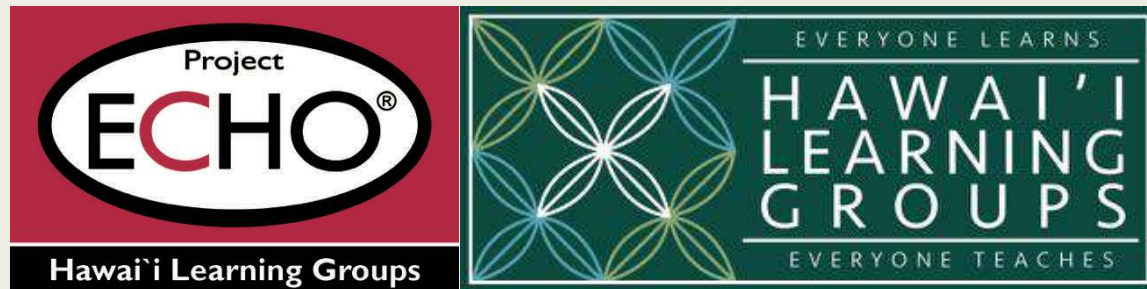


SELF-MONITORED BLOOD GLUCOSE PATTERNS

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ECHO Diabetes Learning Group
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Objectives

1

Advise patients about when to test their blood sugar to minimize burden of care

2

Recognize diagnostic patterns of glucose results to inform medication choice and adjustment

Purposes of SMBG

- Diagnosis for glycemic variability
 - *Assesses response to therapy, diet/exercise*
 - *Timed strategically to answer clinical questions*
- Surveillance of glycemic control
 - *Monitors controlled diabetes for trends over time*
 - *Identifies progression of diabetes*
 - *Ensures safety with medications that contribute to hypoglycemia (insulin and sulfonylureas/glitinides)*

Common Testing Schedules for Surveillance when A1c target achieved

- Fasting and bedtime for two days once a month, if not on insulin or sulfonylureas/glitinides
- Once a day before taking basal insulin dose
- 2 to 3 times a day before meals taking mealtime insulin
- Sick day care every 4 hours with fever/vomiting

Paired Testing of Blood Glucose

- Use for 5 to 7 days when A1c is above target or with frequent hypoglycemia episodes with mealtime insulin
- Before and after a meal
 - *Answers “Does current therapy keep 2 hour post-meal glucose within target (under 180) compared to pre-meal glucose (80 to 130)?”*
- Bedtime and fasting in the morning
 - *Answers “Does current therapy maintain blood glucose during overnight fasting?”*

Case #1 SMBG Scenario #1

- Middle aged man with type 2 diabetes for 15 years on metformin and a GLP-1. He lost 30 pounds since starting his GLP-1. Despite optimum diet and regular exercise, his A1c is now 8.2%. He weighs 70 kg and his BMI is 24.

Day	bedtime	fasting
Th	154	143
F	160	157
Sat	177	166
Sun	165	158
Mon	144	140

Case #1 SMBG Scenario #2

- Middle aged man with type 2 diabetes for 15 years on metformin and a GLP-1. He lost 30 pounds since starting his GLP-1. Despite optimum diet and regular exercise, his A1c is now 8.2%. He weighs 70 kg and his BMI is 24.

Day	bedtime	fasting
Th	120	143
F	110	157
Sat	105	166
Sun	112	158
Mon	108	140

Case #2 SMBG Scenario #1

- Elderly woman on maximum metformin and a GLP-1 for 7 years. Started on bedtime basal insulin 2 years ago with fasting BGs consistently in the target range and no hypoglycemia. Her target A1c is 7,5% and her recent A1c is 8%. She eats 3 meals a day with dinner as her largest meal.

Day	Meal	Pre	Post
Th	D	129	185
F	B	110	130
Sat	L	125	146
Sun	D	130	200
Mon	B	115	139

Case #2 SMBG Scenario #2

- Elderly woman on maximum metformin and a GLP-1 for 7 years. Started on bedtime basal insulin 2 years ago with fasting BGs consistently in the target range and no hypoglycemia. Her target A1c is 7,5% and her recent A1c is 8%. She eats 3 meals a day with dinner as her largest meal.

Day		Bedtime	Fasting
Th		250	110
F		212	106
Sat		218	125
Sun		232	113
Mon		195	128

Case #3 Scenario #1

- Patient is a 53 yo non-obese sheltered homeless man seeking care for minor but extensive lower extremity wounds at the shelter's clinic. He is a poor historian but shares a H/O longstanding diabetes, off and on metformin, with insulin prescribed at hospital discharge. He eats his meals at the shelter.

Day	Pre- B	Pre- L	Pre- D
M	172	240	267
Tue		211	263
W	164	187	
Thu		286	298
F	178	220	278

Case #3 Scenario #2

- Patient is a 53 yo non-obese sheltered homeless man seeking care for minor but extensive lower extremity wounds at the shelter's clinic. He is a poor historian but shares a H/O longstanding diabetes, off and on metformin, with insulin prescribed at hospital discharge. He eats his meals at the shelter.

Day	Pre- B	Pre- L	Pre- D
M	254	240	216
Tue		211	193
W	287	187	
Thu		286	241
F	264	220	194

Case 4

Maria

- A 65-year-old woman presents with a 15-y history of T2D; she was treated with metformin 1000 mg bid for a few years until glimepiride 4 mg bid was added because of progressive hyperglycemia
- 5 y ago, HbA_{1c} rose to 9.1%, and 70/30 biphasic insulin pen therapy was added. Her current doses are 40 U daily with breakfast at 8 AM and 30 U qpm with dinner at 6 PM
- She presents to see you and complains of hypoglycemia at 10 to 11 AM and at 3 to 4 AM
- HbA_{1c} is 7%, and her blood glucose log is as follows on next slide



Maria's Blood Glucose Log

Units for glucose = mg/dL

DATE	6 AM	10 AM	12 PM	5 PM	10 PM	3 AM
Monday	110	58	166	143	215	No complaint
Tuesday	99	66	172	166	231	42
Wednesday	168	No complaint	112	132	189	61
Thursday	155	No complaint	108	151	173	No complaint
Friday	101	54	156	144	168	No complaint
Saturday	87	83	161	129	202	74

Identifying Hypoglycemic Events

Units for glucose = mg/dL

DATE	6 AM	10 AM	12 PM	5 PM	10 PM	3 AM
Monday	110	58	166	143	215	No complaint
Tuesday	99	66	172	166	231	42
Wednesday	168	No complaint	112	132	189	61
Thursday	155	No complaint	108	151	173	No complaint
Friday	101	54	156	144	168	No complaint
Saturday	87	83	161	129	202	74

Clinical Observations for Maria

From blood glucose analysis:

- Excessive NPH in the PM is causing hypoglycemia between 3 and 4 AM
- Inadequate prandial insulin in the PM is causing 10 PM hyperglycemia
- Excessive prandial insulin in the AM is causing 10 AM hypoglycemia
- The NPH dose in the AM looks slightly less than ideal
- Frequent episodes of hypoglycemia are driving the patient to seek extra nonmeal doses of carbohydrates, which are typically overcorrecting for the episode of hypoglycemia
- "Hypoglycemia begets hyperglycemia": the rollercoaster effect

References

- Medscape 2018 slides 887449

AGENDA

Welcome and Introduction

Carol H. Wysham, MD

Who Is Prandial Insulin the Best Option for as Part of an Individualized Diabetes Care Plan?

David Baldwin, Jr, MD, and Janet B. McGill, MD

Emerging Prandial Insulins: Clinical Comparisons of Data That Matter to Clinicians

Carol H. Wysham, MD

Expert Guidance on Clinical Practice Implications

All Panelists

Concluding Comments

Carol H. Wysham, MD