 days
<b>Rapid Acting</b>					
Aspart (Fiasp)	Vial; Fiasp FlexTouch pen	2.5 min/90-130 min	3.5 hours	Right before to 20 minutes after meal	28 days
Aspart (NovoLog)	Vial; NovoLog FlexPen	5-15 min/40-50 min	3-5 hours	5-10 minutes before meal	28 days
Glulisine (Apidra)	Vial; Apidra SoloStar	5-15 min/30-90 min	5 hours	5-15 minutes before or within 20 minutes after meal	28 days
Lispro (Humalog & Humalog U-200)	Vial; Humalog KwikPen; Humalog Kwikpen U-200	5-15 min/30-90 min	3-5 hours	Within 15 minutes before or right after meal	28 days
<b>Pre-mixed</b>					
<b>Intermediate &amp; Short (NPH &amp; Regular)</b> Humulin 70/30, Novolin 70/30 & ReliOn 70/30	Vial ( <b>ReliOn best option if no/poor insurance coverage</b> ); Humulin 70/30 KwikPen	30 min/2-4 hrs	18-24 hours	30 min before meal	Humulin 70/30 vial 28 days, Kwikpen 10 days; Novolin & ReliOn 70/30 vial 42 days
<b>Intermediate &amp; Rapid</b> Lispro protamine suspension & lispro (Humalog Mix 75/25 & 50/50) Aspart protamine Suspension & aspart (NovoLog Mix 70/30)	Vial; Humalog Mix 75/25 & 50/50 KwikPen  Vial; NovoLog Mix 70/30 FlexPen	30 min/2-5 hrs  10-20 min/1-4 hrs	>22 hrs  Up to 24 hrs	Within 15 minutes before meal	Humalog Mix 75/25 & 50/50 vial 28 days, Kwikpen 10 days  NovoLog Mix 70/30 vial 28 days, FlexPen 14 days

\* Combination long-acting insulin & GLP-1 injectables are available. Consult Pharmacist or refer to Endocrinology to initiate.

\*\* May be dosed BID if not getting 24 hour coverage

\*\*\* All insulin vials/pens not currently in use should be stored in the refrigerator, but kept at room temperature (below 86 degrees F) once opened

TDD = Total Daily Dose

#### HOW TO INITIATE & ADJUST INSULIN

TYPE	START	ADJUST
<b>Long-acting/Basal</b>	0.1-0.2 unit/kg	1-2 units / 1-2 x per week
<b>Intermediate Acting</b>	0.1-0.2 unit/kg; 50/50 AM/PM if dosed BID	2-4 units every 2-3 days
<b>Short Acting</b>	0.1 unit/kg/meal	1-2 units / 1-2 x per week
<b>Rapid Acting</b>	0.1 unit/kg/meal	1-2 units / 1-2 x per week
<b>Pre-mixed</b>	0.2-0.3 unit/kg; TDD 67% before 1 <sup>st</sup> meal & 33% before 3 <sup>rd</sup> meal	2-4 units every 2-3 days

#### CONVERSION BY TYPE

Long-acting	All types are unit to unit	Levemir ↔ Lantus ↔ Tresiba ↔ Toujeo ↔ Basaglar
Rapid & short-acting	All types are unit to unit	NovoLog ↔ Humalog ↔ Apidra ↔ Regular
Long-acting to pre-mix/ intermediate	All types are unit to unit	2/3 TDD AM meal & 1/3 TDD PM meal
Pre-mix to pre-mix	All types are unit to unit	Humulin/Novolin 70/30 ↔ Humalog Mix 75/25/Mix 50/50 or NovoLog Mix 70/30
Basal/bolus		TDD - 50% basal/50% bolus; change based on meal size & glucose pattern

# Avera Patient Education Resources

- ▶ Handouts designed for initial diabetes education in primary care setting; may be used by all staff

Access: Knowledgenet → Avera Medical Group →

Diabetes Treatment & Prevention Resources →

Click on [View the Diabetes Education Handouts](#) to learn more

(highlighted in green) → Diabetes → 13 handouts

# Avera Patient Education Resources

- ▶ [Managing Type 2 Diabetes](#)
- ▶ [Healthy Eating with Diabetes](#)
- ▶ [Diabetes: Shopping and Preparing Food](#)
- ▶ [Physical Activity and Diabetes](#)
- ▶ [Managing Stress When You Have Diabetes](#)
- ▶ [Medications for Type 2 Diabetes](#)
- ▶ [How to Use and Inject Insulin](#)
- ▶ [Diabetes: Caring for Your Feet](#)
- ▶ [Hypoglycemia \(Low Blood Sugar\)](#)
- ▶ [Diabetes and Eye Problems](#)
- ▶ [Diabetes and Heart Disease](#)
- ▶ [Diabetes and Kidney Disease](#)
- ▶ [Long-Term Complications of Diabetes](#)



# How to Use and Inject Insulin



Insulin is a hormone, or natural chemical, made in the pancreas that helps to keep your blood sugar levels from getting too high. Many people with diabetes need to take insulin injections to control their blood sugars. Insulin is given in the fatty layer of the body just under the skin. Insulin is given with a shot, using a prefilled pen or a syringe.

## Where to Inject Your Insulin

- Insulin can be injected into the belly (abdomen), arm, thigh or buttocks. Insulin is absorbed best from the abdomen.
- Stay at least 2 inches away from your belly button with injections.
- Change your injection site each time. Rotate your injections in an organized way. Use all the sites within one area before moving to a different part of the body.

## When to Inject Your Insulin

- Follow your health care provider's instructions about when to inject your insulin.
- The timing of insulin injections is very important. Some insulins are given before meals and others are given at bedtime. Stay on a regular schedule with your insulin injection times.

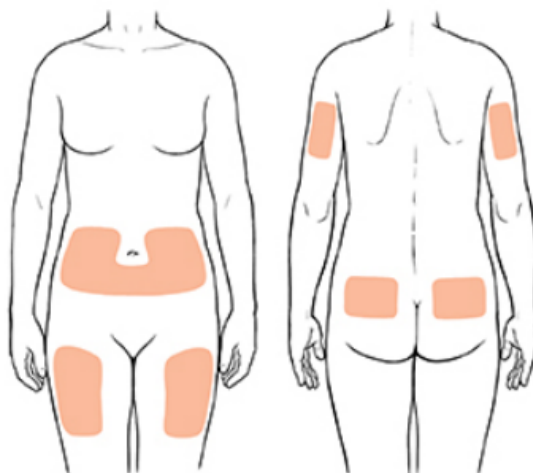
## Drawing Up Insulin from a Bottle

1. Wash your hands with soap and warm water.
2. If you are using a cloudy insulin, roll the bottle between your hands to mix it up.
3. Wipe the top of the insulin bottle with rubbing alcohol.
4. Remove the cap from the syringe.

5. Pull back the plunger until the top end of the plunger is even with the number of units of insulin you are to inject.
6. Insert the needle into the top of the bottle. Keep the bottle on the table. Push the plunger in all the way to put air into the bottle.
7. Turn the bottle and syringe upside down so the bottle is on the top.
8. Pull back on the plunger until the top end of the plunger is even with the number of units of insulin you are to inject.
9. Remove the needle from the bottle.

## Injecting the Insulin

1. Clean your skin with rubbing alcohol.
2. Put the needle straight into the skin at a 90 degree angle.
3. Push down on the plunger. Press until syringe is empty. Count to 10. Remove the needle from your skin. Do not rub the site.
4. Put the used syringe in a sharps container. Do not throw needles directly into the trash or recycling.
5. Never reuse an insulin syringe.



Questions?

Thank you!