



Dear REMEC Coordinator:

The TIPDON Diabetes Series programs are approved for credit by Michigan Nurses Association and Commission on Dietetic Registration through the Michigan Diabetes Outreach Networks.

1. In order to award credit for attending each session, you need to mail the completed Attendance List and the Evaluations to the **TIPDON** office at:

103 West Hurlbut  
Charlevoix, MI 49720

**We need to receive these at TIPDON within five business days of the session date so that we may process the information and send it to Lansing.**

2. A responsible person needs to insure that all attendees stay for the entire program, fill out the Attendance List, and submit a completed Evaluation to them on the day of the presentation in order to receive MNA or CDR credit.
3. Once the completed Attendance List and Evaluations have been received in the TIPDON office, we will e-mail or mail the "Certificate of Participation". It is important that the Attendance List and Evaluations are completed in their entirety and legible for us to complete this task.
4. We are not aware of any charge or restrictions to attending nurses or other health professionals as the Diabetes Outreach Network offers these programs free of charge. If there are any restrictions at your site, please notify us as soon as possible.

Following this letter of instructions are the Power Point, Handouts, Attendance List, and Evaluation Tool for the next TIPDON Diabetes Series: **Ups and Downs of Insulin scheduled for June 18, 2009, from 3:30pm to 4:30 pm**. You are responsible for making copies of all of these to use at the presentation.

Please don't hesitate to call me with any questions or concerns.

Sincerely,

*Ann Scott*

Ann Scott RN MSN  
TIPDON Diabetes Educator

231-237-9681 or 800-847-3665 or Fax: 231-237-9684  
[tipdon@diabetesinmichigan.org](mailto:tipdon@diabetesinmichigan.org)

Cert # 2401/ Ups and Downs of Insulin

Contact Hours: 1.0

Location: Munson Medical Center

Presenter: Ann Scott, RN, MSN

Address: 1105 Sixth Street, Traverse City, MI 49684

Date: 4/18/09

**NOTE: Drivers License or Professional Number is Required for Awarding Contact Hours  
Contact TIPDON at (800) 847-3665 for presentation content information**

### ATTENDANCE LIST

<b>Name: (print legibly)</b>
<b>Prof. License or Drivers license #:</b>
Address:
City, State, Zip:
Email:
Phone:
Profession : RN, LPN, RD, Other (specify)
Agency Affiliation:
<b>Name: (print legibly)</b>
<b>Prof. License or Drivers license #:</b>
Address:
City, State, Zip:
Email:
Phone:
Profession : RN, LPN, RD, Other (specify)
Agency Affiliation:
<b>Name: (print legibly)</b>
<b>Prof. License or Drivers license #:</b>
Address:
City, State, Zip:
Email:
Phone:
Profession : RN, LPN, RD, Other (specify)
Agency Affiliation:

<b>Name: (print legibly)</b>
<b>Prof. License or Drivers license #:</b>
Address:
City, State, Zip:
Email:
Phone:
Profession : RN, LPN, RD, Other (specify)
Agency Affiliation:
<b>Name: (print legibly)</b>
<b>Prof. License or Drivers license #:</b>
Address:
City, State, Zip:
Email:
Phone:
Profession: RN, LPN, RD , Other (specify)
Agency Affiliation:
<b>Name: (print legibly)</b>
<b>Prof. License or Drivers license #:</b>
Address:
City, State, Zip:
Email:
Phone:
Profession : RN, LPN, RD, Other (specify)
Agency Affiliation:

# Ups and Downs of Insulin

Ann Scott RN MSN  
TIPDON  
Michigan's Diabetes Outreach Network

2/2008

## MDON MISSION STATEMENT

Create innovative partnerships throughout Michigan to strengthen diabetes:

- Prevention**
- Detection**
- Management**

### Visit TIPDON's Web Site

[www.diabetesinmichigan.org](http://www.diabetesinmichigan.org)


For

- Professional Workshops
- Independent Study Modules
- Resource Directory for Self-Management Education Programs and Other Services
- Northern Michigan Support Groups
- Fitness & Kids – BMI Calculator

## Continuing Education Certificate

REGISTER and BE SURE TO **INCLUDE YOUR E-MAIL ADDRESS!!**

THIS WILL ASSURE THAT YOU GET YOUR CERTIFICATE

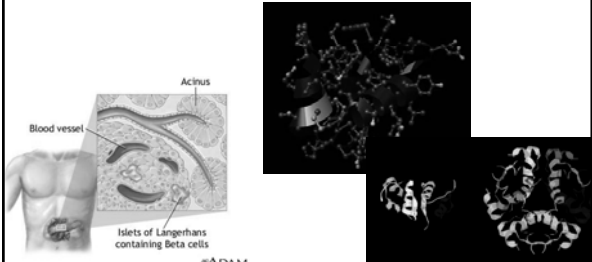


## Objectives

1. Identify 2 insulin types.
2. Describe three areas of patient education related to insulin.
3. Identify a reason for selecting a specific insulin regimen to reach target blood glucose goals.

# INSULIN

A hormone produced in the beta-cells of the islets of Langerhans in the pancreas



## Functions of Insulin

- Facilitates entry of glucose into cells for use as energy or storage.
- Enhances protein synthesis & cell growth.
- Enhances fat storage and prevents the mobilization of fat for energy.
- Inhibits release of glucose from the liver or muscle glycogen stores.
- Inhibits formation of glucose from non-carbohydrates such as amino acids.

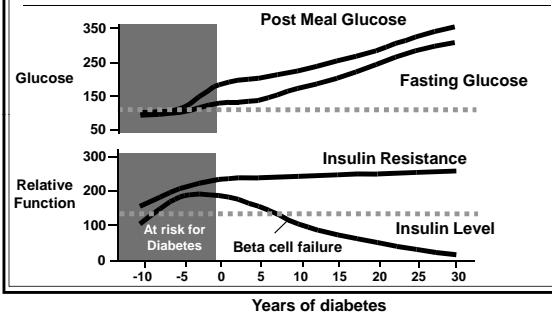
## What happens without insulin?

- BG levels elevate (increase urination and thirst)
- Muscle used for energy (weight loss)
- Fat used for energy ---> ketones (DKA)

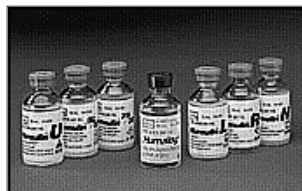
## Types of Patients Who Need Insulin

- Type 1 diabetes.
- Type 2 diabetes not controlled
- Gestational diabetes if Medical Nutrition Therapy (MNT) does not work.
- Parenteral nutrition.
- Acutely ill hospitalized patients
- Pancreatitis or other diseases that decrease beta-cell function.

## Progression of Type 2 Diabetes



## Insulin Brands and Types

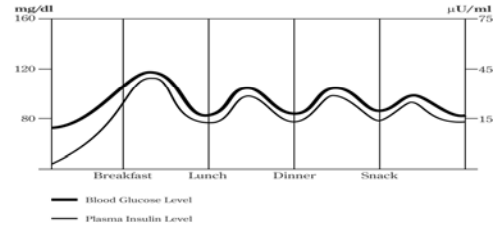


## Insulin Brands & Types

Rapid Acting	Short Acting	Intermediate Acting	Long Acting
Humalog	Regular	NPH	Lantus
NovoLog			Levemir
Apidra			

## Insulin action review

## Normal Blood Glucose and Insulin Levels



## Insulin Coverage

- **Rapid/Short acting insulin**
  - Covers meal intake
  - Used for elevated BG
  
- **Intermediate/Long acting insulin**
  - Used for basal insulin needs
  - Not intended to cover meals

## Basal and Bolus Insulin

- Basal insulin: insulin all the time to cover the normal needs of the body when not eating
- Bolus insulin: 'On demand' insulin to cover food
- Correction insulin: extra insulin to cover hyperglycemia

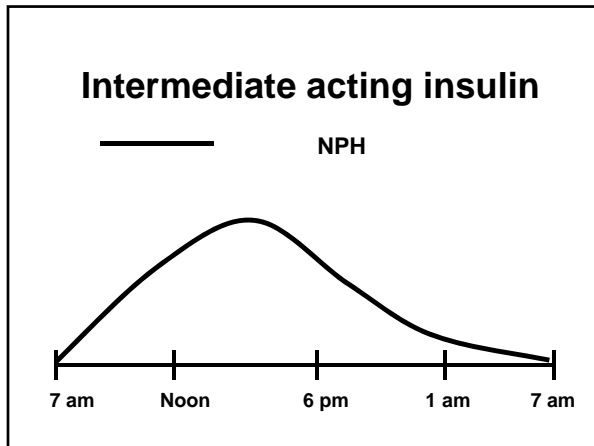
## Basal Insulins

Type	Color	How Supplied	Onset	Peak	Duration
NPH	Milky-white	Vial Cartridge Disp. Pen InnoLet	1-1 1/2 hours	4-12	24+ hours
Lantus	Clear <b>NEVER MIX</b>	Vial Cartridge	1-2 hours	None	24 hours
Levemir	Clear <b>NEVER MIX</b>	Vial Disp. Pen	1-2 hours	None	Varies by dosage

## Intermediate Acting Insulin

Onset	Peak	Duration
1 - 2 hrs	4 - 12 hrs	10 - 16 hrs

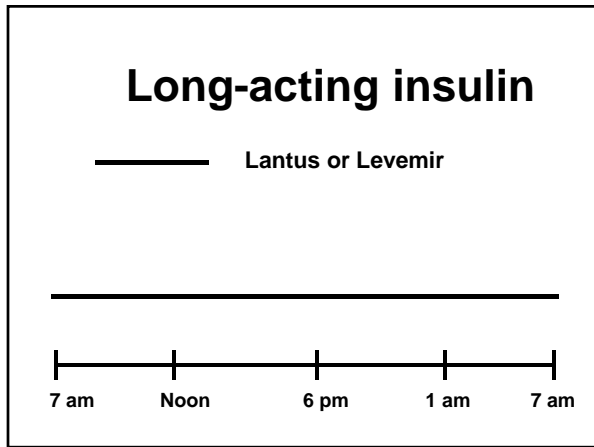
- Sources: human
- Type: NPH insulin
- Appearance: cloudy



### Long-Acting Insulins

	Onset	Peak	Duration
Lantus:	1 – 2 hrs	Flat	24 hrs
Levemir:	1 – 2 hrs	Flat	17 – 23 hrs

- Source: human insulin analogs
- Types:
  - Lantus (glargine): qd dosing
  - Levemir (detemir): qd or bid dosing
- Appearance: clear
- Other: **Can not** mix with other insulins



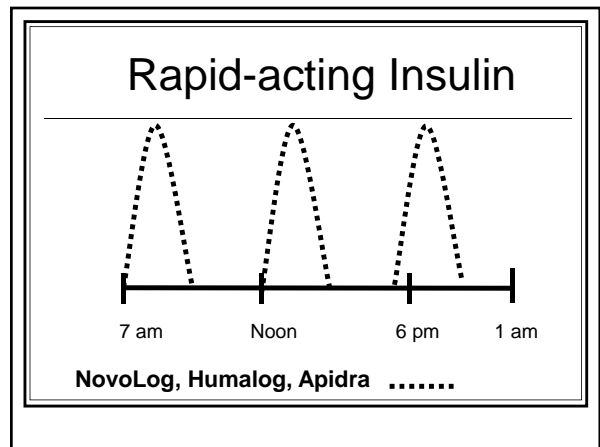
### Bolus Insulins

Type	Color	How supplied	Onset	Peak	Duration
Apidra	Clear	Vial/disp pen Cartridge	5 -20 minutes	1 hour	2-5 hours
Humalog	Clear	Vial Disp. Pen	5 -20 minutes	1 hour	2-5 hours
Novolog	Clear	Vial Cartridge Disp. Pen	5-20 minutes	1 hour	2-5 hours
Regular	Clear	Vial Cartridge InnoLet	1/2-1 hour	2-5 hours	6-12 hours

### Rapid Acting Insulins

Onset	Peak	Duration
10 - 20 min	1 hr	3 - 5 hrs

- Source: human insulin analog
- Types: Humalog (Lispro); NovoLog (Aspart); Apidra (glulisine)
- Appearance: clear
- Other: used in pumps

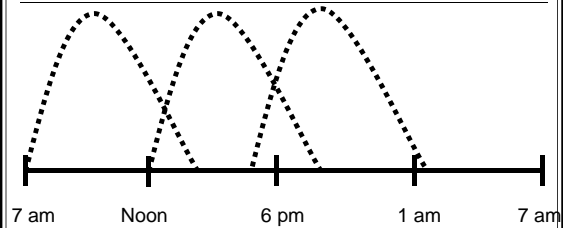


## Short Acting Insulin

Onset	Peak	Duration
30 - 60 min	2 - 4 hrs	6 - 10 hrs

- Source: human
- Type: Regular
- Appearance: clear
- Other:
  - Does not cover postprandial BG well
  - IV Regular: half-life of 4-5 min.

## Short-acting Insulin



Regular.....

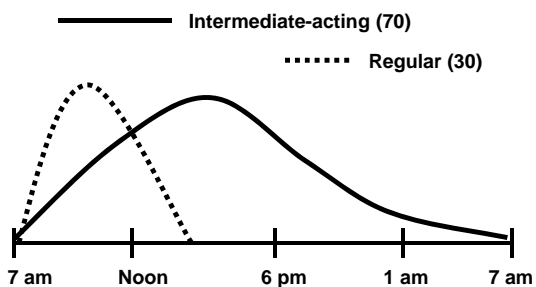
## Mixed Insulins

### Novolin or Humulin 70/30

Onset	Peak	Duration
30 - 60 min	varies	18 - 24 hrs

- Source: human
- Appearance: cloudy
- Other:
  - Usually dose bid
  - Available OTC
  - Not very effective for covering PPBG

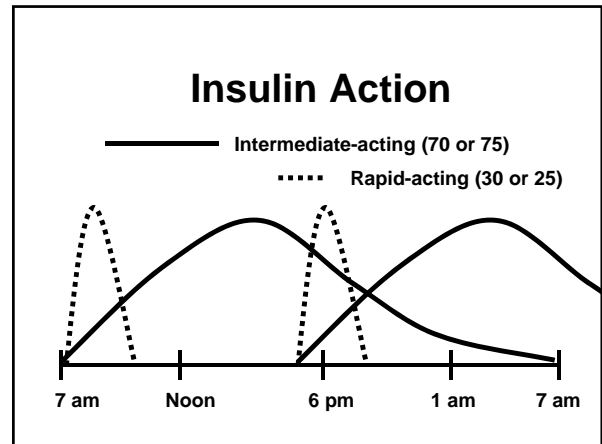
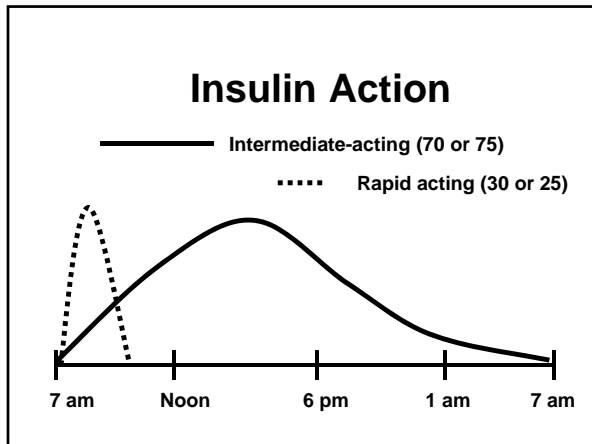
## Insulin Action



### Novolog Mix70/30 or Humalog Mix75/25

Onset	Peak	Duration
5 - 15 min	varies	varies

- Source: human insulin analog
- Appearance: cloudy
- Other:
  - Given qd or bid
  - Covers PPG well



## Humalog Mix 50/50

Onset	Peak	Duration
5 – 15 min	varies	varies

- Source: human insulin analog
- Appearance: cloudy
- Other:
  - Intended for tid dosing
  - Covers PPBG well

## INSULIN REGIMENS

- Sliding Scale
- One injection per day
- Two-Three Injections per day
- Multiple component- Flexible
- Pump Therapy- CSII

### Starting an insulin program- type 1

- Meal time insulin and correction
  - Consider
    - Administration devices
    - Action of insulin
    - Special circumstances
- Basal insulin
  - Consider
    - Time of day
    - Administration device/frequency

### Starting an insulin program- type 2

- Multiple choices depending on patient need
  - May start with evening insulin and continue oral agents
  - May start with mealtime coverage for one meal daily and continue oral agents
  - Split mixed two injections per day
  - Basal-bolus MDI regime

## Dosing - How much?

- **Based on patient weight, age, level of insulin resistance, life style**

- **Adult Starting Dose** 0.5-1.0 units/kg/day

- Average Dose 0.8-1.2 U/kg

- **Children Starting Dose**

- Starting Pre-Puberty 0.2-1.0 U/kg

- Average Dose 0.5-1.0 U/kg

- Starting Puberty 0.3-1.2 U/kg

- Average Dose 0.8-1.5 U/kg

## Dosing - How much?

- Determine Blood Glucose target range.
- Start with small dose based on weight and adjust dose using blood glucose readings.
- Must be individualized for the patient.

## SLIDING SCALE

- Short or rapid acting insulin used exclusively
- Used to correct BG levels.
- Does not anticipate events such as food intake.
- Leads to "roller coaster" effect
- Often used in hospital settings:
  - When oral medications cannot be used
  - With impending surgery when intermediate and long-acting insulin cannot be used.
  - Should only be used for a SHORT time.
- Sliding scale use is discouraged by AACE.

## Client Education Areas

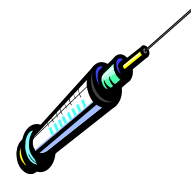
- Address fears/myths
- Insulin Action
- Insulin administration
- Site rotation
- Storage
- Disposal
- Blood glucose monitoring
- Hyperglycemia and Hypoglycemia
- Referrals

## Barriers to Insulin

- DAWN (Diabetes Attitudes, Wishes & Needs)
- 2001 Study by Novo Nordisk and International Diabetes Federation to id psychosocial issues related to poor outcomes. Results:
  - 50% report insulin means they failed to manage their disease
  - Only 20% believe insulin would help them better manage their DM
  - 1/3 of MDs postpone until "absolutely essential"

## Other Barriers to Insulin

- Fear of needles
- Fear of the unknown
- Inconvenience
- Weight gain
- Myths



## Why Weight Gain?

- Decreased glycosuria (due to improved glycemic control)
- Fat storage effect of insulin
- Aggressive or over-tx of hypoglycemia
- Defensive eating to prevent hypoglycemia

## Myths

- Insulin causes serious complications.
- Insulin therapy is always permanent.
- Using insulin is complicated.
- Insulin therapy is expensive.
- People who use insulin are viewed as weak or disabled.

## Insulin Delivery

### Syringes



- Needle gauge (thickness)
  - ◆ higher gauge (31): thinner the needle
  - ◆ lower gauge (28): thicker needle
- ◆ Allow for mixing insulin
- ◆ Cost: least expensive

## Insulin Delivery

### Pens



- ◆ Pen-like device with cartridges holding 150-300 units of insulin
- ◆ Reusable or Disposable
- ◆ Use disposable needles (1/2", 5/16", 3/16")
- ◆ Dial insulin dosage and inject (like a syringe)



## Insulin Delivery (Novo Nordisk)

### NovoFine® Autocover™

- Single use pen needle with automatic shield that hides the needle
- Reduces risk of accidental needle sticks
- Reduces anxiety assoc. with needle phobia
- Can be used with FlexPen, NovoPen 4, NovoPen 3, NovoPen 3 Demi, NovoPen Junior and InnoLet



## Insulin Pen Considerations

- ◆ Pros: portable, discreet, convenient, saves time, accurate dosing
- ◆ Cons: more \$, waste, can't mix insulins
- ◆ Questions to ask
  - ◆ Number units pen holds
  - ◆ Largest dose that can be injected
  - ◆ Dose adjustments (1/2 unit vs 1 unit)
  - ◆ Size of numbers on dose dial
  - ◆ Strength/dexterity needed to use pen
  - ◆ Can you tell if there's insulin left to dose?

## Injection aids



www.forecast.diabetes.org

## Syringe/Needle Use and Disposal

- Syringes are single use and disposable.
- Syringe/Pen Needle and needle sizes
- Syringes may be reused if the client meets ADA requirements.
  - Cost saving for those with no insurance coverage.
  - Must have good personal hygiene.
  - Must be able to demonstrate safe recapping of the syringe.
- Used syringes/needles should be disposed of in puncture resistant container that is capped and sealed shut and labeled "Sharps" and disposed of by biohazardous waste company.

## INSULIN PUMP THERAPY Continuous Subcutaneous Insulin Infusion (CSII)

- More closely mimics physiologic secretion of insulin
- Reduces risk of hypoglycemia
- Needs highly motivated subject
- Needs high level of self care skills
- Enhances life style

### Insulin Pumps

- Animas Pump
- MiniMed Pumps
- AccuChek Spirit
- Nipro Amigo pump
- Omnipod
- One touch ping



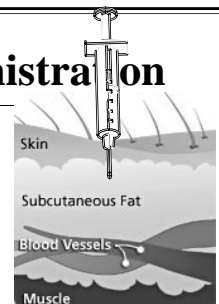
## Insulin Administration

### Skin Preparation

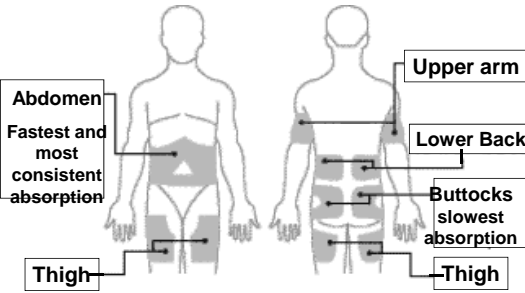
- Skin should be clean.
- Does not need to be wiped with alcohol, but if used should dry before injection.
- Inspect the skin prior to injection.
  - Avoid areas of:
    - Thickened tissue
    - Dimpling
    - Redness or irritation
- Injections can be given through clothing.

## Insulin Administration

- Pinch up skin and subcutaneous tissue.
- Inject at 90° angle for most patients
- Very thin and small children can use shorter length needles or a 45° angle.



## Rotation Sites



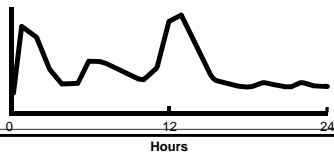
## Storage of Insulin

### Unrefrigerated

- Pre-filled pens
  - Humalog™, NovoLog®, Flexpen, Novolin R Innolet = 28 days
  - Humulin N, Novolin N Innolet, NovoLog® Mix 70/30 = 14 days
  - Novolin 70/30 Innolet, Humulin 70/30, Humalog™ 75/25 = 10 days
  - Detemir = 42 days
- Cartridges
  - Humalog™, NovoLog®, Novolin R = 28 days
  - Novolin N, NovoLog® Mix 70/30 = 14 days
  - Novolin 70/30 = 10 days
  - Detemir = 42 days
- Syringes filled by family members = 21-30 days refrigerated and stored needle up.

## Insulin Therapy Goals

- Maintain normoglycemia or near normal glycemia
- Avoid short-term crisis (do not cause lows!!!)
- Minimize long-term complications



## Is insulin therapy right for this patient?

Assess ability to administer/monitor therapy:

- Patient age
- Complications (impaired eyesight, neuropathy)
- Absorption/onset/duration of action
- Cost
- Technology

## Blood Glucose Goals

- Patient should know personal BG goals.
- Patient should be taught to monitor Blood Glucose to be able to:
  - Assess level of control.
  - Evaluate patterns in blood glucose results.
  - Correct out of range blood glucose results quickly
  - Learn from trial and error.

## Target Blood Glucose Levels for Non-pregnant Adults

	ADA mg/dl	AACE* mg/dl
Preprandial Plasma Glucose	70-130	<110
Peak Plasma Glucose	<180	
A1C	<7.0% (general) <6.0% (individual)	<6.5%

\*American Association of Clinical Endocrinologists (2002)

## Hypoglycemia/Hyperglycemia

---

- Review signs and symptoms of each
- Teach rule of 15
- When to call healthcare provider
- Glucagon

## Referrals

---

- Follow-up Appointment
- Additional Education
  - Self-Management Education
- Resources
- Support groups

## Common Errors

---

- The wrong type
- Wrong dose
- Mixing errors
- Using the wrong syringe
- Drawing up air and/or air bubbles in the syringe
- Insufficient rolling of NPH

- Not inserting air before drawing up insulin
- Technique
  - Observe patient administer injection
- Timing - is everything!
- Forgotten Dose
- Lack of SBGM

## Summary

---

- Currently four types of insulin based on profiles of action: rapid, short, intermediate and long acting.
- Patient/provider fears and beliefs about insulin can be an obstacle to insulin therapy

## Summary

---

- Education must include: insulin action; administration; site care and rotation; hypoglycemia and Tx; storage and disposal; SMBG
- Choosing a regimen is based on: type of diabetes; patient goals, lifestyle and preference; patterns of hyperglycemia.

**Questions?**

---



**TIPDON**

---

**Raising the Standard  
of  
Diabetes Care  
in  
Northern Michigan**

revised 5-09 ALS

**EVALUATION TOOL, October 3, 2007 - October 3, 2009**

**MICHIGAN DIABETES OUTREACH NETWORK**

Title of Activity: Ups and Downs of Insulin

Date: 6/18/09 Address: Munson Medical Center  
1105 Sixth Street, Traverse City, MI 49684

DON: TIPDON Name of Presenter: Ann Scott, RN, MSN  
 Cert #: 2401

Using the following scale, rate your achievement of each objective listed below by checking the appropriate option:

	Excellent	Good	Satisfactory	Unsatisfactory
1. Identify 2 insulin types.	_____	_____	_____	_____
2. Describe 3 areas of client education related to insulin.	_____	_____	_____	_____
3. Identify 1 reason for selecting a specific insulin regimen to reach glycemic goals.	_____	_____	_____	_____
4. Teaching expertise of presenter.	_____	_____	_____	_____
5. Appropriateness of the teaching strategies.	_____	_____	_____	_____

<b>Comments:</b>		Room Temperature:	Cold _____	Hot _____
Excellent slides & handouts:	_____	Topic too advanced:	_____	
Not enough time:	_____	Topic too basic:	_____	
Quality of food provided:	_____	Very interesting/Informative:	_____	
Repetitive information:	_____	Visual/Audio Quality:	Visual _____	Audio _____
What program topics do you want presented in the future? _____				
<b>Additional Comments:</b>				

## VIDEOCONFERENCE DVD PRESENTATIONS AVAILABLE

Below is a list of the TIPDON REMEC videoconferences showing when they are available on DVD and the expiration date for credit of contact hours. Viewing after the expiration date is encouraged, but be aware that no credit is available past that date. **To order a free DVD after the available date, please contact TIPDON.**

<b>Videoconference</b>	<b>Date Available</b>	<b>Date Credit Expires</b>
Pain Management in Diabetic Neuropathy	2/23/09	4/19/09
Medication Options for Type 2 Diabetes	4/20/09	6/16/09
Ups and Downs of Insulin	6/22/09	7/18/09
Basic Diabetes Meal Planning	8/24/09	10/20/09
Kidney Disease in Diabetes	10/19/09	12/15/09
Glucose Monitoring Savvy	12/14/09	2/10/10

### **INSTRUCTIONS FOR VIEWING DVD BEFORE CREDIT EXPIRES:**

1. If handouts are not included with the DVD, you may print them out at [www.diabetesinmichigan.org](http://www.diabetesinmichigan.org). Click on the TIPDON region, click on Videoconference Handouts (left side of page). Handouts include: Attendance Sheet, Attestation Form, Powerpoint Presentation, Evaluation Form
2. View DVD.
3. All viewers (including students) must register by completing the attendance sheet, attestation and evaluation forms.
4. Mail **original** completed attendance sheet and evaluation forms to:  
**Maggie Willette**  
**TIPDON**  
**103 Hurlbut Street**  
**Charlevoix, MI 49720**
5. Upon receipt of the sign in and evaluation, we will mail or e-mail a certificate of completion to you.

### **INSTRUCTIONS FOR VIEWING DVD AFTER CREDIT EXPIRES:**

If the Powerpoint presentation is not included with the DVD, you may print it out at [www.diabetesinmichigan.org](http://www.diabetesinmichigan.org). Click on the TIPDON region and click on the Powerpoint Presentation, click on the presentation you will view.

**Should you wish to order a DVD or have any questions regarding the continuing education program or this process, call TIPDON with any questions (231)237-9681 or (800) 847-3665 or email to [tipdon@diabetesinmichigan.org](mailto:tipdon@diabetesinmichigan.org).**



**Michigan Department of Community Health  
Michigan Diabetes Outreach Network  
Nursing Management of Diabetes 2007-2009**

**ED 1 Taped Presentation Attestation Form**

Complete this form if you are viewing the presentation from a DVD

**TITLE OF ED 1 TAPED PRESENTATION:**

Ups and Downs of Insulin 6/18/09

**Participant Name:**

\_\_\_\_\_

Print

\_\_\_\_\_

Signature

**Date:**

\_\_\_\_\_

**Signing this form attests to you viewing the complete tape of the ED 1 presentation listed above. Upon completion of viewing the taped ED 1 presentation the completed attestation form must be returned to the TIPDON office with your attendance and evaluation forms for you to receive your certificate for 1.0 contact hours.**

**This educational activity has been approved by the MNA, which is accredited to approve continuing education in nursing by the American Nurses Credentialing Center Commission on Accreditation for 1.0 contact hours.**

7-31-07  
7-15-08