Back to Basics: Best Practices in Insulin Use Diabetes Educators

Jay Shubrook, DO

June 19, 2019

Technical Instructions

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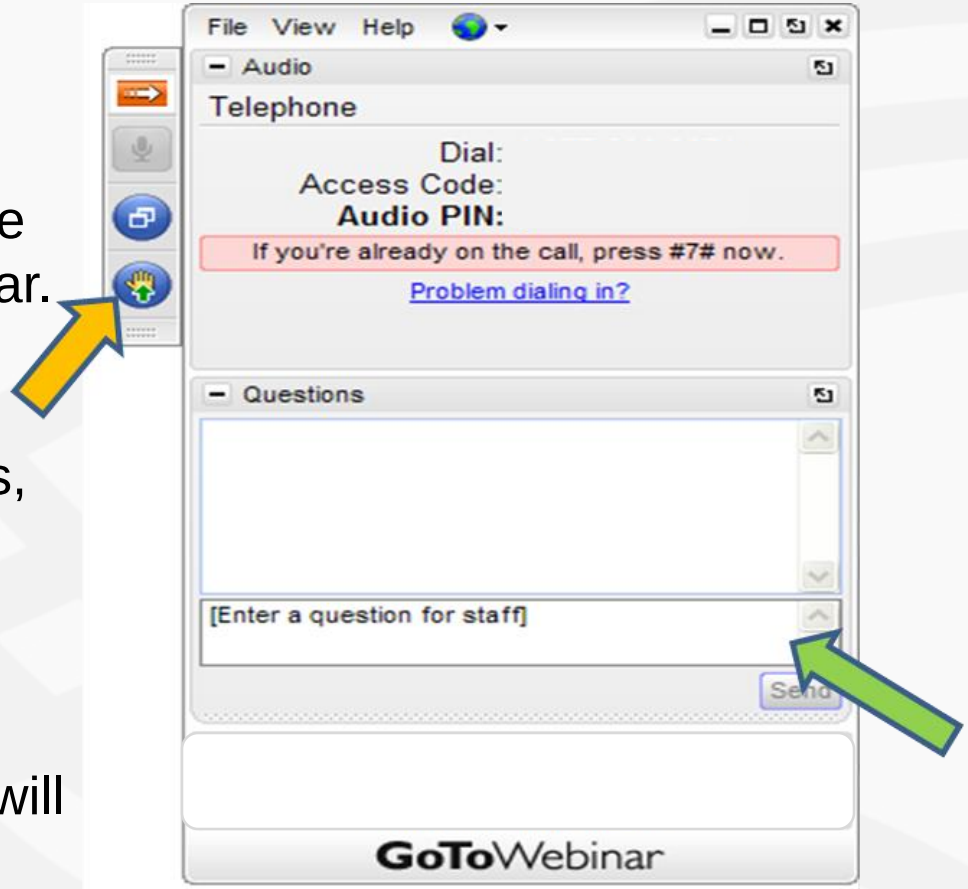

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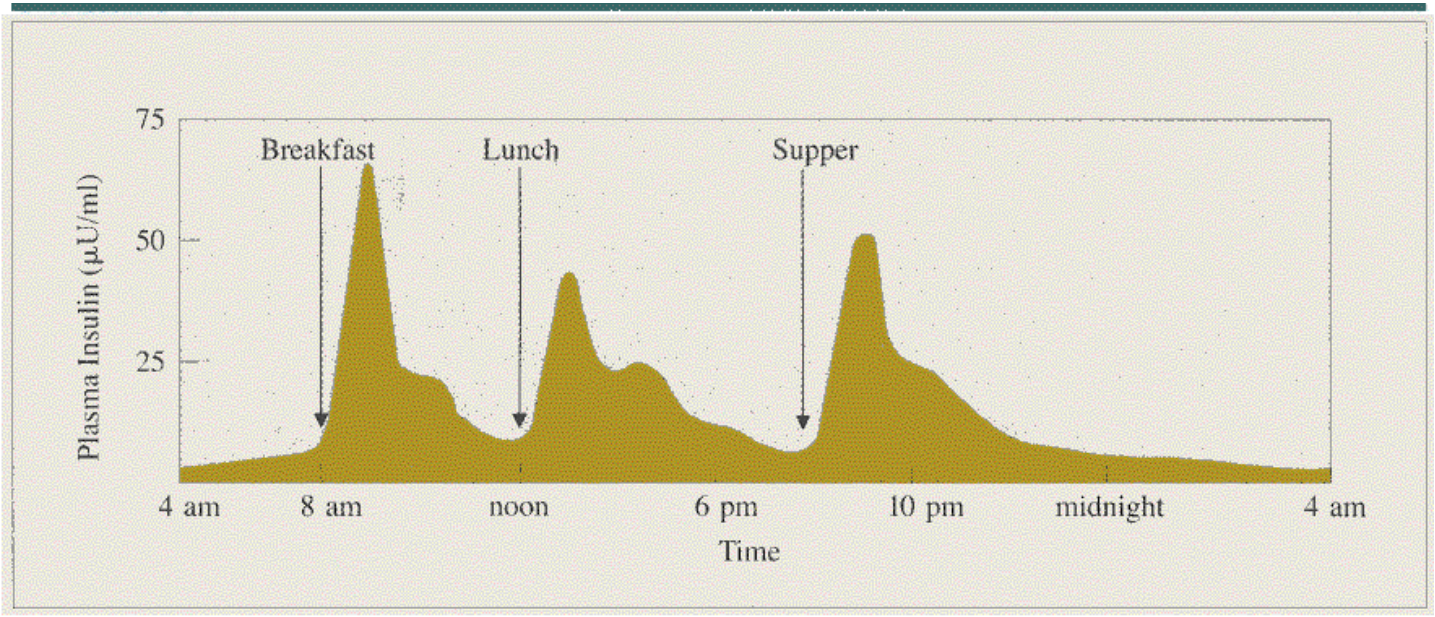
About Me

- Jay Shubrook, DO
- Professor and Diabetologist
- Director of Diabetes Services
- Touro University California
- Jay.shubrook@tu.edu

Objectives

- Discuss clinical aspects of physiologic/pharmacologic insulin formulations
- Review common challenges with insulin use
- Use a case based approach to demonstrate best practices for insulin use in T2DM

Physiologic Insulin Release



Basal and Prandial Insulin

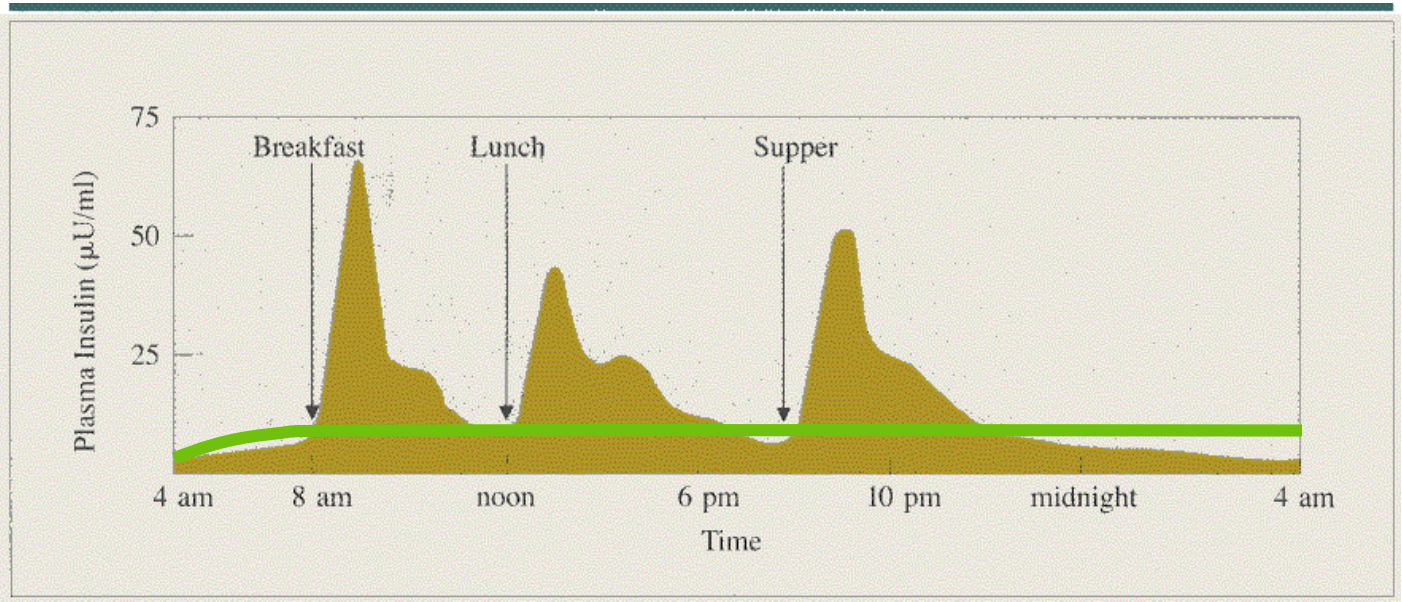
Basal insulin

- Required for resting metabolic needs
- Suppresses glucose production at night and between meals
- Stays relatively constant
- Usually is half of total daily insulin needs

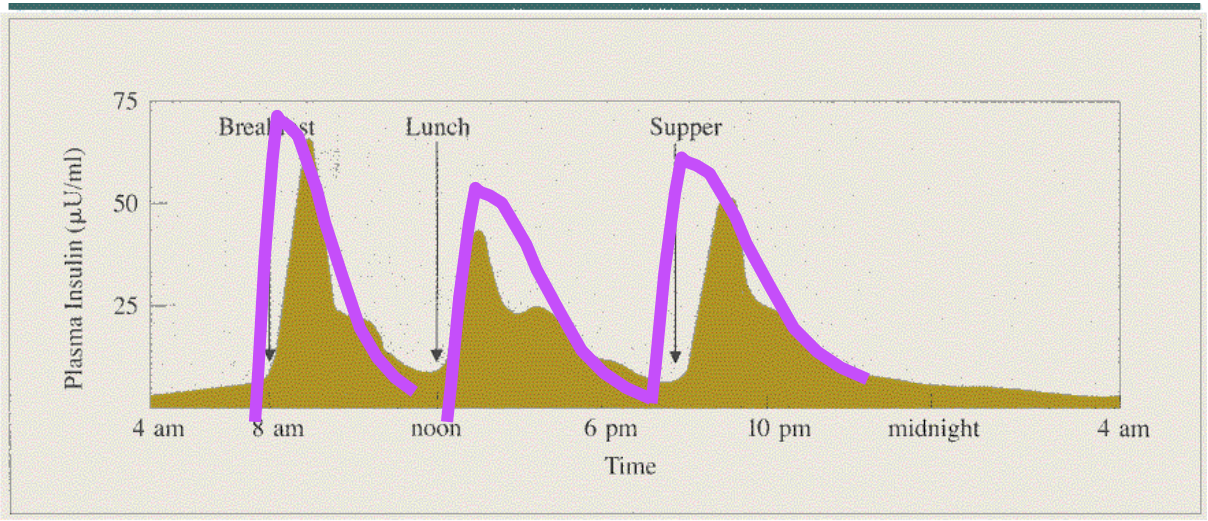
Prandial insulin

- Limits/prevent post-prandial hyperglycemia
- Physiologic two phase release
  - First phase immediate and lasts 1-2 hours
  - Delayed slower to peak second phase
- Each meal about 10-20% of daily insulin needs

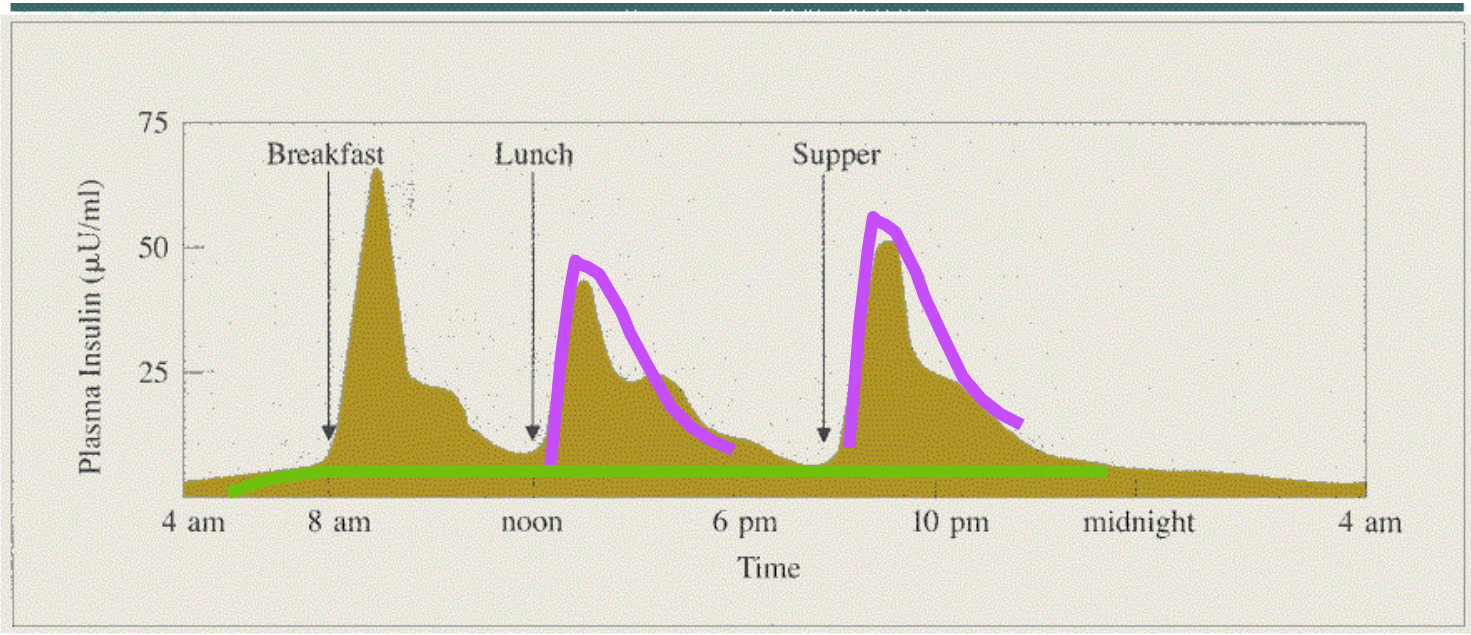
Physiologic Insulin Replacement



Physiologic Insulin Replacement



Physiologic Insulin Replacement



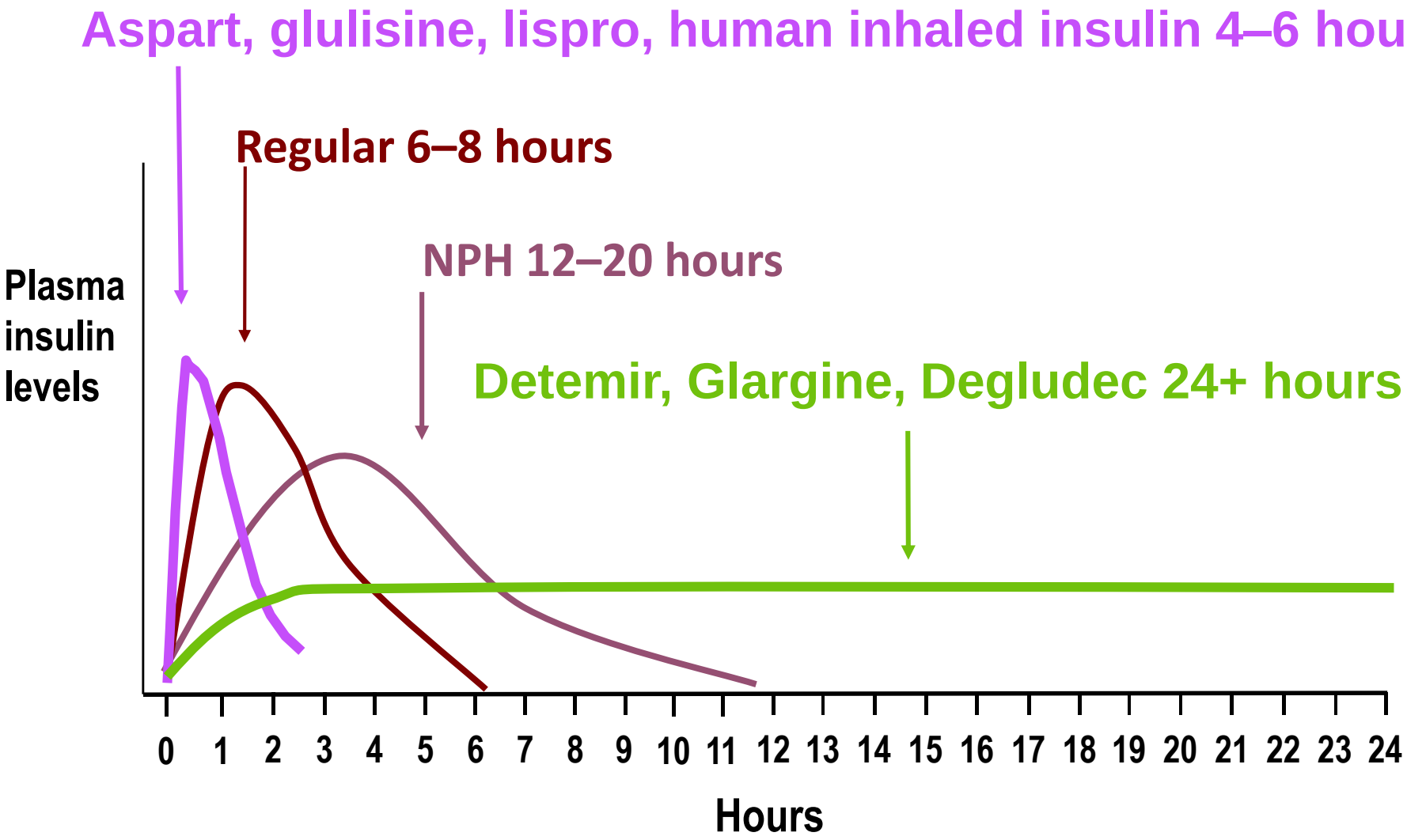
Factors Affecting Absorption

- Injection site
- Depth of injection
- Exercise
- Body temperature
- Insulin type and dose
- Insulin mixture

Best Practices in Insulin Use

- Do not use insulin as a weapon
- Insulin does not have to be a lifetime medication
- Start a weight-based dose
- First injection in the office
- Have a titration plan
- Do not under estimate the value of glucose readings
- Always look at injection sites

Action Profiles of Insulin/Analogues



Insulin Landscape: Basal Insulin

	Branded names	Onset	Peak	Duration	Cost	Notes
NPH	**HumuLIN** **NovoLIN** **ReliON**	1-2 hours	4-8 hours	6-12 hours	$100 $100 $26	Pens,vials Pens.vials vials
Glargine (U100)	Lantus **Basaglar**	1-4 hours	No peak	24 hours	$180 $286 $150 ($390)	Vials Pens Pens only
Detemir	Levemir	1-4 hours	No peak	20-23 hours	$313 $465	Vials Pens
Glargine U300	Toujeo Toujeo Max	6 hours	No peak	24 hours	$466 $620	Pens only
Degludec U100, U200	Tresiba	1 hour	No peak	42 hours	$600	Pens only

Insulin Landscape: Meal-Time Insulin

	Branded names	Onset	Peak	Duration	Cost	Notes
Regular (R)	**HumuLIN** **NovoLIN** **ReliON**	30-45 minutes	2-5hours	4-8 hours	$100 $100 $26	Pens, vials Pens, vials Vials only
Aspart	NovoLOG	15 minutes	1-2 hours	2-4 hours	$300 $500	Vials pens
Glulisine	Apidra	15 minutes	1-2 hours	2-4 hours	$206 $445	vials
Lispro	Humalog **Admelog**	15 minutes	1-2 hours	2-4 hours	$180 $240 $239 $454	Vials Pens Vials Pens

Bold products are PHP preferred

Case 1: Betty

Betty is a 48 year old female with 10 years of type 2 diabetes. She had GDM with each of her three pregnancies, and it never went away after the birth of her third child.

She has been to diabetes education (in pregnancy) and thinks she has a good idea of how to handle it, but it is hard as she is the main caregiver for her family.

She currently takes metformin 1000 mg bid, glipizide 10 mg bid. This has worked in the past, but she is having a hard time keeping up with managing her diabetes.

Case 1: Betty

Vitals: Bp 128/78, P 72 R 12 Wt 220 lbs (100 kg), BMI 34
Exam – truncal obesity, acanthosis
Otherwise normal exam
HbA1c 11.4%
Fasting glucose 248 mg/dl
Random SMBG mean 278 mg/dl
Total cholesterol 248, Trigs 220, LDL 168, HDL 36 (diabetic dyslipidemia)
Mild elevation of AST, ALT

Case 1: Betty

How can you best help with this patient?

A. She needs re-education

her health improves family health

B. She is glucose toxic

C. Assistance with injection instruction (first shot supervised)

D. Insulin titration

E. Education about hypoglycemia

F. Support along the way

Case 1: Betty

Key times to recommend diabetes self management education and support

- At diagnosis
- When new complicating factors arise
- When transitions of care occur
- Annually for health maintenance

Diabetes education 10 years ago and while pregnant may look different than now

How Long Does Diabetes Self Care Take?

Type 2 diabetes in an adult on oral meds and SMBG once daily?

234 minutes total

Type 1 diabetes child on basal bolus insulin regimen and working with school and after school program?

305 minutes total

Shubrook JH, Brannan G, Klein G, Wapner A, Schwartz FL. Time needed for diabetes self-care. Diabetes Spectrum 2018. 31(3): 267-271. https://doi.org/10.2337/ds17-0077

Case 1: Betty / Starting Insulin

Key times to start insulin

- New diagnosis and unsure what type of diabetes
- When patient is experiencing glucose toxicity
- Polys and /or weight loss
- Fasting above 200 mg/dl

How to start a basal insulin (weight based is best)

- Glargine/Detemir– 0.2 units/kg once daily
- NPH- 0.1 unit/kg twice daily at least 10 hours apart

Basal Insulin Titration

Many options for titration

Patient driven (provider guided) titration are best

- 1 unit per injection per day
- 2-4 units 2 x week
- 5-7 units/weekly

Stop titration at:

- Dose is 0.5 units/kg/day
- Hypoglycemia
- Achieved fasting glucose goal

Who Does Insulin Titration for Patients?

A. Provider

B. CDE

C. Pharmacist

Examples

Let's try a couple of examples

- Robert is a 55 year old male. His A1c is 10.4%. He weighs 80 kg.

- Please share how you would start glargine (basaglar)
- Include starting dose and titration
- What you will do with metformin and glipizide?
- What do you advise about his meal plan?

Examples-Solutions

Let's try a couple of examples

- Robert is a 55 year old male. His A1c is 10.4%. He weighs 80 kg. Please share how you would start glargine (basaglar)
- 0.2 (or 0.3) units/kg/day==16 units daily
- Titration- increase by 3 units on Monday and Thursday
- Plan for when he should return- stop titration at 40 units or if you have any lows, or if to goal fasting glucose
- What you will do with metformin and glipizide?-lots of choices here– I would continue for now but you could reduce glipizide and stop once in control
- What do you suggest about meal schedule?
- On this regimen no special meal plan needed for medications

Examples

Let's try a couple examples

- Betty-she weighs 100 kg and her A1c is 11.4%
- She is on metformin and glipizide
- How would you start NPH?
- How would you titrate this medication?
- What would you do with metformin and glipizide?

Examples-Solutions

Let's try a couple examples

- Betty-she weighs 100 kg and her A1c is 11.4%. She is on metformin and glipizide
- How would you start NPH?
- 0.1 units/kg/shot bid == so 10 units a.m. and 10 units p.m.
- Preferably 10-12 hours apart
- How would you titrate this medication?
- Could just titrate evening shot first (increase 2-4 units/wk)
- Or increase each shot 2 units each week to goal
- What would you do with metformin and glipizide?
- More likely to reduce glipizide earlier here
- What do you suggest about meal schedule?
- On this regimen she will need lunch 4 hours after a.m. injection and a bedtime snack about 4 hours after evening injection

Key Steps to Use Best Practices

- **Start a weight-based dose**
- **First injection in the office**
- **Have a titration plan**
- Do not use insulin as a weapon
- Insulin does not have to be a lifetime medication
- Do not underestimate the value of glucose readings
- Always look at injection sites

Case 2: Maria

Maria is a 58 year old female T2DM 10 years. She currently takes metformin 1000 mg bid, glipizide 10 mg bid, alogliptin 6.25 mg daily, and Glargine 80 units once daily evening.

She is frustrated. She checks her glucose each morning, and it is usually pretty good – 60mg/dl- 140 mg/dl. She does get random high readings some mornings and is not sure why.

If she misses lunch she gets real hungry and shaky.

Every time she comes to the doctor, her glucose is high, and she cannot seem to get her A1c below 8.4%

Case 2: Maria

Question

- What do you suggest as a next step?
  - Change glargine
    - Move glargine injection to the morning
    - Split the glargine injection to half morning and half evening
    - Decrease the dose
  - Change to NPH twice daily
  - Add meal time insulin
  - Add a different agent
  - Stop one of the agents

Case 2: Maria's Logs

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	142	68	112	120	56	146
278 church event	200			248 2 pm office		

What do you notice on these logs?

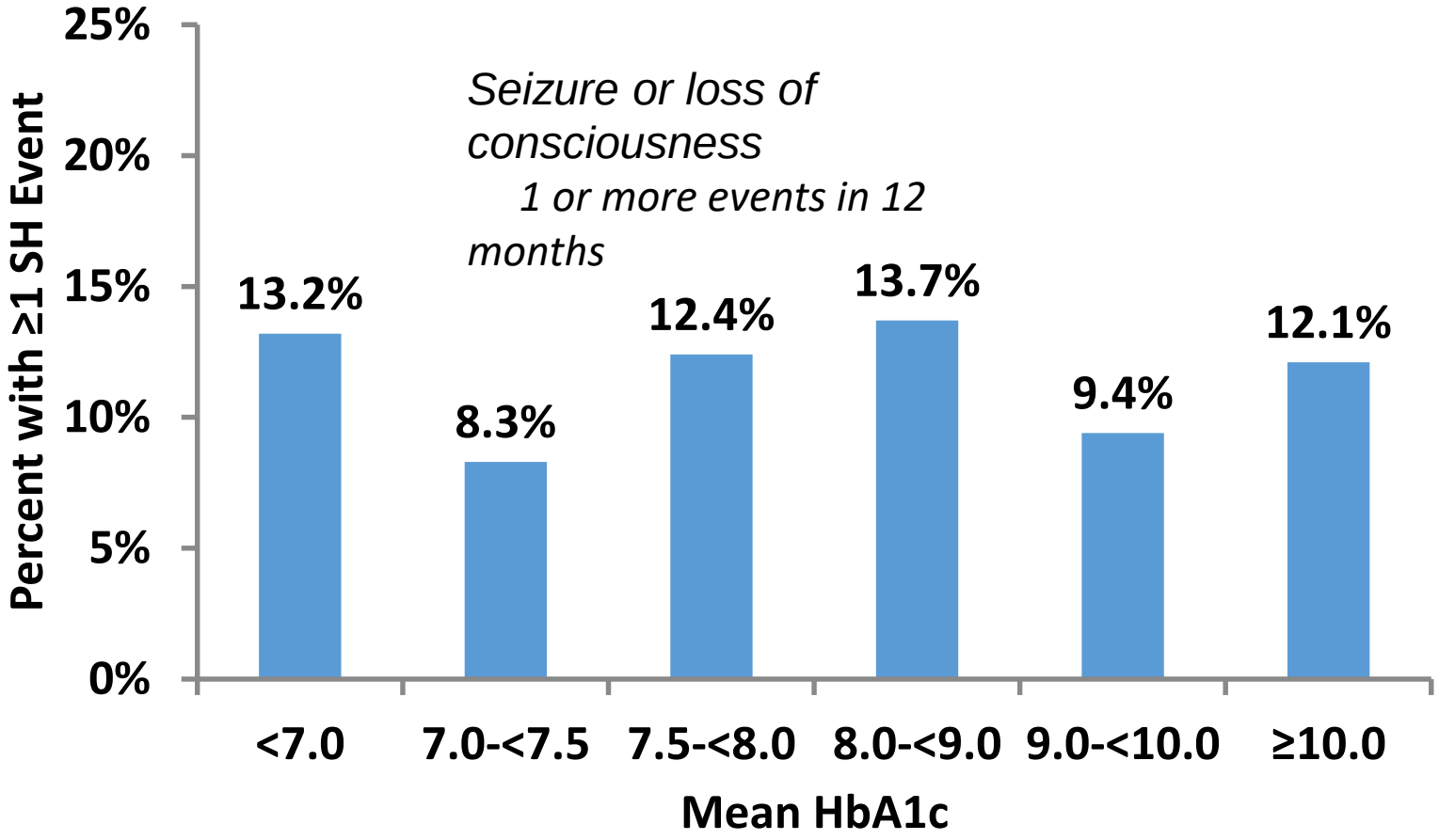
Case 2: Maria

Case 2: Problem List

- She is over-basalized (too much basal insulin)
  - She has first am glucose variability
  - She will drop low if she misses a meal
- She is on 2 agents that could drop her low (SU and insulin)
- She has inadequate coverage for her meals
- She is on a sub-therapeutic dose of DPP-4 I
- She is not using her SMBG as a tool to her direct therapy

Severe Hypoglycemia

Severe Hypoglycemia is Not Related to A1C Level



What is hypoglycemic unawareness?

Hypoglycemic unawareness

- Blunted physiologic response to repeated hypoglycemic episodes

- Strong predictor of increased mortality
- How to treat
  - Reduce medication to stop ALL hypo events for 2-3 weeks to REBOOT the body's rescue system

Case 2: Maria

Best Practices

Limit titration of basal insulin to:

- Glucose in am at goal (Regardless of HgA1c)
- Dose of 1 unit/kg/day (**Risks> benefits when more than 0.7 units/kg/day**)
- If there is a big drop in the **BE.AM**. –bedtime to am glucose

Target glucose monitoring to provide you with info for med titration

- First am while titrating basal insulin
- Once at goal move glucose checks to other times in the day

Case 2: Maria

Case Continued

Maria comes back for a recheck

- You gave her the choice to stop Glipizide or reduce insulin
- She wanted to reduce insulin first (she says the shots burn)
  - You eventually got her down to 55 units per day
  - She is still taking the Glipizide and metformin, and alogliptin

Her hypoglycemic episodes have decreased

- Her am readings 100-140 mg/dl
- After dinner 180-240 mg/dl
- No lows seen on her logs
- A1c =8.4%

Case 2: Maria

What is Your Next Step for Maria?

- Remind her the current meds largely focus on fasting glucose (metformin, basaglar)
- Her meal time meds are inadequate (glipizide, and alogliptin)
- Great time to double back on education as she can have large impact on post meal glucose
- She is trying to be more moderate with her carb intake
  - Will choose 1 carb choice per meal
    - 2 small corn tortillas
    - Rice or juice
- She walks her grandkids to and from school on weekdays

Case 2: Maria

What is Your Next Step for Maria?

- Increase basal insulin
- Add a meal time insulin (Biosimilar Lispro-Admelog ® preferred)
- Add a GLP-1 receptor agonists (Liraglutide-Victoza ® PHP preferred)
- Increase the DPP-4 inhibitor (alogliptin-Nesina® preferred)
- Add a SGLT-2 inhibitor (ertugliflozin-Steglatro® preferred)

Meal-Time Focused Medications

Medication	Strength	Side effects	Notes
DPP-4 inhibitors	Weak 0.4-0.7 % A1c	Joint pain, URI	
GLP-1RA	Strong	GI side effects	CV benefits, Renal benefits Weight loss
SGLT-2 inhibitors	moderate	UTI Genial mycotic infections Fournier's gangrene Euglycemic DKA	CV benefits, Renal benefits Heart Failure Benefit, Weight loss Lower BP Glucoretic
Meal time insulin	Strong	Weight gain hypoglycemia	

Case 3: Junior

Junior is a 64-year-old male who says his insulin is not working anymore. He has had diabetes for 15 years, and he has been on insulin for 5 years. He is taking glargine (U100) 60 units per day.

He said he really noticed a difference when he started this, but he thinks his body is rejecting it now. He also is between jobs, and he is worried about the cost of his insulin.

He also takes metformin 1000 mg bid, lisinopril-HCT 20/25 daily and atorvastatin 40 mg daily.

He is recently divorced and has had to assume more self care.

His A1c is 10.2% and he is wanting to get back in control to have more time with his grandkids.

Case 3: Junior

Question: Next Steps?

What would you do next to evaluate/educate Junior?

- Review timing of medication schedule
- Review location and technique of insulin dosing
- Evaluate the changes in self care responsibilities
- Remind him that diabetes is progressive, and we know more meds are needed over time

Case 3: Junior / Technique

He has been doing his own injections for the past year

Has his favorite spots

Has gotten really good at doing it quick

Admits he hits hard spots

Says he can sometimes smell the insulin

Case 3: Junior

Junior's Injection Sites: What Do You See?

Injection Sites

Case 3: Junior

How to handle lipohypertrophy

Stop all injections at this site

Remind patient importance to injection site rotation

Ask patient to demonstrate injection technique annually

Case 3: Junior

Question: Which insulin regimen?

- Assuming you want to put him on a human insulin routine how would you do this?
- Regular insulin alone
- NPH alone
- NPH and R together
- Premixed- NPH and R

Human Insulin

Converting to Human Insulin

- Typically unit per unit switch
- Must decide if only replacing basal or basal and meal time needs
- NPH and R
- Typically 2/3 NPH 1/3 R and typically 2/3 a.m. and 1/3 p.m.
- BUT many Americans eat more than 50% of their calories after 6 p.m.
  - So I do a 50/50 dosing schedule but will do 2/3 NPH and 1/3 R-this would need to be dose 30 minutes before breakfast and dinner

Human Insulin

Converting to Human Insulin: Example

He was taking 60 units of glargine and glipizide 10 mg bid. (Stop both)

Start Relion brand 70/30

- 30 units before breakfast
- 30 units before dinner
- Ideally 10-12 hours from breakfast to dinner

Alternative

- 20 units of NPH before Breakfast
- 10 units of R before breakfast
- 20 units of NPH before dinner
- 10 units of R before dinner

Questions

- What are the questions you have in relation to interfacing with your patients and other providers when it comes to insulin and type 2 diabetes management?
- What are you commonly seen problems?
- What are the biggest challenges your patients face?
- Any best practices you want to share with the group?

You Are Invited!

High Impact Diabetes Conference November 9-10

https://www.eventbrite.com/e/2019-diabetes-update-high-impact-management-for-clinicians-registration-59495303053

Tuition is reduced for FQHC and FQHC look like members

Back to Basics Sat night $50

High Impact Day $50

Must do early-bird registration

Finally…

Thanks so much!

Jay.shubrook@tu.edu