



Hypoglycemia Increasing Awareness & Reducing Risks and Harms

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Hypoglycemia - The Stats

- Leading cause of ED & Hospital Admissions for people with diabetes
 - ~100,000 ED visits annually for Hypoglycemic events due to insulin therapy (IHE)
 - >30,000 Hospitalizations
 - In-hospital death - ~34% in elderly
 - High 30 day readmission rate
 - In the elderly 105/100,000 person-years admissions for Hypoglycemia vs 70/100,000 person-years for hyperglycemia
- Second leading Adverse Drug Event concern

Risk of In-hospital Death or Prolonged LOS After Severe Hypoglycemic Event -- Along with **Age**

Charlson Index (comorbidity)

- **1 each:** Myocardial infarct, congestive heart failure, peripheral vascular disease, dementia, cerebrovascular disease, chronic lung disease, connective tissue disease, ulcer, chronic liver disease, diabetes.
- **2 each:** Hemiplegia, moderate or severe kidney disease, diabetes with end organ damage, tumor, leukemia, lymphoma.
- **3 each:** Moderate or severe liver disease.
- **6 each:** Malignant tumor, metastasis, AIDS.

Indices of deprivation

- **Income**
- **Employment**
- **Health and disability**
- **Education, skills and training**
- **Barriers to Housing and Services**
- **Living environment**
- **Crime**

Why Talk About Hypoglycemia

- Safety and patient outcomes
 - We need to increase awareness of hypoglycemia as a risk for harm
 - Education (clinician, staff, patient & family)
 - Awareness of the harms
 - Symptom & treatment awareness
 - Hypoglycemia risk assessment
 - We need to prevent / reduce hypoglycemic events
 - Patient & family education - action plan
 - Glycemic targets (risk vs benefit of tight control-shared decision making)
 - Medication choices/ impact of other medications, etc.

Think Possibilities



- Be alert to information that relates to patients in your clinic who may be at risk for hypoglycemia
 - What factors indicate risk for hypoglycemia?
 - How can that risk be reduced?
 - How can you increase awareness of hypoglycemia (low blood sugar) among your staff and patients?
- Be engaged & ready to share ideas

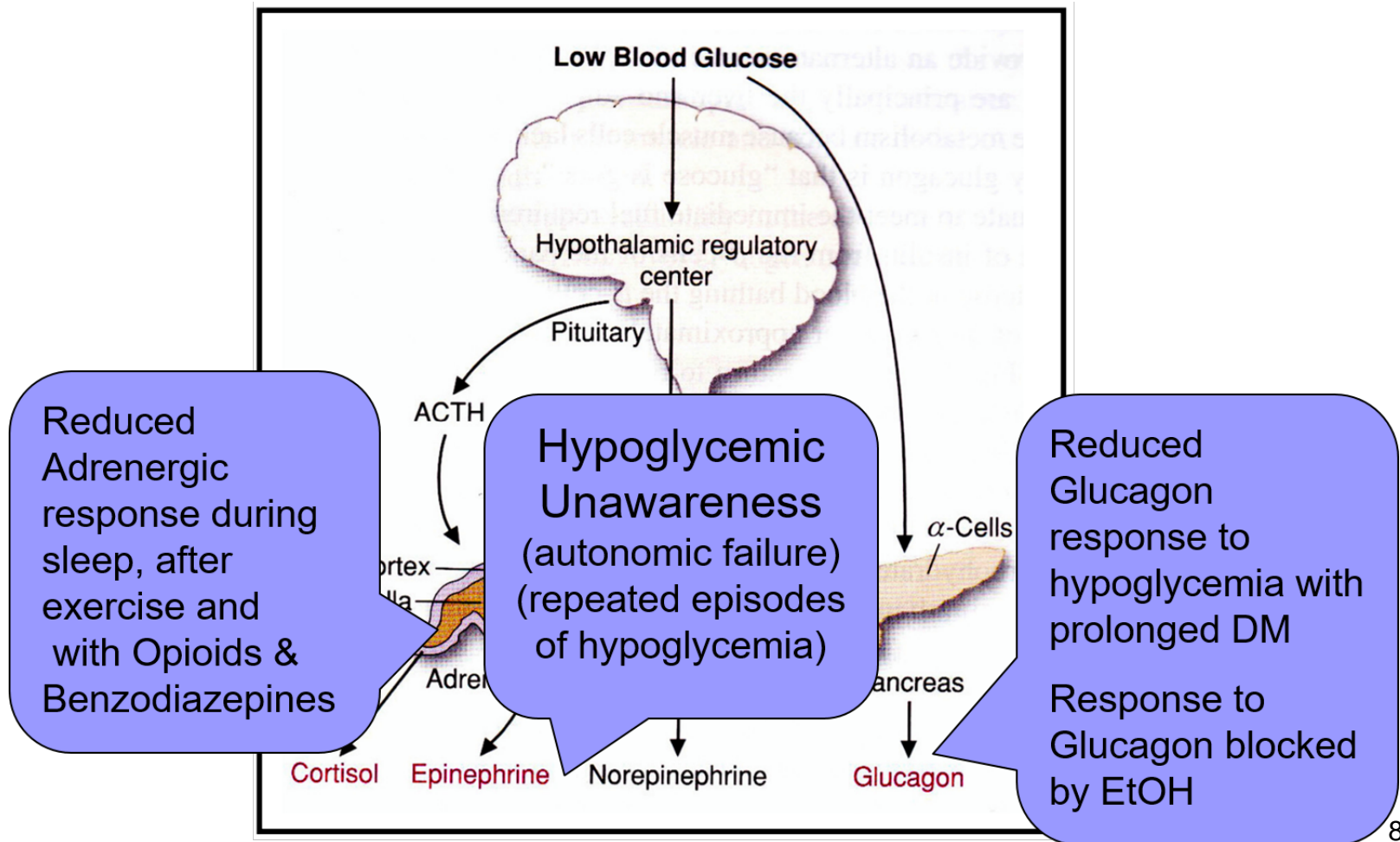
Hypoglycemia in Patients with Diabetes

- Currently main focus in diabetes care is on reducing hyperglycemia: acute & chronic complications
 - Tight control advocated
 - Can take up to 9 to 20 years to develop chronic complications of hyperglycemia (youth < elderly)
- Need to consider Benefit vs Risk
 - Risk of Hypoglycemia Event(s)
 - Risk of Harm from Hypoglycemia
 - Living or working alone
 - Driving/ operating heavy equipment /other dangerous work/life exposure
 - Comorbid susceptibility to effects of hypoglycemia

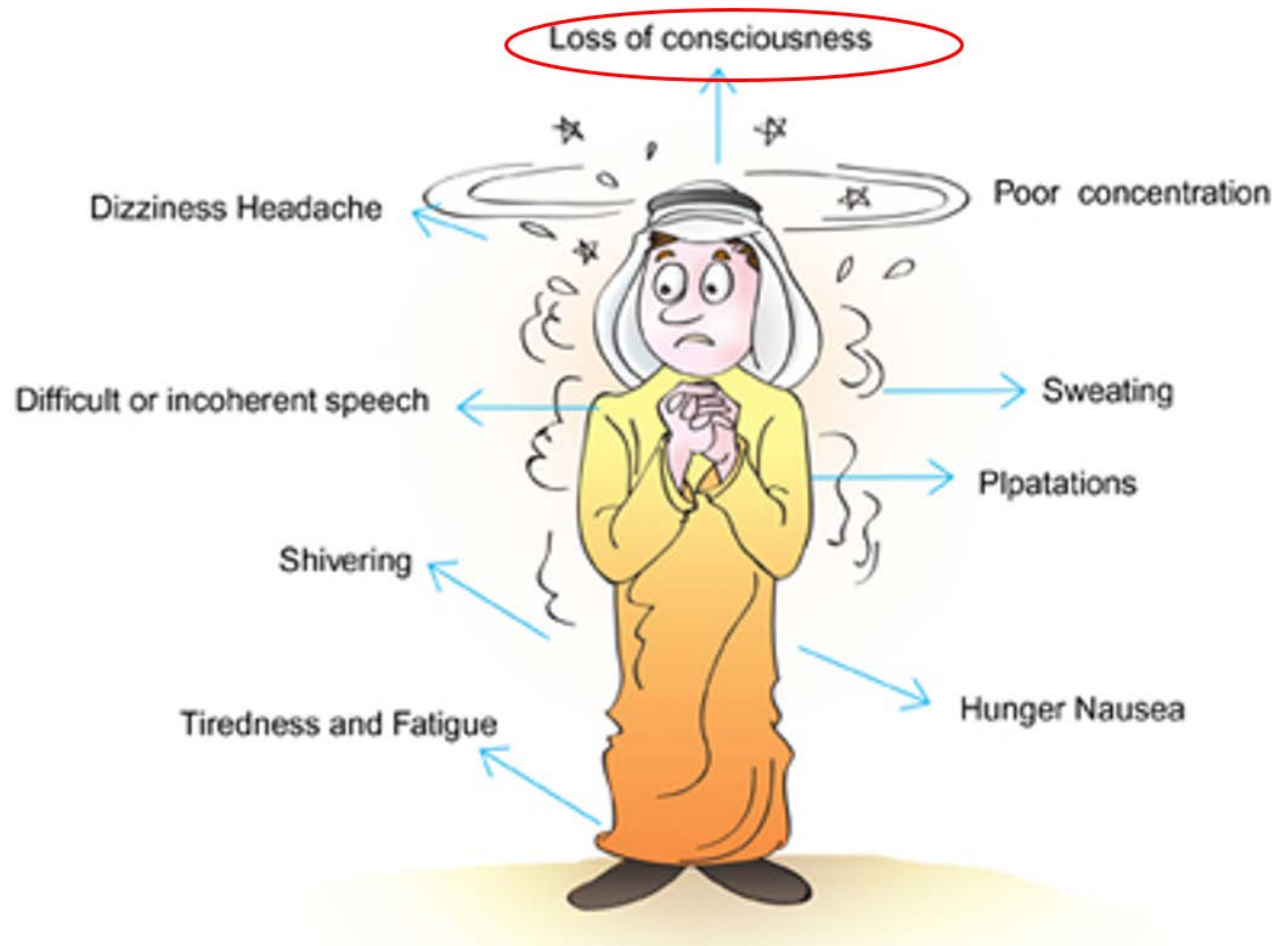
Hypoglycemia in Patients with Diabetes (cont.)

- Hypoglycemia defined as blood glucose <70 for people with diabetes = “**Low Blood Sugar**”
 - **Severe Hypoglycemia (SH)** defined as needing assistance to treat or <40 mg/dl
 - **Asymptomatic Hypoglycemia -Hypoglycemic Unawareness** defined as not getting the adrenergic & cholinergic warning symptoms of hypoglycemia
 - **Relative or Pseudo-Hypoglycemia** - Some patients, especially with T2DM & poorly controlled DM, get symptoms of hypoglycemia with a blood sugar >70
 - **Fear of Hypoglycemia** – can be cause for high blood sugars and/or roller-coaster blood sugars

Counter-Regulatory Hormones



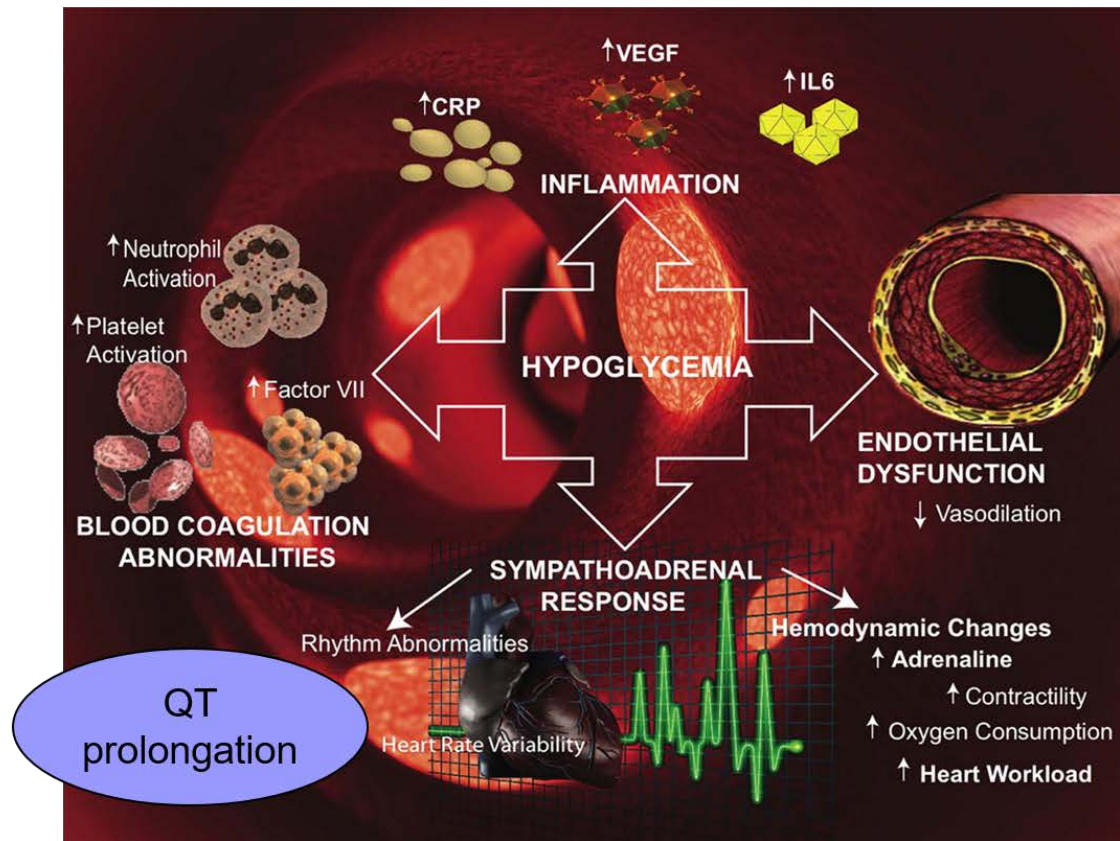
Neurogenic Response >> Neuroglycopenia



Hypoglycemic Effects

- Neurocognitive effects
 - cognitive effects & impairment, coma, brain dead, dementia
- Increased falls and trauma
 - Impaired driving/ accidents
 - Fractures, lacerations, Traumatic Brain Injury
- Increased CVD and Mortality
 - Acute Ischemia
 - Atherogenic effects
 - Pro-inflammatory/ Pro-coagulant
 - Greater at BG 50 than BG 200;
 - Elevated for >7-8 days after event
 - Arrhythmogenic effects
 - “ Dead in bed”

Mechanisms by Which Hypoglycemia May Affect Cardiovascular Events



Desouza C V et al. Dia Care 2010;33:1389-1394

Hypoglycemic Risk

- Insulin & insulin secretagogues (Sulfonyl-Urea (SU) meds)
- Intensive or tight control & targets
- Risk in T2DM: in Accord highest risk with A1c >9%
 - Not all hypoglycemic risk is from tight control
- Missed / irregular meals (food insecurity)
- Risk higher with longer duration of diabetes
 - Progressive loss of Beta cells
- Increased in the elderly, especially if cognitive impairment (“vicious cycle”)

Hypoglycemic Risk (cont.)

- Renal and/or Hepatic Impairment
 - Prolonged $t_{1/2}$ and reduced Gluconeogenesis (GNG)
- Medication errors & safety
 - literacy, numeracy, lack of education
- EtOH, Opioids, benzodiazepines
 - Reduced counter-regulatory responses
 - EtOH blocks Hepatic glucose output (glucagon ineffective)
- Exercise / Increased activity
 - Increased glucose utilization and insulin sensitivity (3days)
 - Blunted counter-regulatory response (autonomic failure)

Causes of Severe Hypoglycemia: Cultural Similarities, Differences and Resource Consumption in Three European Countries¹

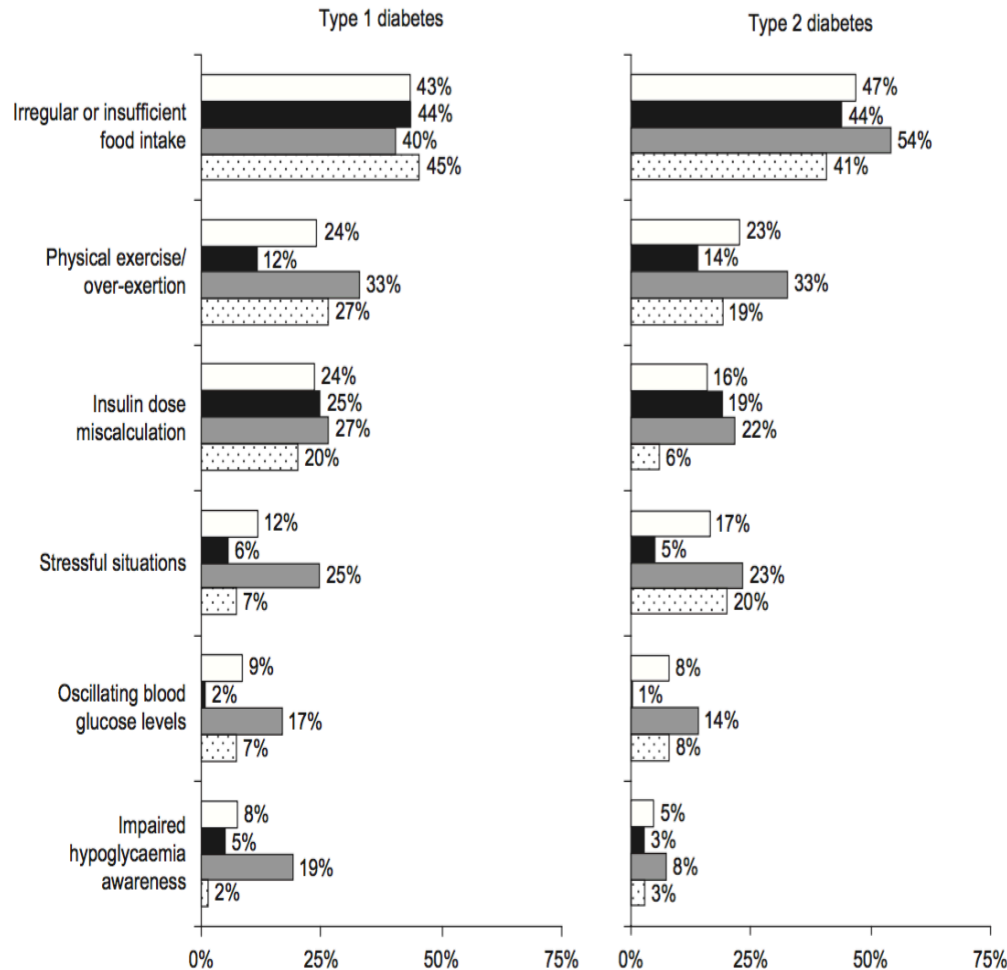
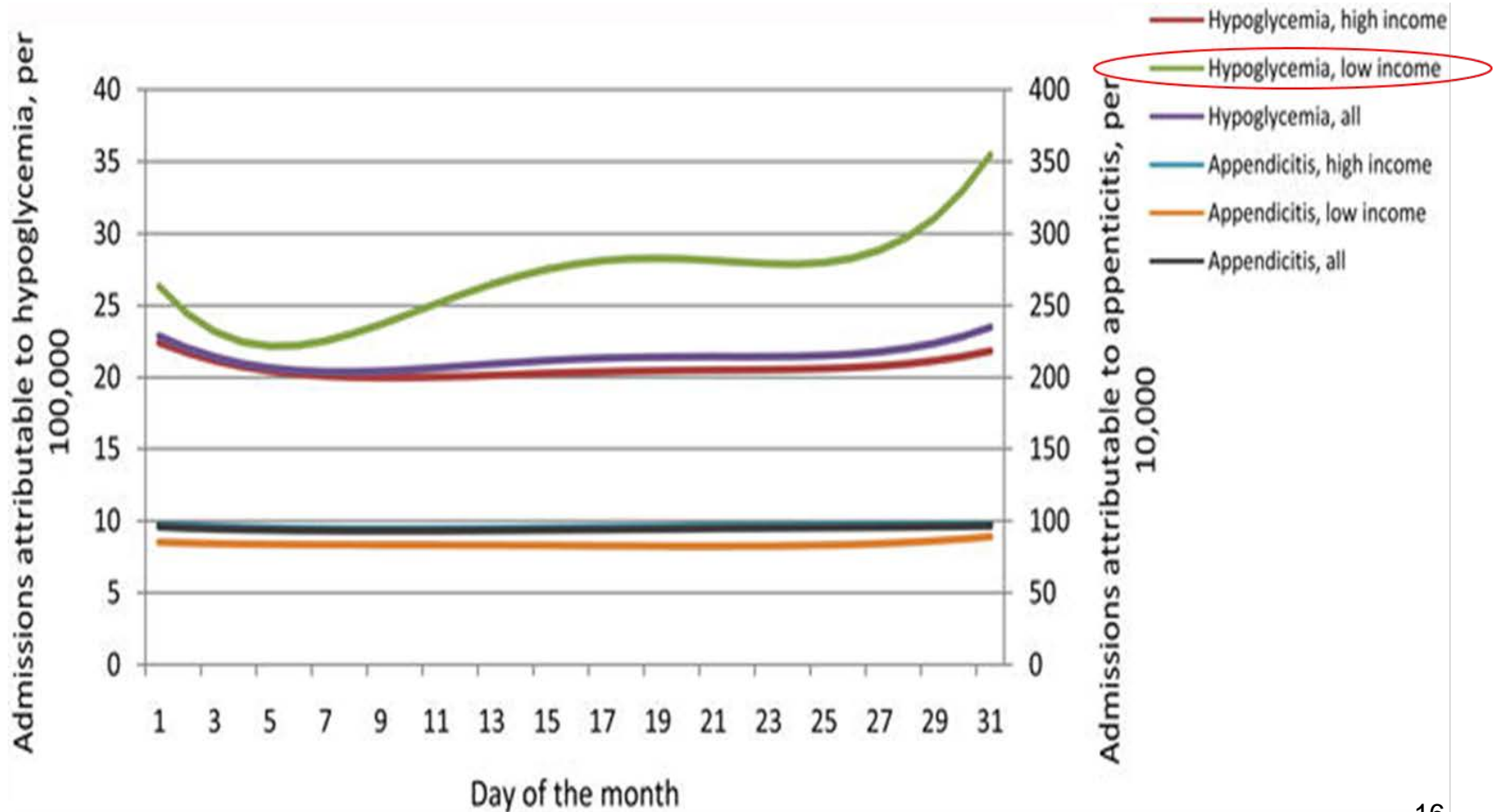


Figure 2. Causes identified by patients for the severe hypoglycaemic events and number of patients (as % of group) reporting them. White bar = total of all countries (type 1, 319; type 2, 320); black bar = UK (type 1, 101; type 2, 100), grey bar = Germany (type 1, 94; type 2, 120), dotted bar = Spain (type 1, 124; type 2, 100).

Irregular or Insufficient Food Intake

- Missed / Delayed / Reduced Meals
 - Job demands, travel, meetings, etc.
 - Fasting for tests or procedures
 - Illness (eat less or unable to eat or vomiting)
 - Lack of nutritional knowledge (carbs) (eggs & bacon)
 - Struggles with numeracy (carb counting & insulin dose)
 - Reduced ability to shop for or prepare meals
 - Aging, widower, loss of vision, amputations, etc.
 - Lack of food (food insecurity)
 - Insufficient money or SNAP funds for purchasing food

Hypoglycemia and Food Insecurity



ADA Standards of Care for Hypoglycemia

- Recommendation
 - Individuals at risk for hypoglycemia should be **asked** about symptomatic and asymptomatic hypoglycemia at each encounter

(patients on insulin or sulfonylurea medications)

Symptoms of Hypoglycemia

Early “mild” symptoms (adrenergic/cholinergic):

- Sudden moodiness or confusion
- Dizziness
- Feeling shaky or trembling
- Hunger
- Headaches
- Irritability
- Pounding heart; racing pulse
- Skin turning pale
- Sweating or clammy
- Weakness
- Anxiety

Late severe symptoms (neurocognitive):

- Poor coordination
- Poor concentration or confusion
- Difficulty speaking or slurred speech
- Numbness around mouth & lips or other localized neurologic symptoms
- Seizures or convulsions
- Passing out
- Coma
- Death

Symptoms of Hypoglycemia (cont.)

Nighttime symptoms:

- Damp sheets or bed clothes due to perspiration
- Nightmares or bad dreams
- Tiredness
- Irritability, headache or confusion upon waking
- Not waking up

Signs and Symptoms

Here's what may happen when your blood sugar is low:



If low blood sugar is not treated, it can become severe and cause you to pass out. If low blood sugar is a problem for you, talk to your doctor or diabetes care team.

ADA Standards of Care for Hypoglycemia (cont.)

- Recommendation
 - ***Glucose (15-20 g) is the preferred treatment*** for the conscious individual with hypoglycemia (glucose alert value of <70) although any form of carbohydrate that contains glucose may be used.
 - Fifteen minutes after the treatment, if SMBG shows continued hypoglycemia, the treatment should be repeated.
 - Once SMBG returns to normal, the individual should consume a meal or snack to prevent recurrence of hypoglycemia.

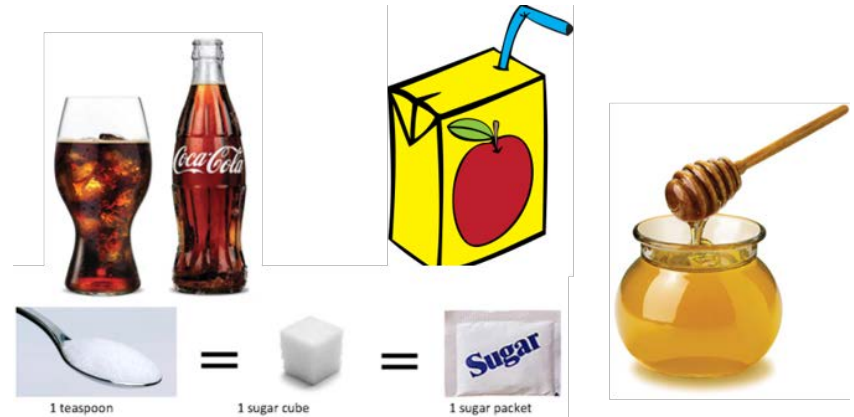
Treating Hypoglycemia

- Hypoglycemia “**Rule of 15/15**”

- 1) Check your blood glucose: If your blood glucose is 70-100mg/dL and you are symptomatic (sweaty, shaky, hungry, irritable, tired) or your blood glucose is less than 70mg/dL, take **15 grams of fast acting carbohydrates***.

- *Examples of fast acting carbohydrates are:

- 3-4 glucose tablets OR
- 1 tube glucose gel OR
- 1 cup non-fat milk OR
- 6 oz regular soda OR
- 4oz (1/2 cup) fruit juice OR
- 5 lifesavers OR
- 2 tablespoons of raisins or
- 2 teaspoons of sugar or honey.



- 2) **Wait 15 minutes and then recheck** your blood glucose. If your blood glucose is not up to 100mg/dL, then repeat the above treatment.
- If the symptoms of low blood glucose are gone but it is more than 1 hour away from your meal time, eat a snack of 1 starch and 1 protein such as ½ sandwich OR 1oz cheese and 6 crackers OR 1 tbsp. peanut butter and 6 crackers OR 4oz non-fat milk and 2 graham crackers.

Sources of Carbs (want “rapid” Carbs for fast absorption)

- **Great Sources of Carbohydrate for a Low Blood Sugar**

- *Glucose gels (cake gels) (absorbed from lining of mouth)*

Glucose tabs

Smarties

Pixie Sticks



- These are all dextrose and glucose and are broken down and in your system within 10 minutes. Dextrose is very similar to glucose in terms of it’s molecular structure, which makes it a fast source of carbohydrate for a low.

- **Pretty Good Sources of Carbohydrate for a Low Blood Sugar**

- *Juice box*

Soda

Dried fruit

Jelly beans

- These sources can take at least 20 minutes to break down and get into your bloodstream (e.g. Jelly beans have a lot of additives and fillers, which your body has to break down first, before digesting the carbohydrates)

- **Not-So-Great Sources of Carbohydrate for a Low Blood Sugar**

- *Milk*

Peanut Butter Sandwiches

Chocolate bars

Cookies

Ice cream

- These sources of carbohydrates are loaded with fats and proteins, which will slow down the digestion process and delay your body’s ability to get that glucose into your bloodstream.

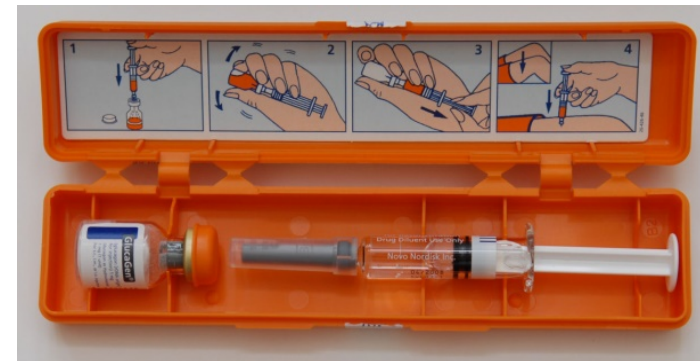
ADA Standards of Care for Hypoglycemia (more)

- Recommendation
 - **Glucagon** should be prescribed for all individuals at increased risk of clinically significant hypoglycemia, (defined as blood glucose <54) so that it is available should it be needed.
 - ***Caregivers, school personnel, or family members of these individuals should know where it is and when and how to administer it.***
 - Glucagon administration is not limited to health care professionals

Joslin Diabetes Center Patient Guide

If you pass out [from low blood sugar]

- If ... you do not take care of low blood glucose, you may pass out.
- If you do, a drug called **glucagon** should be injected into your skin, like you do with insulin.
- This can be done by a family member or friend who has been taught how to do it.
- Since glucagon may cause you to vomit, you should be placed on your side when the injection is given.
- If no one knows how to give the injection, you should be taken to a hospital.
- You need a prescription for a glucagon kit.
- You should awaken about 10 minutes after the glucagon is injected. If you do not, you should be taken at once to a hospital.



Help from Technology

- Continuous Subcutaneous Insulin Infusion (CSII)
 - Insulin pumps
 - Less variability in insulin absorption
 - Can reduce basal rate for exercise and overnight
 - Help with calculations (“bolus wizard”)
 - More precise dosing (2.6 units vs 2 or 3 units)
- Continuous Glucose Monitoring (Sensor) (CGM)
 - W or w/o pump therapy
 - Warns when reach threshold
 - With pump
 - Suspend insulin if <60
 - “Artificial pancreas” prevents lows (ac



ADA Standards of Care for Hypoglycemia

- Recommendations to improve patient outcomes from hypoglycemia
 - Individualized glucose targets
 - Patient education
 - Dietary intervention (match carbs and insulin)
 - Exercise management (snacks to prevent low glucose; reduce insulin; awareness of *delayed* post-exercise low BG)
 - Medication adjustment
 - Glucose monitoring
 - Routine clinical surveillance

Individualized Glucose Targets

- Consideration of more *intensive treatment* only if the **potential absolute benefits outweigh the harms**
 - ...with a thorough understanding of the
 - **patient's risks**
 - **prognosis (i.e. age, comorbidities, and functional status)**
 - **socio-personal context (e.g. lifestyle, social support, workload capacity)**
 - **perceived or experienced treatment burden**
 - **values and preferences for care**

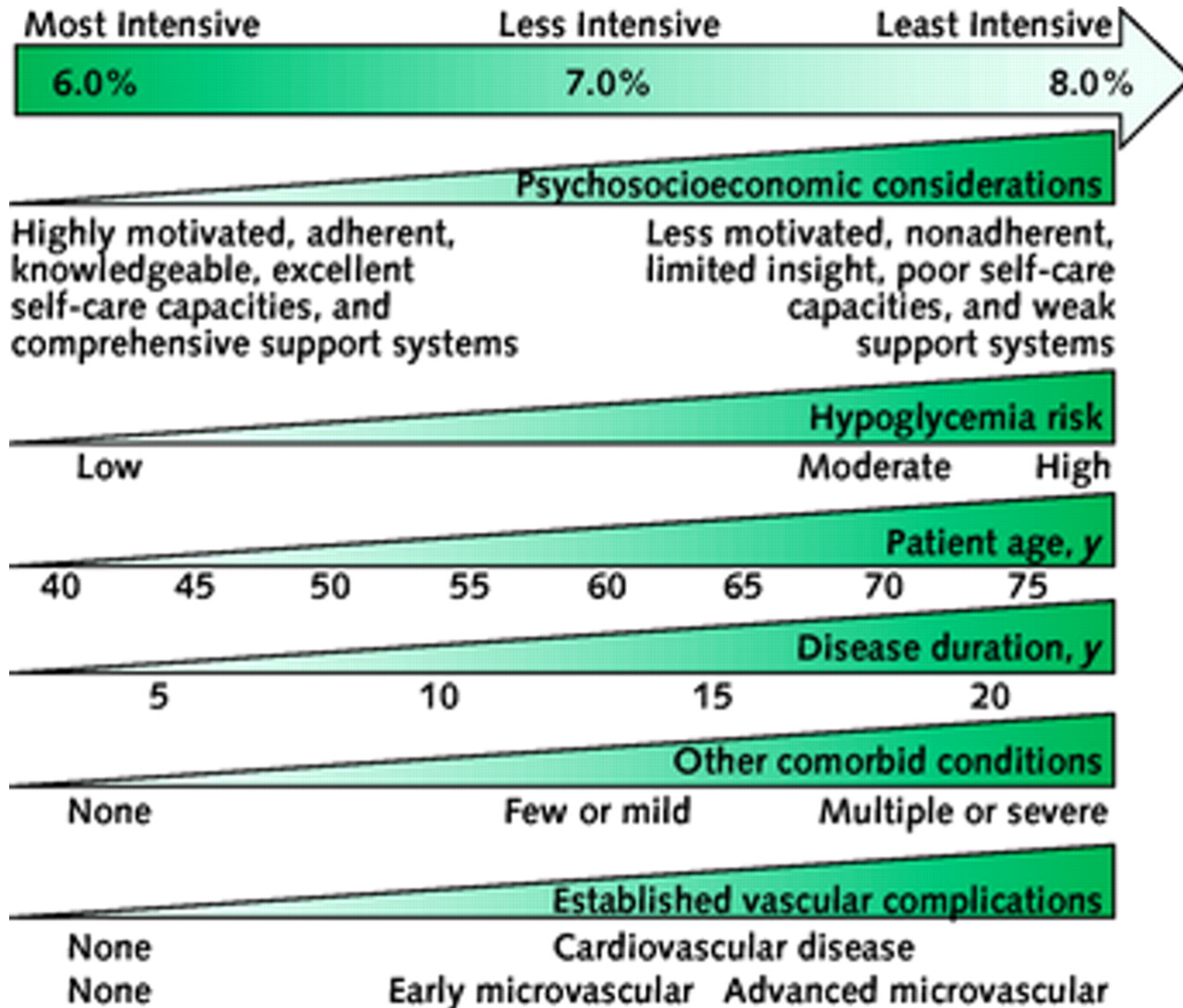
*“...the fundamental goal is to help individuals who have diabetes make the best therapeutic **decision to improve their overall health and quality of life**, not to prevent diabetes-related complications by any means possible”*

Clinical Equipoise in Setting Glycemic Goals

No single HbA1c level is appropriate for all patients...

- **“we should abandon the notion that HbA1c levels $\leq 7\%$ are well controlled and levels $> 7\%$ are uncontrolled.”**
- This arbitrary dichotomy does not adequately portray whether we are optimizing
 - **the benefits of treatment,**
 - **quality of life, and**
 - **value for individuals**

Individualized Glucose Targets



But Before We Individualize Glycemic Goals...

- Need to be aware of issues around A1c values
 - **Accuracy** issues (often not accurate reflection of glycemic levels or true glycemic control)
 - **Precision** issues: better as a **range**, not a cut-off
 - Does not indicate degree of **glucose variability**
 - Therefore **not safe guide for adjusting insulin** therapy – need actual blood sugar patterns

Issues with A1c Assays

- **Assay accuracy** (how well represents actual glycemia (blood glucose levels))
 - Age and ethnic/race difference
 - Different alignment with “estimated glucose”
 - African American: A1c ~0.4 higher for same level of blood sugars
 - Elderly reported to have higher A1c as well
 - If aim for same A1c goal = over treating (more lows)
 - Interfering substances/conditions
 - Iron deficiency (increased A1c)
 - Sickle Cell trait (lowers A1c)

Table 1

Conditions Causing Inappropriately High or Low Hba1c[10]

Inappropriately Low HbA1c	Inappropriately High HbA1c	Variable Effect on HbA1c+
Hemolysis	Iron deficiency	Fetal hemoglobin
Certain hemoglobinopathies	Vitamin B 12 deficiency	Methemoglobin
Recent blood transfusion	Alcoholism	Certain hemoglobinopathies
Acute blood loss	Uremia	
Hypertriglyceridemia	Drugs*	
Drugs*		
Chronic liver disease		

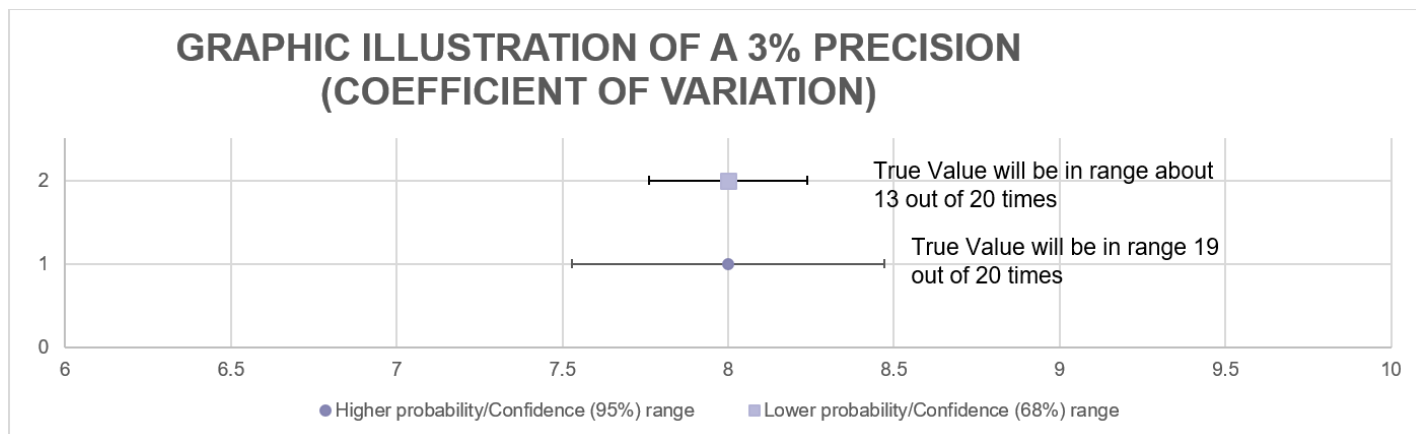
Table 2

Drugs Causing Inappropriately Low or High HbA1c

Postulated Mechanism	Falsely Low HbA1c	Falsely High HbA1c
Increased erythrocyte destruction	Dapson [11-16] Ribavirin [17] Antiretrovirals [18] Trimethoprim-Sulfamethoxazole[14]	
Altered hemoglobin Altered glycation	Hydroxyurea [19] Vitamin C[10] Vitamin E[10] Aspirin (small doses)[10]	
Interference with assays		Aspirin (large doses)[20] Chronic opiate use [21]

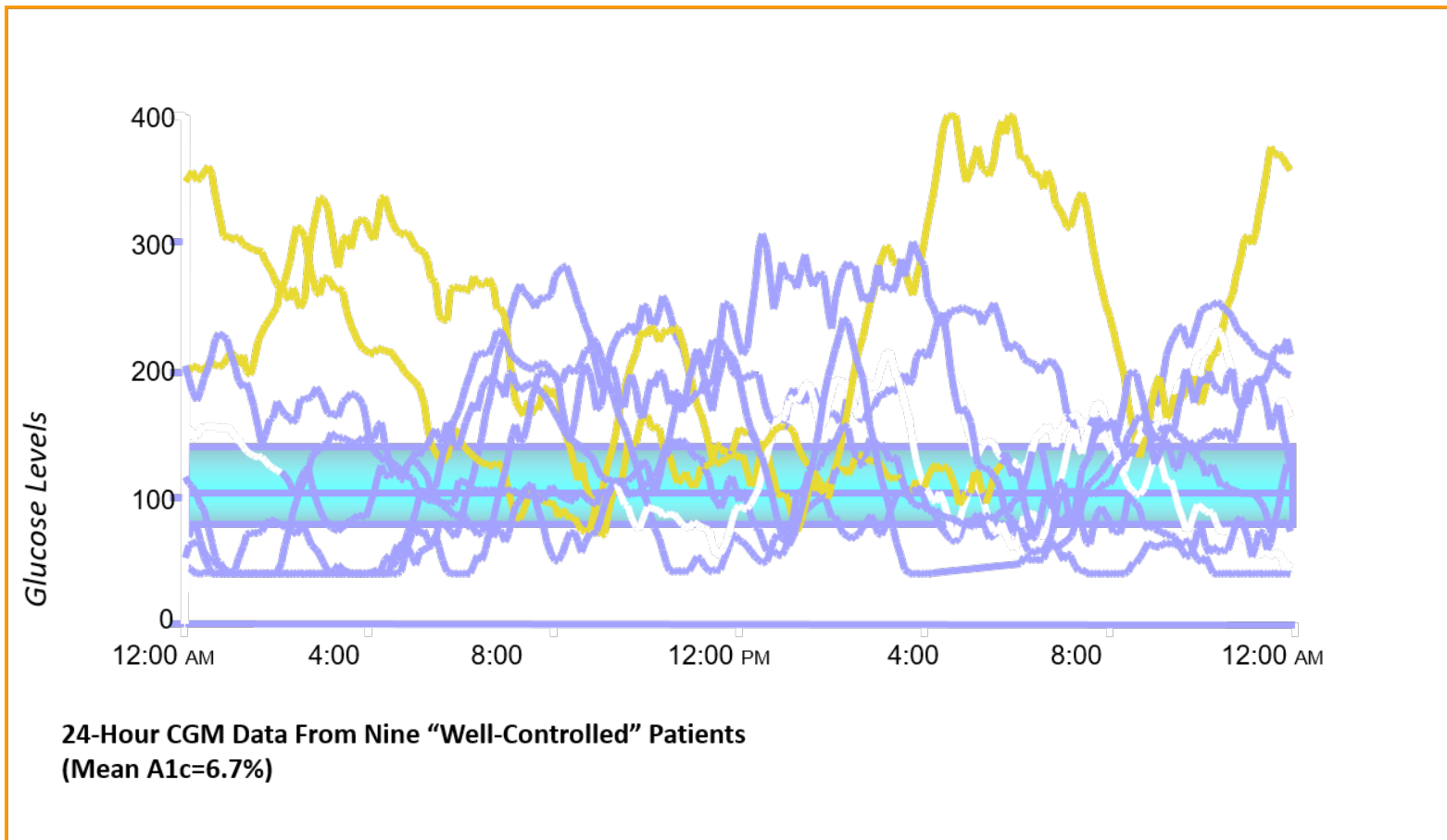
Issues with A1c Assays (cont.)

- Assay accuracy (as representative of glycemia)
 - Interfering substances/conditions (iron deficiency)
 - Age and ethnic/race difference
- **Assay Precision**



Issues with A1c Assays (more)

- **Glucose Variability**



Current T2DM Care Paradigm

- 90% of patients with T2DM cared for in primary care setting
 - <25% referred to specialists
 - Major reason for referral: initiation of /difficulty with Insulin therapy
 - PCP serves as primary provider of diabetes *education*
 - Low use of Certified Diabetes Educator (CDE) resources
 - <25% of patients counseled by CDE annually
 - 24% have no access to CDE in geographic region
 - Major obstacles to optimal diabetes care cited by PCPs
 - Insufficient time /Insufficient staff & patient adherence

Endocrine Practice Dec 2011; Beaser et al

- Inadequate education of PCPs, staff and patients regarding hypoglycemia
- Pressure to meet performance metrics (A1c <7%, <8%, >9%)

Patient Education

- What is low blood sugar
 - Why is it dangerous
- What are the symptoms
- How do you treat
- Sick day rules
- Prevention
 - Snacking for extra physical activity (or reduce insulin)
 - Carry rapid glucose on person
 - Mealtime insulin guides (don't take if don't eat)
- Call care team if experience low blood sugar, especially if unexplained

Clinician & Care Team Education

- *Awareness* that people with T2DM can have serious hypoglycemic & harm from hypoglycemia
- Symptoms and consequences
 - How to recognize hypoglycemia
 - When to think about it and ask about it
- How to treat hypoglycemia
- How to teach patients & families / caregivers about hypoglycemia
- Appropriate targets (risk vs benefit)
- Medication management

Routine Clinical Surveillance

- **Ask** about low blood sugar &/or symptoms suggestive of low blood sugar
- Ask how they treat low blood sugar
- **Monitoring:** more frequent **SMBG** after medication dose changes, addition of new medications or with illness or other changes (renal function, etc.) *examples:*
 - Reduce prednisone dose
 - Increase glipizide or insulin dose/ increase metformin or other diabetes medication
 - Add liraglutide, metformin, etc.

ADA Standards of Care for Hypoglycemia

- Recommendation
 - Ongoing assessment of cognitive function is suggested with increased vigilance for hypoglycemia by the clinician, patient, and caregivers if low cognition or declining cognition is found
 - Hypoglycemia can cause reduced cognition and is associated with greater risk of dementia (*decline in cognitive functioning may be sign of hypoglycemia*)
 - Cognitive impairment or decline in cognitive functioning significantly associated with (*results in (?)*) episodes of severe hypoglycemia

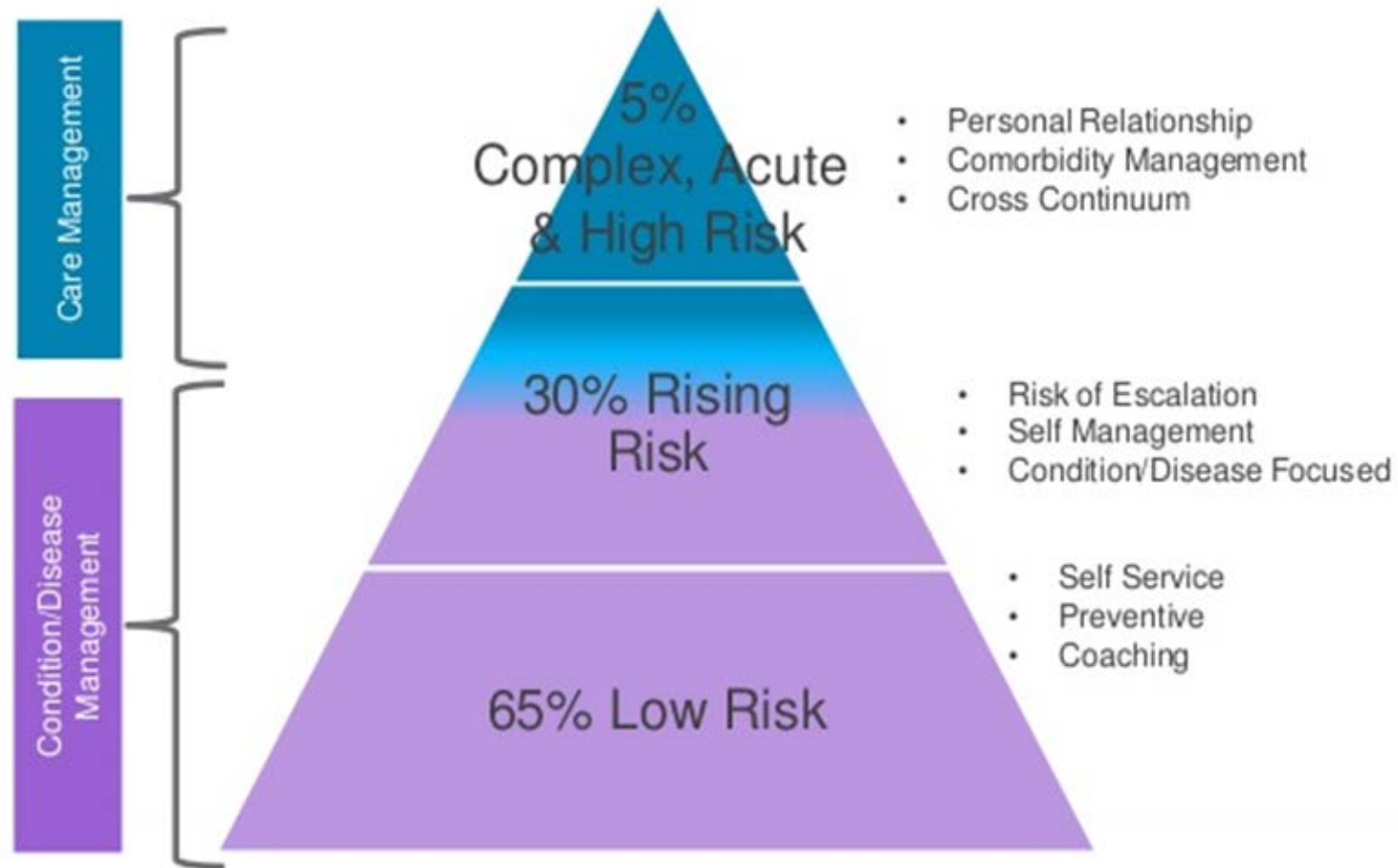
Routine Clinical Surveillance

- **Ask** about low blood sugar &/or symptoms
- Ask how they treat low blood sugar
- More frequent SMBG after med changes or with illness or other changes (renal, etc.)
- Consider **risk stratification** for hypoglycemia (start with highest risk, i.e., severe events)
 - Patients taking Insulin (highest risk) or SUs*
 - History of a severe hypoglycemic event and/or Hypoglycemia Unawareness
 - Elderly
 - Renal impairment

Patient Centered Medical Home

- Change from acute care model to the Chronic Care/ Expanded Care Model
 - First Contact, Comprehensive, Continuous and Coordinated Care
- Requires team care and population management:
 - Shift from the model of the physician doing everything
 - Utilize staff at “top of their license”
 - Empanelment of patients
 - Use of registries, risk stratification, care management
 - Focus on quality & safety; evidence based protocols
- Patient-Centered Care
 - the patient is the center of care (“what is best for the patient”) and a partner in care (shared decision making & shared accountability)
 - the team cares for each patient and their population of patients (vs. task oriented mindset)

Patient Stratification & Care Strategy



Risk Stratification Assessment Tool

Patient Name: _____ DOB: _____ Assessment Date: _____

Risk Stratification Assessment Tool

Patient A1C	Points (Age 18-64)	Points (Age ≥65)	Blood Pressure	Points
9 or greater	4	4	SBP >160 or DBP >95	3
8.0-8.9	3	2	SBP 140 to 160 or DBP 90 to 95	2
7.1-7.9	3	1	SBP 130 to 139 or DBP 80 to 89	1
6.5-7.0	2	0	SBP < 130 or DBP < 80	0
5.7-6.4	1	1	Total	
<5.7	0	1		
Not screened – High risk	1	1		
Not screened – Low risk	0	0		
Total				

Statin Use/LDL	Points
Statin absent and LDL>100	2
Statin present and LDL>100	1
Statin absent and LDL <100	0
Statin present and LDL <100	0
Unknown – screening indicated	2
Unknown – screening not indicated	0
Total	

Depression Screening	Points
Screened Positive BH not involved	2
Screened Positive BH involved	1
Screened Negative	0
Total	

Age	Points
≥ 65	2
18-64	0
Total	

Tobacco Status	Points
Current everyday tobacco use	2
Current someday tobacco use	1
No tobacco use	0
Total	

Obesity	Points (Age 18-64)	Points (Age≥65)
BMI > 30	2	2
BMI 26-30	1	0
BMI 18-25	0	0
BMI < 18	1	1
Total		

Team/Provider Risk Questions	Points	
	Yes	No
Concerns about patient's likelihood to follow recommended treatment plan?	1	0
Is patient on 5 or more prescription medications daily?	1	0
Does patient have active problems with substance abuse?	1	0
Does patient have a mental health diagnosis?	1	0
Does the patient have cognitive deficits, dementia, or Alzheimer?	1	0
Would provider be surprised if the patient were to die within the next year?	0	3
Does the patient have a permanent safe place to live?	0	1
Is the patient at risk for falls?	1	0
Has the patient been in the ER since their last visit? Or in last 6 months?	1	0
Hypoglycemia:		
Never	0	
Occasionally	1	
Frequently	2	
ER visit or EMT assistance	3	
Total		

Complete Risk Stratification Total

Patient Name: _____ DOB: _____ Assessment Date: _____

Red Zone
GOAL: Treat the late or final stages of a disease &/or minimize disability
Score 9-36

Yellow Zone
GOAL: To treat a disease and/or avoid serious complications
Score 5-8

Green Zone
GOAL: To prevent onset of disease
Score 0-4

yes	no	n/a - describe
		RED ZONE (MAXIMUM SUPPORT NEEDED)
		Wellness visits as indicated & provider visits regularly scheduled
		Preventative screenings and immunizations
		Utilize shared decision making for ongoing education & self-management support
		Interventions for unhealthy lifestyle/habits
		Referral to diabetic educator yearly if indicated
		Referral to dental hygiene if indicated
		Referral to behavioral health if indicated
		SMAP every 3 months
		Risk stratification every 3 months
		Assess patient readiness to change and utilize motivational interviewing
		Assess referral barriers & refer to community care team if indicated
		Referrals to specialists if indicated
		Referral for care coordination or case management as needed
		Provide links to community resources
		Referral to Care Program
		Personalized intensive care plan (w/ Care Program)
		Case management check ins
		YELLOW ZONE (MODERATE SUPPORT NEEDED)
		Wellness visits as indicated & provider visits as recommended by provider
		Preventative screenings and immunizations
		Utilize shared decision making for ongoing education & self-management support
		Interventions for unhealthy lifestyle/habits
		Referral to diabetic educator yearly if indicated
		Referral to dental hygiene if indicated
		Referral to behavioral health if indicated
		SMAP every 6 months
		Risk stratification every 6 months
		Assess patient readiness to change and utilize motivational interviewing
		Assess referral barriers & refer to community care team if indicated
		Referrals to specialists if indicated
		Referral for care coordination or case management as needed
		Provide links to community resources
		GREEN ZONE (MINIMAL SUPPORT NEEDED)
		Wellness visits as indicated & provider visits prn
		Preventative screenings and immunizations
		Offer ongoing education & self-management support
		Interventions for unhealthy lifestyle/habits
		Referral to diabetic educator yearly if indicated
		Referral to dental hygiene if indicated
		Referral to behavioral health if indicated
		SMAP yearly
		Risk stratification yearly

Added Hypoglycemia to Their Global Risk Tool Lead to Increased Awareness

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Occasionally	1	
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ER visit or EMT assistance	3	
Total		

Complete Risk Stratification Total

Hypoglycemia

Never	0
Occasionally	1
Frequently	2
ER visit or EMT 3	

ADA Standards of Care for Hypoglycemia

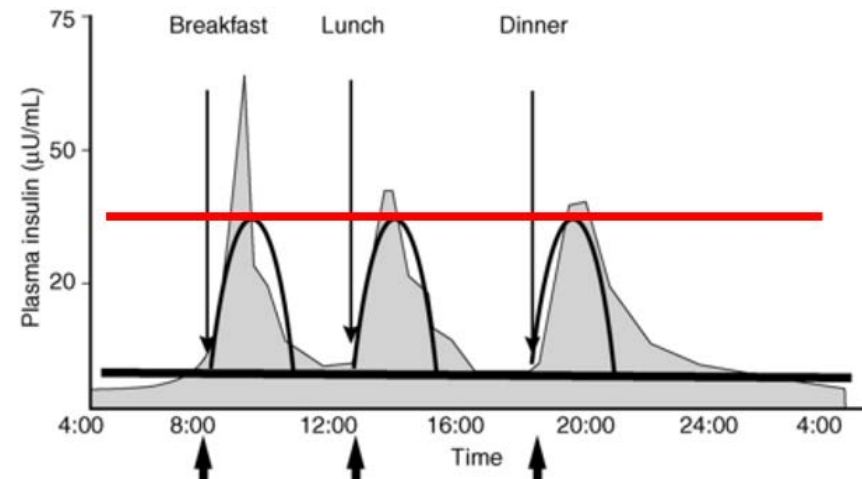
- Recommendation
 - Hypoglycemia Unawareness or 1 or more episodes of severe hypoglycemia should trigger ***reevaluation of the treatment regimen***
 - Insulin-treated patients with Hypoglycemic Unawareness or clinically significant hypoglycemia should be advised to ***raise their glycemic targets*** to strictly avoid hypoglycemia for several weeks in order to partially reverse hypoglycemia unawareness & reduce risk of future episodes

Medication Adjustment

- Our patients change & diabetes changes
 - May just need to reduce/ adjust for these changes (renal, hepatic, cognitive, weight, etc.)

- Common insulin issues

- Too much basal insulin
 - “blanket insulin”




- Adding pre-meal insulin, especially at supper meal and not reducing overnight basal insulin

Take a Minute....



- How does this change your approach to your patients?

The Paradigm of Diminishing Returns

- Endocrinologists **tell** PCPs what to do
 - Complexity
 - Time/Staff/Safety
 - Perceived patient barriers
 - PCP **tells** Patient what to do
 - Complexity
 - Time
 - Confusion/Misperceptions
 - Safety/Fear
 - Patient successfully uses Insulin(or not..)(any Rx)
- 

New Paradigm of Diabetes Care

- Individualization ...of goals & of therapy
 - Biologic
 - Ethnic
 - Age
 - Co-morbidities
 - Family history
 - Socioeconomic
 - Skills/literacy
 - Lifestyle
 - Financial
 - Personal goals and values
 - Competing priorities

Contextualizing Care

Shared Decision Making

Patient-Centered Decision Making

‘The process of adapting **best evidence** to the care of the **individual patient**’

At the heart of Share Decision Making

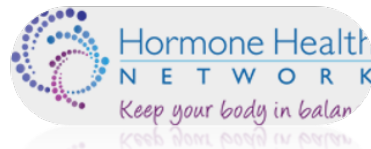
- Including the patient in the process
 - “Before...I saw patients and their needs as problems and I was a problem solver. Now I see what is missed is knowing the patient, their preferences , values and needs and using that knowledge to match the best medicine to their circumstances.”

SH in Colorado Medicine Jan/Feb 2011



Clinician as a ***Coach***

The Accurate Insulin Decisions (AID) Program



The Endocrine Society
Hormone Health Network
American College of Physicians
American Osteopathic Association
American Diabetes Association
American Association of Diabetes Educators
American Pharmacists Association
Diabetes Nation

Patient 1: Rudi

- 72 year old Caucasian male
 - T2DM dx +/- 20 years ago
 - Cr 1.8
 - Peripheral paresthesias
 - S/p acute MI 2005 with stents
 - BMI 32
 - Had Metformin & glyburide stopped a year ago, replaced with bedtime dose of insulin glargine
 - His last A1c was 7.7% and he was told to increase glargine dose from 48 units to 54 units
 - pocA1c now 6.9%
- His wife is here with him concerned about low BGs around 4 AM and also when out doing gardening and yard work

Patient 1: Physician Tool

- ***STEP ONE: IS THE GOAL APPROPRIATE FOR THE PATIENT?***
- If your patient continues to have trouble controlling their blood sugar, first evaluate whether the blood sugar and A1c goals are appropriate.

Is the Goal Appropriate for the Patient?

STEP 1 IS THE GOAL APPROPRIATE FOR THE PATIENT?

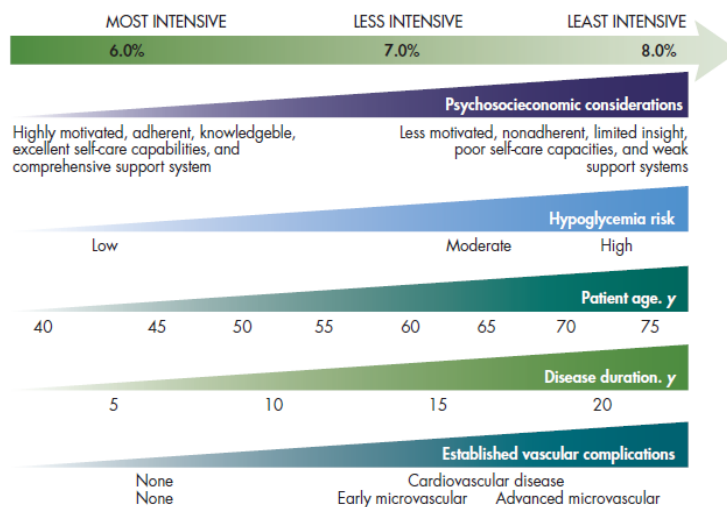
If your patient continues to have trouble controlling their blood sugar, first evaluate whether the blood sugar and A1c goals are appropriate.

Goals for Patients at Low Risk for Hypoglycemia ¹			
Pre-Meal	Post-Meal	Bedtime	A1C
70-130	<180	<180	6.5%-7.0%

Goals for Patients at High Risk for Hypoglycemia ¹			
Pre-Meal	Post-Meal	Bedtime	A1C ²
100-180	<250	<250	7.0%-8.0%

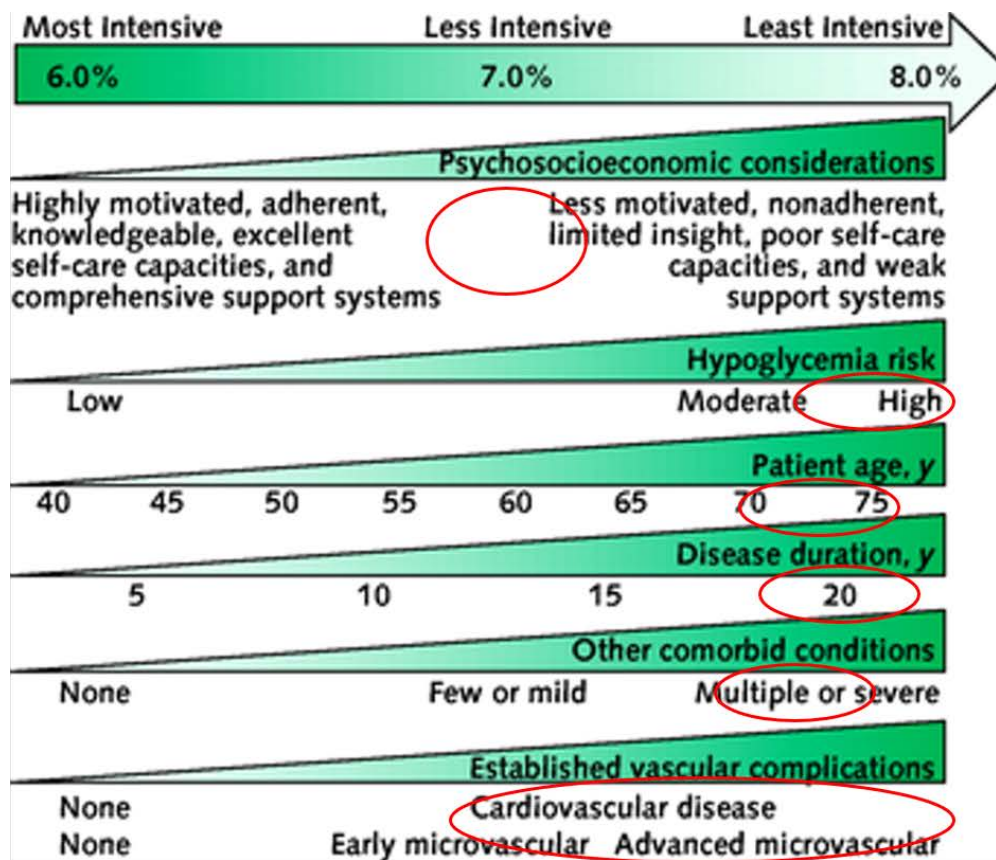
Physicians should individualize goals with the patient for those with medium risk for hypoglycemia using clinical judgment and patient agreement. Patients with end-stage or terminal co-morbid conditions should be maintained at glucose levels that prevent catabolism and symptoms, such as an A1C >8% which corresponds with an estimated average daily blood sugar of 183³.

A number of factors should also be considered when setting an appropriate A1c goal for someone with type 2 diabetes. It should also be noted that A1c is not a perfect indicator as it does not reveal glycemic variability or other factors that may impact risk for complications. The graph⁴ below can help you to determine whether your patient's goal is appropriate based on risks for hypoglycemic events, age, comorbidities, and other lifestyle factors. A more in-depth examination of recommended A1C targets based on clinical characteristics can be found in the following graph.



¹Note: these goals are not evidence-based but are consensus opinion. Goals for any patient should be individualized further based on patient preference and clinical judgment.
²Practical goals for patients with a high-risk for hypoglycemia may vary and should be individualized.

Framework to Assist in Determining Glycemic Treatment Targets in Patients with Type 2 Diabetes



Ismail-Beigi F et al. Ann Intern Med 2011;154:554-559

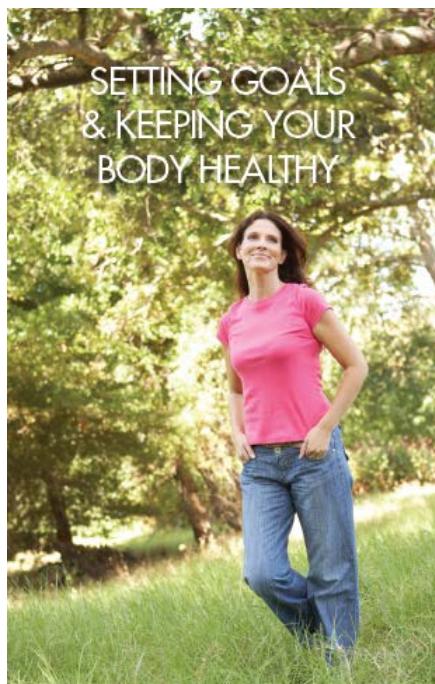
Annals of Internal Medicine



Patient 1: Patient tools

- Asks the patient and his wife for their input on what they would like his goal to be.
- Asks them to look over the information and the questions so that they can all decide what will be the best for him.

Patient Tools (1)



Deciding what hemoglobin A1C (A1C) and blood sugar goals are right for you depends on many factors. Talk to your doctor to decide what goals will work best for you.

BLOOD SUGAR RANGES & DIABETES

Diabetes occurs when the body can no longer control the sugar levels in the blood. As a result, blood sugar levels in people with diabetes are higher than normal. This is called hyperglycemia, or high blood sugar. It can lead to problems like blindness, kidney failure, amputation, and heart problems.

Low blood sugar (below 70) can sometimes happen, especially with insulin and some diabetes pills.

Blood Sugar is Normal When:	
Before breakfast	70-99 ⁱⁱ
After eating	Below 140
A1C results	4.5% - 5.6%

Diabetes is Diagnosed When:	
Before breakfast	126 or Over ⁱⁱⁱ
After eating	200 or Over ⁱⁱⁱ
A1C results	6.5% or Over

WHAT BLOOD SUGAR GOAL IS RIGHT FOR ME?

Because people with diabetes are different in their risk for low blood sugar, are in different stages of the disease, and have different complications, blood sugar and A1C goals should be matched to each person. The chart below

shows you what blood sugar ranges are recommended based on individual factors. You and your doctor should decide together what the best goal would be for you.

Recommended Blood Sugar Goals for People with Diabetes Based on Individual Factors		
About You	If You: <ul style="list-style-type: none"> • Are newly diagnosed • Are under 65 years old • Are less likely to have low blood sugar • Have no or minor complications 	If You: <ul style="list-style-type: none"> • Are over 65 years old • Have kidney failure, heart disease, or other serious complications • Have been diagnosed with other serious health problems • Have frequent low blood sugar
Goal Before Breakfast	80-130 ^{iv}	100 -180 ^v
Goal After a Meal	Under 180 ^{vi}	Under 250
Goal at Bedtime	Under 180	Under 250
	Some patients may want to get even closer to the normal range of 70-99 before a meal and below 140 after a meal.	You and your doctor should talk about what the right goal is for you based on your individual factors. If you are prone to low blood sugar or are dealing with a major illness, having a goal that is a bit higher can be better for you.

Patient Tools (2)

HOW CAN I MONITOR MY BLOOD SUGAR & KEEP MY BODY HEALTHY?



Home glucose meters show what your blood sugar level is at that moment. Measuring your blood sugar level at the same times each day can show you if there is a pattern when your blood sugars are out of range. It will also tell you how food, exercise, and medication affect your blood sugar levels. For instance, some people have higher blood sugars when they wake up in the morning and some have higher levels after certain meals.

A1c blood tests show what your average blood sugar levels have been over the last three months. It is a simple blood test that is done at the doctor's office or at the lab every 3 to 6 months.

The normal A1c range is 4.5 to 5.6%.¹⁴ The A1c level goes up or down as the average blood sugar level goes up or down, but the A1c test cannot tell how much your blood sugars are fluctuating throughout the day.

The overall goal of treating diabetes is to prevent damage to the body and to keep people with diabetes healthy and feeling good. Wide swings in blood sugar levels can make you feel bad and may cause more harm to the body.

A1c:	Approximate Daily Blood Sugar: ¹⁴
12%	298
11%	269
10%	240
9%	212
8%	183
7.5%	169
7.0%	154
6.5%	140
6.0%	126
5.0%	97

WHAT A1C GOAL IS RIGHT FOR ME?

Please circle the answers to the following questions to help you and your doctor talk about what the right blood sugar and A1C goals are for you. It can be helpful to aim for a range instead of a fixed goal.

How long have you had diabetes?			
Do you ever have low blood sugars?	Almost never	Sometimes	Often a problem
Can you tell when your blood sugar is low?	Yes	Sometimes	No
Have you had any vision changes?	No	Some	Yes, I have problems with my vision
Do you have neuropathy or nerve pain?	No	Some	Yes, I can't feel my feet and/or my fingers
Have you had a heart attack, stroke or bypass surgery?	No	Yes	
Have you had a heart stent or angioplasty?	No	Yes	
Do you have kidney or liver problems?	No	Unsure	Yes
Do you have good support at home?	Yes	Some help	No
Do you have other major health problems?	No		Yes
How much do you know about diabetes?	I have a good understanding	I want to learn	I don't understand diabetes
How much time and effort can you devote to managing your diabetes?	Whatever it takes	Some	I don't have much time in my schedule for this
Are you concerned about your blood sugar while at work?	No	Sometimes	Yes
Are you able/willing to test your blood sugar?	As many times as needed	More than two times	Once or twice
Suggested A1c Goal	6.5%		8.0%
	<small>It is important that you discuss this with your doctor as your answers may fall across a spectrum.</small>		

Patient Tools (3)

WHAT IS HYPOGLYCEMIA & WHY SHOULD I AVOID IT?

Hypoglycemia happens when your blood sugar falls below 70. Because some people are more likely to have problems with low blood sugar, they may need to set their goal a bit higher to prevent their blood sugar from falling too low.

Just as having blood sugar levels that are high can cause problems, having blood sugar levels that are too low can also cause problems.

Hypoglycemia is more likely with certain diabetes medications, including insulin.

The overall goal of treating diabetes is to prevent damage to the body and to keep people with diabetes healthy and feeling good. Wide swings in blood sugar levels can make you feel bad and may cause more harm to the body.

Medications That May Cause Hypoglycemia

Glyburide (Micronase)	Glimiperide (Amaryl)
Repaglinide (Prandin)	Nateglinide (Starlix)
Any type of Insulin	Glipizide (Glucotrol)

Exercise, skipping meals, and big changes in what you eat at meals can also cause low blood sugar. If blood sugar falls too low, it can damage your body, just as high blood sugar can. It is best to try to avoid low blood sugar as much as possible.

Signs and Symptoms of Hypoglycemia^{ix}

Mild: Below 70	<ul style="list-style-type: none"> Hunger Nervousness and shakiness Sweating
Moderate: Below 55	<ul style="list-style-type: none"> Dizziness Sleepiness Confusion Difficulty speaking Feeling anxious or weak
Severe: Below 35-40	<ul style="list-style-type: none"> Seizure or convulsion Loss of consciousness or coma

Conditions That May Lead to Problems with Low Blood Sugar

Older age	Kidney problems
Cirrhosis of liver	Dementia (Alzheimer's)
Inability to feel when blood sugar is low	

FACTORS THAT MAY MAKE LOW BLOOD SUGAR MORE DANGEROUS

- Having a heart condition
- Living alone with no one to assist you if you have a low blood sugar attack
- Using heavy equipment, mining, law enforcement, working with chemicals, or working in isolated situations can make having a low blood sugar attack more dangerous.



HEALTH TIP

If you get hypoglycemia, drink some juice or eat something that contains sugar, like hard candies. You can also take glucose tablets to bring your blood sugar into normal range.

AFTER TALKING WITH YOUR DOCTOR, WHAT ARE THE BEST GOALS FOR YOU?

Goal blood sugar range before breakfast:

Goal blood sugar range after breakfast:

Goal for next A1C test:

What is your plan for hypoglycemia?



For more information, visit www.AccurateInsulin.org

ⁱ Standards of Medical Care in Diabetes—2013. American Diabetes Association. Diabetes Care. 2013; 36(1): S11-S66.

ⁱⁱ Ibid.

ⁱⁱⁱ Ibid.

^{iv} The recommended blood sugar goal of 80-130 is based on a consensus recommendation intended to help patients avoid low blood sugar reactions (hypoglycemia) in patients on insulin.

^v The recommended fasting blood sugar goal of 100-180 is based on a consensus recommendation for patients aiming to meet an A1C goal of 8%.

^{vi} Standards of Medical Care in Diabetes—2013. American Diabetes Association. Diabetes Care. 2013; 36(1): S11-S66.

^{vii} Nathan, DM et al. Translating the A1C Assay Into Estimated Average Glucose Values. Diabetes Care. 2008;31(8): 1473-1478.

^{viii} Standards of Medical Care in Diabetes—2013. American Diabetes Association. Diabetes Care. 2013; 36(1): S11-S66.

^{ix} Weitzel, M. and Umphress, G. Adapted from Hormone Health Network Fact sheet, Type 2 Diabetes & A1C, March 2010.

This program was supported by educational grants from Lilly USA, LLC; Novo Nordisk Inc.; and sanofi-aventis U.S.

Patient 1: Shared Decision Making

- Together decide that his goal should be 7.5-8.5% range rather than $<7\%$
- Based on low BGs and A1c lower than appropriate goal, basal insulin lowered back to 48 units



PEARL

This tool is designed to be used by your practice team.
The physician does NOT have to do it all.

- Front desk staff can give patients the decision aids.
- Medical assistants can explain the Action Plan.
- Health coaches can help with shared decision making.
- RN, NP, PA, CDE, RD, PharmD can help with the full implementation with standing orders.

What Actions Can You Take....



- To identify patients in your clinic at risk for hypoglycemia, especially severe hypoglycemia
 - To reduce their risk of hypoglycemia
- To increase awareness of hypoglycemia (low blood sugar) for your entire practice team
- To ensure patient education for patients on insulin and Sulfonylurea meds includes info on hypoglycemia/ low blood sugar (“action plan”)



End

- <http://www.accurateinsulin.org/>