

2019 CALTCM Summit for Excellence



Reducing Hypoglycemic Risk in Diabetes Care

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2019

Disclosure Statement

- Dr. Timothy Gieseke, MD, CMD has no relevant financial relationship with commercial interests to disclose.



Learning Objectives

- Recognize the subtle presentations of hypoglycemia in seniors
- Set individualized targets for glycemic control
- Minimize care plans that are high risk for hypoglycemia
- Know why and when to add a trial of GLP 1 receptor agonists to the care plan



2019

Diabetes in NHs

- Independent predictor of placement
- In a 2012 study:
 - Prevalence ~32%
 - Cost of care 19.6 billion
- ~ 90% are Type II diabetics (elevated C-peptide), but we do see Type 1s
- Prediabetes confers 2x > risk of CVDz
- Complications of DM ~ triple cost of care



2019

Why Focus on Diabetes?

- Readmission Penalties (adjusted payments) as of January 1, 2019
- The CMS “SNF Readmission Measure (SNF-RM)” has been tracked and reported since Oct 2016 (2% withhold began then)
- SNF-RM is for all-cause SNF Readmissions the first 30 days after discharge from the Acute Hospital.
- Payments are adjusted based on SNF-RM relative to other SNFs.
- Hypo- & Hyperglycemia are major causes for readmissions.



Readmission Rate > in Diabetes

- CMS (data April 2016–March 2017) found persons on diabetic medications had readmission rate:
 - 22.75% vs. 18.8% for all persons.
- Serious hypoglycemia was a common cause for these readmissions



Case of Duncan Mills

- 86 y/o long stay resident with old right CVA, Stage 3B CKD, HBP, MCI, and Type II IDDM. His FS BG is ~ 140 before breakfast & ~ 180 before dinner. He receives: Metformin LA 1500 mg daily & NPH 70/30 a.c. bid. Lately, he has been mentally slow in the morning though his FS BG has increased to 160. His CNA notices at 2:00 am that he is moaning and restless.
- If you were his nurse, what would you be thinking?



Check FBG = 50 mg/dl

- **Somogyi effect**—when nocturnal hypoglycemia occurs and isn't recognized, Norepinephrine and Glucagon are released raising glucose levels so hours later, the FBG is 160
- NPH at dinner has peak effect at 2-3 a.m.
- NPH should only be given a.c breakfast or HS(peak effect at bkft)
- NPH has higher-risk for hypoglycemia than other basal insulins

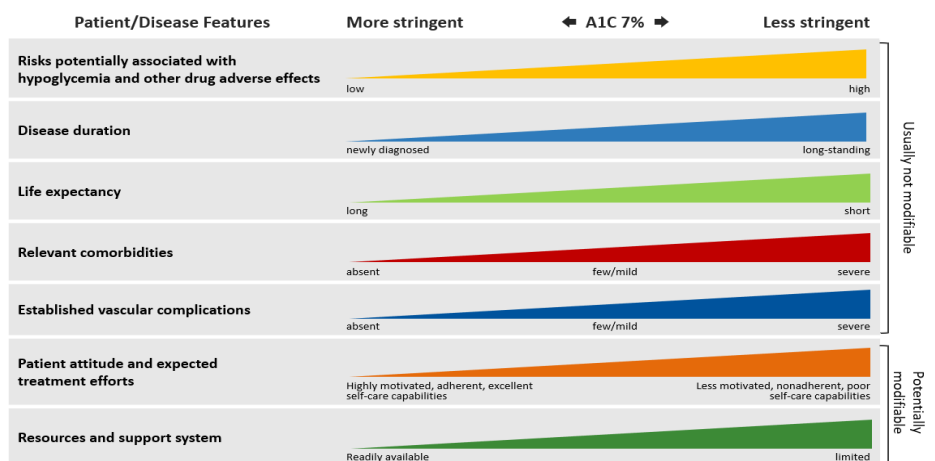


Hypoglycemia in the Elderly is Often Subtle

- May not have robust **alarm symptoms** (tremors, anxiety, sweating, hunger, lightheadedness or rapid palpitations)
- **CNS Dysfunction** common
 - Confusion, agitation, fatigue, or reduced LOC
 - Weakness & falls
 - If severe: Seizures, MI, CVA, Brain Injury, or Death
- **Definition:**
 - Mild if < 70 mg/dl or **higher** (if typical symptoms)
 - Severe if:
 - < 55
 - Hypoglycemia requiring bystander resuscitation



Approach to Setting A1C Goal



American Diabetes Association. Standards of Medical Care in Diabetes- 2017. Glycemic Targets. Diabetes Care. 40(S1):S53, 2017.

ADA Glycemic Targets for Older Adults

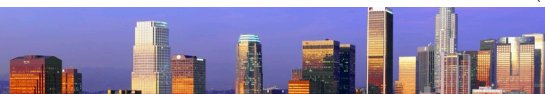
Patient Characteristics/ Health Status	Rationale	Reasonable A1C Goal	Fasting or Preprandial Glucose	Bedtime Glucose
Healthy (few coexisting chronic illnesses, intact cognitive and functional status)	Longer remaining life expectancy.	<7.5%	90–130 mg/dl	90–150 mg/dl
Complex/ Intermediate (multiple coexisting illnesses or 2+ instrumental ADL ¹ impairments or mild-to-moderate cognitive impairment)	Intermediate remaining life expectancy, high treatment burden, hypoglycemia vulnerability, fall risk.	<8.0%	90–150 mg/dl	100–180 mg/dl
Very complex/ Poor health (LTC ² or end-stage chronic illnesses or moderate-to-severe cognitive impairment or 2+ ADL dependencies) 1. Activities of daily living (ADL) 2. Long term care (LTC)	Limited remaining life expectancy makes benefit uncertain. *Avoid hyperglycemia to prevent dehydration, electrolyte abnormalities, urinary incontinence, dizziness, falls, hyperglycemic crisis.	<8.5%	100–180 mg/dl	110–200 mg/dl

Standards of Medical Care in Diabetes- 2017. Older Adults. American Diabetes Association. Diabetes Care 40(S1): S101, 2017. *Munshi et al, Diabetes Care. 39:308-18, 2016.

Monitoring Glycemic Control

- **FBG**
 - Frequency depends on desired control, risk of hypoglycemia, and patient preference
 - Before meals and bedtime until stable
 - 2 or 3 a.m. if identify risk for nocturnal hypoglycemia
 - Values > 400 mg% may not be accurate & could be considerably higher
- **A1C**
 - Assumes RBC half life of 3 months
 - Falsely low if < 3 mo. RBC half life as in CKD, HCT < 30
 - When A1C does not correlate with FBG measurements, **rely on FBGs**

1. Post acute/long term care (PA/LTC)
2. Red blood cell count (RBC)
3. Hematocrit (Hct)



2019

Block FBG Testing for Stable DM

- Test 1 time a day (a.c tid + h.s) over the course of a week, to assess control over the whole day. Eg.
 - Monday (Bkft), Tuesday (Lunch), Weds(Dinner), Thurs(h.s.), Friday (Bkft), Sat (Lunch), Sunday (Dinner)
 - May only do this for 1-2 weeks prior to next visit and not test at other times unless becomes unstable.
- FBG testing is expensive and wearing on the fingers and patient



Rule of 15 for Rx Hypoglycemia

- When fasting (FS) glucose is <70 mg/dl, give 15 grams carbohydrate
- Carbohydrate sources (15–20 g) for treating hypoglycemia
 - ½ cup fruit juice or non-diet soda or 3-4 lifesavers
 - 1 cup milk (no fat or low fat works faster)
 - If unable to take PO,¹ give glucose gel or glucagon and call MD
- Wait 15 minutes and recheck FS BG
 - If glucose is still <70 mg/dl, repeat 15 grams carb p.o
 - Wait additional 15 minutes and recheck.
 - If still low, repeat treatment and call MD
- Once FBG returns to normal, the individual should consume a meal or snack to prevent recurrence of hypoglycemia
- Inform physician or NP, so that regimen can be assessed and future low can be prevented

1. PO=by mouth

A Core Curriculum for Diabetes Educators, 3rd Ed, AADE, Chicago, Illinois, 1998
 American Diabetes Association. Standards of Medical Care in Diabetes- 2017.
 Glycemic Targets. Diabetes Care. 40(S1):S53-4, 2017.



ADA & EASD Consensus Report on Rx Type 2 DM

- Diabetes Care October 4, 2018
 - <http://care.diabetesjournals.org/content/early/2018/09/27/dci18-0033>
- For patients with CVDz or high risk of CVDz, SGL2s or Incretin RAs are next drugs of choice if Metformin inadequate, not tolerated, or contraindicated.
- Incretin RAs are generally recommended as the first injectable medicine
- Updates: Lifestyle, Diabetes Self-management, Medications, Obesity, & Surgical interventions



2019

Glucose Management for Patients With Type 2 Diabetes

HbA1c 5.7%	PREDIABETES	1	Diabetes education on self-management, lifestyle interventions 3%–5% weight loss 150 min/wk exercise					
6.5%		2	Add metformin					
	DIABETES	3	Add a second antihyperglycemic drug					
			Pio	DPP4	GLP1RA ^a	SGLT2 ^a	SU	Basal Insulin ^a
		HbA1c	↓	↓	↓↓	↓	↓	↓↓
		Weight	↑	No effect	↓↓	↓	↑	↑
		Hypoglycemia	No effect	No effect	No effect	No effect	↑	↑↑
		MACE ¹	No effect	No effect	↓	↓		
		HF	↑	No effect to ↑	No effect	↓		
>9.0%		4	Add basal insulin^a ± prandial insulin^a or SGLT2^a or GLP1RA^a					

a. Indicates a higher-cost drug.

1. Major adverse cardiac event (MACE)

JEB Reusch and JE Manson. Management of Type 2 Diabetes in 2017: Getting to Goal. JAMA. Published online 3/1/17. doi:10.1001/jama.2017.0241

Metformin is First Line Rx

- First line drug therapy as long as renal function is adequate (**ok to use EGFR**)
 - EGFR 30-45 ml/min can use sub-max. dose (500 BID), but avoid new start in this range.
 - **Metformin ER** 1500 mg daily may be safer
 - Don't use if EGFR < 30 ml/min (Lactic Acidosis).
- **B12** deficiency possible with long term use

ADA. Standards of Medical Care in Diabetes- 2019.
Pharmacologic Approaches. Diabetes Care. 40(1):S64-74, 2017.
Kancherla et al. JAGS. 2017.



SGLT2 Inhibitors (Empagliflozin, Cana-, Dapa-)

- Block sodium glucose cotransporter in the proximal renal tubule, enhancing excretion of glucose and sodium.
- Must have adequate renal function (eGFR > **45** ml/min).
- Expect: Weight loss & lower Systolic/diastolic BP
- **Empagliflozin reduced mortality** 32% within 3.1 yrs (CV Mortality 38%, Heart Failure 35% in NEJM Nov 2015).
 - **FDA indication** for reducing **MACE**
- May reduce progression CKD
- **Concerns:** Genital mycotic infections, UTI's, High Cost, Euglycemic DKA, **PVD Amputations (Canagliflozin)**



Injectable Therapies – Start with GLP-1 RAs

- GLP-1 Receptor Agonists (Liraglutide, Dulaglutide, Bydureon)
 - Act like supra-physiologic levels of **incretins**:
 - Enhance glucose stimulated insulin secretion and **glucagon suppression**
 - Post-prandial hyperglycemia improved
 - Slows gastric emptying & promotes early satiety @ CNS¹ level
 - **Potent**, low risk of hypoglycemia, promote weight loss, modest decrease in BP
 - **Liraglutide**: decreased mortality and reduced MACE w/in 3.8 years, but not heart failure (NEJM July 2016)
 - **FDA indication** for reducing MACE
 - Concerns: risk of pancreatitis?, **GI** side effects (nausea, vomiting, diarrhea), C-cell hyperplasia and MTC² in rodents, **Cost high**



1. Central nervous system (CNS)
2. Medullary thyroid carcinoma (MTC)

Marso et al. New Engl J Med. . 375:311-22, 2016



2019

Basal Insulin (NPH, Glargine, Levemir, Degludec)

- Activate insulin receptor to enhance postprandial glucose disposal and suppress hepatic glucose production
- Universally effective
- Degludec has lower risk hypoglycemia
- **Concerns** (for all insulins): serious hypoglycemia, weight gain, training requirement,
- **High Cost**: Only 3 companies produce insulin analogs
 - Tripled price 2003-2013.
 - Doubled price 2012-2016



2019

Rapid Acting Insulins

- **Highest risk** for inducing serious hypoglycemia
- Regular insulin greater risk than analogs
- Give immediately a.c meals (even regular insulin)
- May give analogs immediately p.c. if eating not predictable
- Minimize bedtime use to reduce risk nocturnal hypoglycemia (eg. SSI a.c. tid – not h.s.)



Why Not Just Use Sliding Scale Insulin?

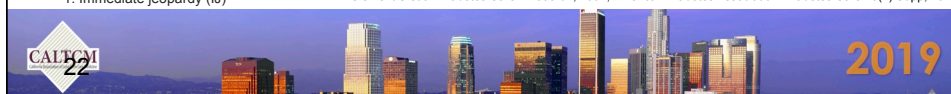
- Dose is not individualized
- Insulin is reactive, rather than proactive to what will happen
 - Giving insulin to cover when the BG is already high, rather than preventing the hyperglycemia



- Leads to wide fluctuations in glucose levels
 - “**brittle diabetes**” is commonly iatrogenic
- Does not provide basal insulinization (needed by insulin deficient diabetics) nor consider nutritional coverage
- If used w/o basal insulin, Calif. facilities have received **IJ citation**¹

1. Immediate jeopardy (IJ)

Leahy J. Endocr Pract 12:86-90, 2006; Queale WS et al. Arch Intern Med 157:545-552, 1997
Clement S et al. Diabetes Care 27:553-91, 2004; American Diabetes Association. Diabetes Care 40(1):Suppl, 2017



Some of the Variability of FBG May be Due to Injection Errors

- Diabetes Care in the UK, “FIT UK Forum for Injection Technique UK”
- Free
- http://www.fit4diabetes.com/files/4514/7946/3482/FIT_UK_Recommendations_4th_Edition.pdf
- Only 1 pen/patient
- Wrong angle of injection
- Wrong size needle
- Injection time errors
- Failure to rotate injection sites in predictable pattern to minimize tissue injury
- Wrong injection site
- Injecting into site of lipodystrophy or hypertrophy



Case of Laura C.

- 80-year-old with HBP,¹ chronic atrial fibrillation, diastolic heart failure, overweight, and prediabetes.
- She is hospitalized with acute abdomen due to perforated diverticulitis with SIRS.²
- She requires emergency laparotomy, colostomy, ICU³ level care, antibiotics, SSI insulin in the ICU on the ward.
- She had complicating *C. diff* for which she is now on oral Vancomycin.
- She is starting to eat, but still has FBG in 200–330 range.
- She is transferred to you on SSI Novalog AC TID⁴ + HS.
- How would you manage her diabetes?

1. High blood pressure (HBP)
2. Systemic inflammatory response syndrome (SIRS)
3. Intensive care unit (ICU)
4. TID=3x/day



Adjust Orders to Reduce Hypoglycemic Risk

- Medically complex and sick
 - A1C target 8.0–8.5% while so sick
 - FBG 100–180 on AC TID + HS
 - Check 2–3 a.m. FBG 2x/wk
- Add basal insulin in the **morning** with goal of morning FBG 100–140 range
- Cancel SSI at bedtime
- Add 3 units of RA analog insulin with or after each meal with hold if doesn't eat
- Continue corrective SSI
- RA analog added to scheduled meal insulin
- Reassess in 2–3 days



Case of Shirley M.

- 50+ year-old women with Type II IDDM with class 3 obesity, severe OSA (BiPAP¹-dependent HS), and persistent flaccid left hemiparesis after a large CVA.
- Her glycemic control remains poor with FBG in 150–350 range before meals and bedtime despite Lantus 80 units a.m./40 units HS and Novalog 30 units AC TID.
- She attempts to restrict calories, but is commonly hungry.
- What might you do to improve her glycemic control and health?

1. Bilevel positive airway pressure (BiPAP)



Options

- Reduce basal insulin if TDD¹ of insulin > 1 unit/kg/day
 - Reduce Glargine and see if hunger, xs PO intake, and FBG improve
- Add a GLP-1 RA
 - Liraglutide .6 mg SQ x 1 wk, then 1.2 mg SQ x 1 wk, then 1.8 mg SQ thereafter
 - She tolerated this well, lost ~5 kg, took less insulin, and had FBG most of the time in the low 100 range and no documented lows

1. Total daily dose (TDD)



Case of Phil M.

- 60+ year-old with developmental delay, long standing schizophrenia, over-weight, and Type 2 NIDDM for about 10 year managed with Metformin
- Hospitalized for poorly controlled DM with dehydration, glucose 650, and A1C 10.9
- He received IV fluids and insulin, but is transferred to SNF for rehab only on Metformin because DPOA¹ is concerned that he will lose his independent living, if his care is too complex
- What do you do?

1. Durable power of attorney (DPOA)



Many Concerns

- Was he taking his Metformin?
- Was his supervision adequate?—delayed crisis recognition
- **Glucotoxicity**
 - High glucose levels worsen insulin resistance
 - Using insulin to control hyperglycemia, resistance improves reducing need for supplemental insulin
- Lantus 15 units daily initially
- Decided to try Liraglutide because it is once a day with much lower risk of hypoglycemia
- Able to stop Lantus and achieve near normal FBG w/o lows
- TAR¹ for Dulaglutide (SQ weekly)

1. Treatment authorization request (TAR)



Evidence Based Consensus Guidelines for Managing Type 2 DM

- Consensus statement by the American Association of Clinical Endocrinologists and American College of Endocrinology on the comprehensive type 2 diabetes management algorithm – 2019 executive summary
- <https://journals.aace.com/doi/full/10.4158/CS-2018-0535>



Resources for Clinicians

1. ADA 2019 Standards of Care—Abridged Version for PCPs
<http://clinical.diabetesjournals.org/content/diaclin/early/2018/12/16/cd18-0105.full.pdf>
2. ADA 2019 Standards of Care—Abridged Version for PCPs
<http://clinical.diabetesjournals.org/content/diaclin/early/2018/12/16/cd18-0105.full.pdf>
3. American Association of Clinical Endocrinologists (AACE) 2018 Comprehensive Type 2 Diabetes Management Algorithm—free
 - a. <https://www.aace.com/publications/algorithm>
 - b. Evidence based, but more expert opinion
 - c. Free slide presentation
4. AMDA, The Society of Post Acute and Long Term Care Medicine
 - a. <https://paltc.org/>. (Resources, Clinical Products, Product type, Clinical Practice Guidelines (CPGs), Diabetes CPG)
 - b. Clinical Practice guideline for Diabetes Care in PA/LTC updated 2016
 - c. Hard copy and electronic version (\$39 for members)



Resources for Clinicians

- HSAG Readmission California Tools and Worksheets
 - <https://www.hsag.com/care-coord-ca-tools>
- HSAG Readmission California Tools and Worksheets
 - <https://www.hsag.com/care-coord-ca-tools>
- Yale Monograph Newsletter list serve—Free
 - https://visitor.r20.constantcontact.com/manage/optin?v=001TYH5ba1NOYXtML0xfSflmrUFVVBwFA7-5fPWBSG8c91yDf2baDSH-MYoJ1v1QYH1urG7SAwC3bvNqQUr24vFLE9fCVfr6CyM0dJ7iO-y2bL_DauNFwTzPVRZv8R9VpW-xhFVX1d0sS7msbfFnu7UpuRpsPVKebg6s
 - Concise daily 5–6 page review of ADA (June), and European Association for the Study of Diabetes (EASD) (September), annual meetings
 - Quick way to keep up on current clinical developments in diabetes care
- Epocrates Online—commercial for PC, tablets, and smart phones
 - <https://online.epocrates.com/>
 - Quick and practical resource I use multiple times daily



Resources for Patient Ed

- Diabetes Self-Management Education and Support (DSME and DSMS)
 - Knowledge is power and power
 - A 24/7 disorder that is complex and can quickly change
 - Diabetes educator(s) in your community extremely valuable
 - Internet based free patient education:
 - UpToDate for Patients:
<https://www.uptodate.com/contents/table-of-contents/patient-information>
 - HealthinAging Tip Sheets:
<https://www.uptodate.com/contents/table-of-contents/patient-information>
 - X-Plain Patient Education Library:
<https://www.uptodate.com/contents/table-of-contents/patient-information>
 - ACP Patient Education Channel:
<https://www.uptodate.com/contents/table-of-contents/patient-information>

