

Practical Approaches to Type 2 Diabetes Management

**SD Diabetes Coalition
Fall Diabetes Conference 2018
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Disclosure

- Nothing to disclose

Objectives

- Describe strategies to intensify treatment for patients with type 2 diabetes
- Discuss strategies to simplify treatment for patients with type 2 diabetes

CASE 1: K.S.

CASE 1 – K.S.

- 49/F first seen in September 2012
- DM type 2 diagnosed at the age of 43
- Was initially on metformin and glipizide
- After 5 years, was started on exenatide but had frequent hypoglycemia
- Thereafter started on glargine and linagliptin; metformin was continued; glipizide was discontinued

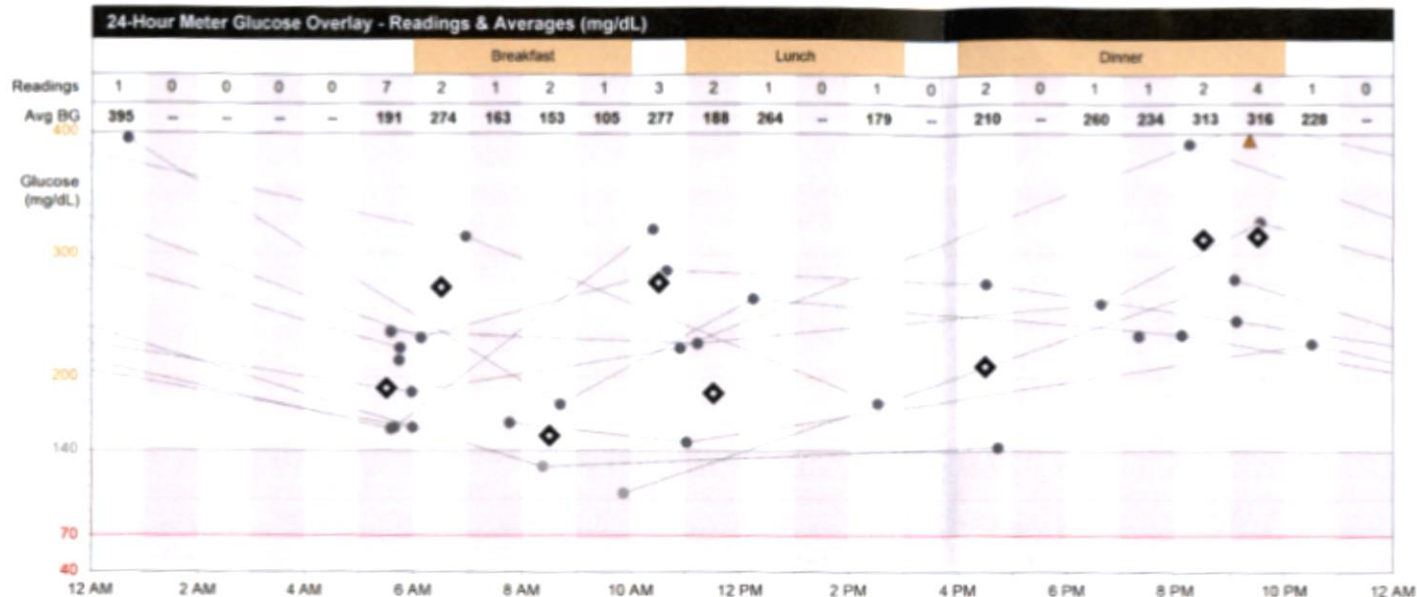
CASE 1 – K.S.

- Few months prior to endocrine consult, cut back on soda intake, limited portion sizes and lost 20-30 lbs
- Eats 3 meals daily, doesn't count carbs
 - “fond of pasta and casseroles”
- At the time of consult, was on:
 - Glargine 86 units daily
 - Linagliptin 5 mg daily
 - Metformin 1000 mg bid

Lab Results

- On 07/25/12 HbA1c ***10.4%***

K.S. Glucose Meter Download at Initial Consult

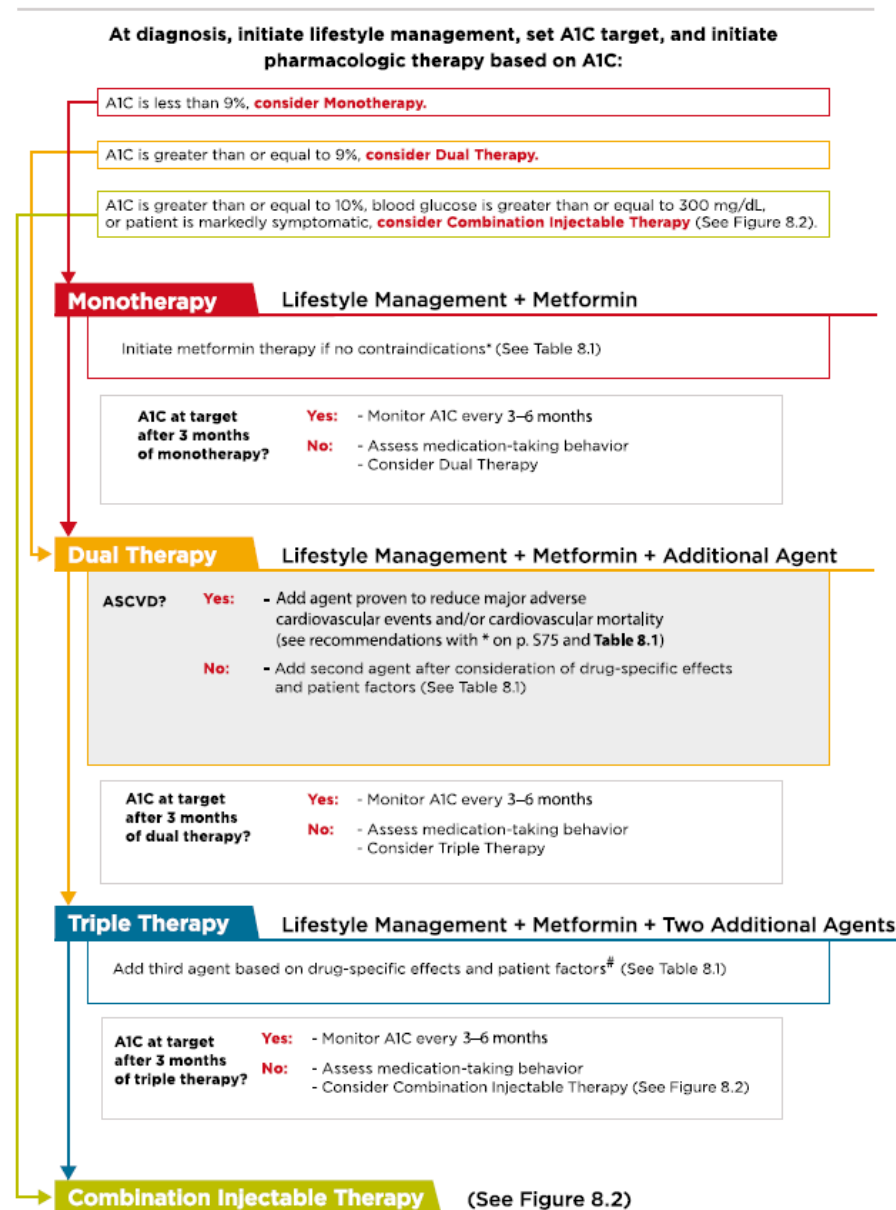


Statistics	9/10 - 9/23	
Avg BG (mg/dL)	32	235 ± 78
BG Readings	32	2.5/d/day
Readings Above Target	30	94%
Readings Below Target	--	0%
Sensor Avg (mg/dL)	--	
Avg AUC > 140 (mg/dL)	--	
Avg AUC < 70 (mg/dL)	--	

Avg Daily Carbs (g)	--
Carbs/Bolus Insulin (g/U)	--

Avg Total Daily Insulin (U)	--
Avg Daily Basal (U)	--
Avg Daily Bolus (U)	--

Antihyperglycemic Therapy in Adults with Type 2 Diabetes



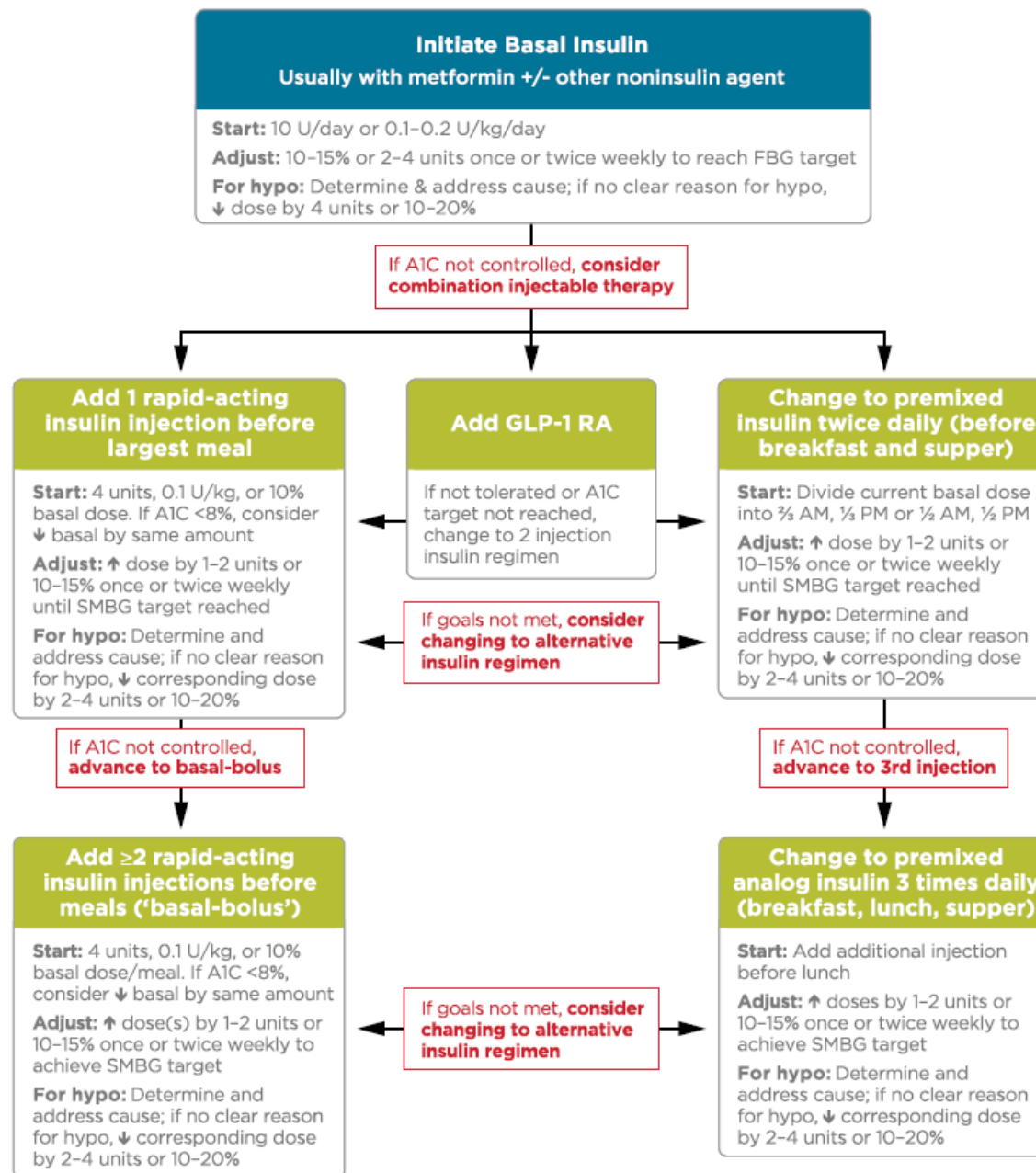


Figure 8.2—Combination injectable therapy for type 2 diabetes. FBG, fasting blood glucose; hypo, hypoglycemia. Adapted with permission from Inzucchi et al. (31).

Summary of glucose-lowering interventions

Intervention	Expected decrease in A1C with monotherapy (%)	Advantages	Disadvantages
Step 1: Initial therapy			
Lifestyle change to decrease weight and increase activity	1.0 to 2.0	Broad benefits	Insufficient for most within first year owing to inadequate weight loss and weight regain
Metformin (usually 1700 to 2000 mg per day)	1.0 to 2.0	Weight neutral	GI side effects, contraindicated with renal insufficiency (eGFR <30 mL/min)*
Step 2: Additional therapy			
Insulin (usually with a single daily injection of intermediate- or long-acting insulin initially)	1.5 to 3.5	No dose limit, rapidly effective, improved lipid profile	One to four injections daily, monitoring, weight gain, hypoglycemia, analogues are expensive
Sulfonylurea (shorter-acting agents preferred)	1.0 to 2.0	Rapidly effective	Weight gain, hypoglycemia (especially with glibenclamide or chlorpropamide)
GLP-1 agonist (daily to weekly injections)	0.5 to 1.0	Weight loss, reduced cardiovascular mortality (liraglutide, semaglutide) in patients with established CVD	Requires injection, frequent GI side effects, long-term safety not established, expensive
Thiazolidinedione	0.5 to 1.4	Improved lipid profile (pioglitazone), potential decrease in MI (pioglitazone)	Fluid retention, HF, weight gain, bone fractures, potential increase in MI (rosiglitazone) and bladder cancer (pioglitazone)
Glinide	0.5 to 1.5†	Rapidly effective	Weight gain, three times/day dosing, hypoglycemia
SGLT2 inhibitor	0.5 to 0.7	Weight loss, reduction in systolic blood pressure, reduced cardiovascular mortality in patients with established CVD	Vulvovaginal candidiasis, urinary tract infections, bone fractures, lower limb amputations, acute kidney injury, DKA, long-term safety not established
DPP-4 inhibitor	0.5 to 0.8	Weight neutral	Long-term safety not established, expensive, possible increased risk of HF with saxagliptin
Alpha-glucosidase inhibitor	0.5 to 0.8	Weight neutral	Frequent GI side effects, three times/day dosing
Pramlintide	0.5 to 1.0	Weight loss	Three injections daily, frequent GI side effects, long-term safety not established, expensive

A1C: glycated hemoglobin; GI: gastrointestinal; eGFR: estimated glomerular filtration rate; GLP-1: glucagon-like protein-1; CVD: cardiovascular disease; MI: myocardial infarction; HF: heart failure; SGLT2: sodium-glucose co-transporter 2; DKA: diabetic ketoacidosis; DPP-4: dipeptidyl peptidase-4.

* Initiation is contraindicated with eGFR <30 mL/min and not recommended with eGFR 30 to 45 mL/min.

† Repaglinide is more effective in lowering A1C than nateglinide.

Modified with permission from: Nathan DM, Buse JB, Davidson MB, et al. Medical Management of Hyperglycemia in Type 2 Diabetes: A Consensus Algorithm for the Initiation and Adjustment of Therapy: A consensus statement of the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetes Care* 2009; 32:193-203. Copyright © 2009 American Diabetes.

CASE 1 – K.S.

- Plan:
 - Refer to DM Ed
 - Decrease glargine 40 units qhs, increase by 3 units q3 days until goal fasting is 150
 - Start aspart 12 units tid ac and aspart ISS 2/50>150 ac and hs
 - Continue metformin 1000 mg bid
 - Discontinue linagliptin
 - Turn in glucose logs every 2 weeks

DIABETES SELF-MANAGEMENT EDUCATION AND SUPPORT (DSMES)

Kalli Kurtenbach, RDN, LN, CDE

Mary Oyos, RN, MS, BC-ADM, CDE

Diabetes Self-Management Education and Support (DSMES)

- Team approach
 - RD & RN assess together
 - Develop collaborative plan
- Patient “homework” before appointment
 - Health/current self-care practices questionnaire
 - Food log
 - Facilitates self-reflection
 - May help prepare for change & goal setting

DSMES – Dietitian Assessment

- Weight loss experience
- Food preferences
- Allergies
- Schedule
- Appetite
- Sleep
- Pain
- Cooking abilities
- Shopping availability
- Regular food & beverages choices
- Obligations – work, children, grandchildren, volunteering
- Past diabetes education
- Previous carb counting experience

DSMES – Nutrition Goals

- SMART goal strategy
 - Specific
 - Measureable
 - Actionable
 - Relevant
 - Time-bound
- Identify short-term & long-term strategies

DSMES – Nutrition Goals

- Manage pasta/casseroles
- No sugary beverages
- Adequate proteins/vegetables/healthy fats
- Stress management
- Add protein to breakfast
- Carb identification
- Balanced plate
 - Examples: Eat 2 vegetables 5 days/week; no more cinnamon rolls at breakfast

DSMES – Nutrition Education

- Initial visit
 - Carb counting/constant carb
 - Plate method
 - Healthy eating
- Identify strengths
 - Eating often enough
 - Eliminating soda
 - Recent weight loss
- Lifestyle change strategies
- Motivation

DSMES – Nurse Assessment

- Previous diabetes education
- Glucose monitoring
 - Meter type & age
 - Current test strips
 - Lancet device/how often lancet changed
 - Testing frequency & times
 - Goal range
- Activity
 - Type, frequency, duration, limitations
- Hypoglycemia
 - Frequency
 - Symptoms
 - Treatment
- Insulin
 - Type & dose
 - Timing of administration
 - Pen or vial/syringe
 - Injection sites & rotation
 - Lipodystrophy/
lipohypertrophy
 - How often doses are missed
 - Duration vial/pen is used
- Other chronic conditions
- Mental health concerns affecting self-care

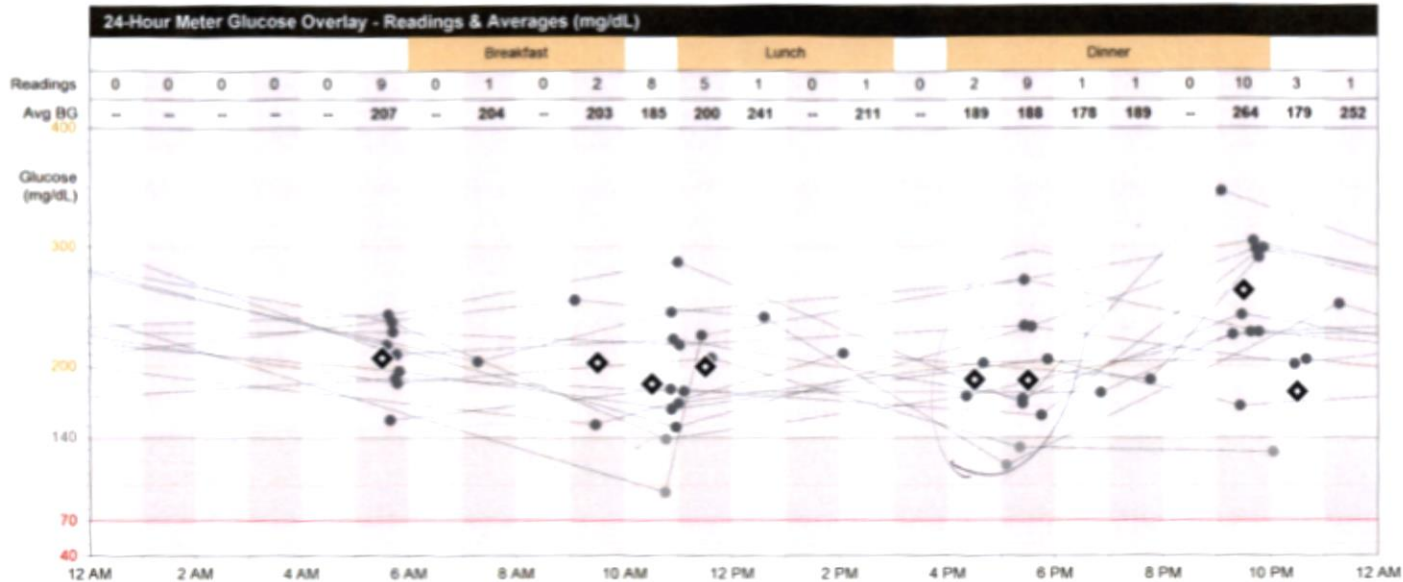
DSMES – Other Goals & Education

- Check glucoses QID & record results; report to physician for medication adjustments
- Regular activity
 - Aerobic activity ≥ 150 min/week
 - Spread over at least 3 days/week
 - No more than 2 consecutive days w/o activity
 - Resistance exercise 2-3 sessions/week
 - Customize based on abilities/limitations
- Hypoglycemia recognition & treatment
- Insulin – dose, timing, administration
- Coping, motivation and behavior change

K.S. 1-Month Follow-up

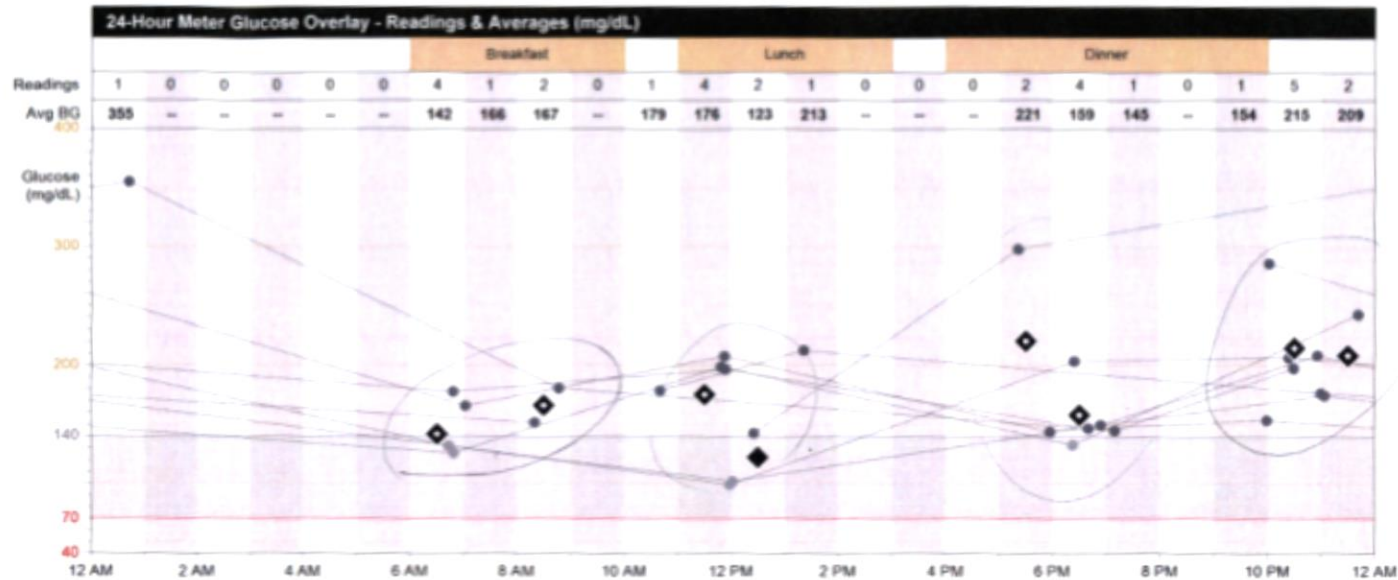
- Was keeping carbs consistent with meals
- No regular exercise
- Medications:
 - Glargine 58 units qhs
 - Aspart 12-12-15, sliding scale 3/50>150 ac and hs
- HbA1c **9.1%** ← 10.4%

K.S. Glucose Meter Download at 1-Month Follow-up (Oct. 2012)



Statistics	10/8 - 10/21	
Avg BG (mg/dL)	209 ± 51	
BG Readings	54	3.9/day
Readings Above Target	49	91%
Readings Below Target	--	0%
Sensor Avg (mg/dL)	--	
Avg AUC > 140 (mg/dL)	--	
Avg AUC < 70 (mg/dL)	--	
Avg Daily Carbs (g)	--	
Carbs/Bolus Insulin (g/U)	--	
Avg Total Daily Insulin (U)	--	
Avg Daily Basal (U)	--	
Avg Daily Bolus (U)	--	

K.S. Glucose Meter Download at 4-Month Follow-up (Jan. 2013)



Statistics	1/14 - 1/27	
Avg BG (mg/dL)	182 ± 56	
BG Readings	31	3.4/day
Readings Above Target	25	81%
Readings Below Target	--	0%
Sensor Avg (mg/dL)	--	
Avg AUC > 140 (mg/dL)	--	--
Avg AUC < 70 (mg/dL)	--	--
Avg Daily Carbs (g)	--	
Carbs/Bolus Insulin (g/U)	--	
Avg Total Daily Insulin (U)	--	
Avg Daily Basal (U)	--	--
Avg Daily Bolus (U)	--	--

K.S. Glucose Meter Download at 1-Year Follow-up (Jan. 2013)

- ! Patient tests an average of 3.4 times per day.
- ! Average number of glucose tests per week flagged as post-meal is 0.5.

- ! 23.4% of values are hyperglycemic.
- ! Downward trend in hyperglycemic events compared to the previous reporting period.

Date	Overnight	Early Morning	Late Morning	Early Afternoon	Late Afternoon	Early Evening	Late Evening	Bedtime
	12 AM - 6 AM	6 AM - 9 AM	9 AM - 11 AM	11 AM - 2 PM	2 PM - 5 PM	5 PM - 7 PM	7 PM - 10 PM	10 PM - 12 AM
10/7/2013 Mon		213 8:28 AM						
10/6/2013 Sun			152 9:31 AM				149 7:41 PM	120 11:22 PM
10/5/2013 Sat	148 12:44 AM			159 1:31 PM		186 5:54 PM		96 11:11 PM
10/4/2013 Fri		134 6:41 AM		117 11:42 AM		170 5:17 PM		
10/3/2013 Thu		99 6:47 AM		140 11:44 AM		153 6:26 PM	46 8:22 PM	
10/2/2013 Wed		158 6:39 AM				176 6:58 PM		90 10:09 PM
10/1/2013 Tue		182 6:39 AM		162 11:51 AM		155 6:28 PM		127 10:27 PM
9/30/2013 Mon		121 6:34 AM		193 11:52 AM			209 7:11 PM	105 10:27 PM
9/29/2013 Sun	109 12:24 AM			177 11:58 AM		226 6:57 PM		80 10:32 PM
9/28/2013 Sat			133 9:20 AM		166 2:01 PM	190 6:29 PM		
9/27/2013 Fri		179 6:47 AM		169 12:55 PM			112 7:47 PM	117 11:14 PM
9/26/2013 Thu		182 6:36 AM		170 11:42 AM			201 7:29 PM	81 10:33 PM
9/25/2013 Wed		236 8:47 AM			146 3:12 PM			202 10:31 PM
9/24/2013 Tue		164 6:47 AM		179 11:53 AM		111 6:53 PM		

Hyper. / Hypo. Threshold: 180 / 69 mg/dL (Plasma)













• Post-meal

Above/Below Target Hypoglycemic

K.S. Current Status

- Most recent visit July 2018
 - Glargine 37 bid
 - Aspart 17-25-37
 - Aspart ISS 3-5-7-9-11 > 150 at ac, 0-2-3-4-5 at hs
 - Metformin 1000 mg bid
- HbA1c 6.2%

K.S. HbA1c trend over 8 years

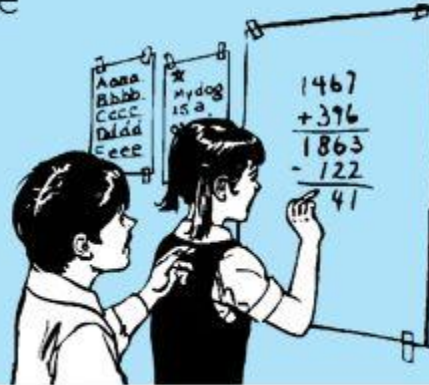
Date	Time	Result	Units
6/28/18	08:04	6.2 H 	%
6/22/17	10:00	6.8 H 	%
8/22/16	17:32	6.4 H	%
2/5/16	08:16	6.9 H 	%
10/8/15	14:04	7.3 H 	%
7/15/15	11:48	6.9 H 	%
4/7/14	09:14	7.0 H	%
12/20/13	08:03	6.8 H 	%
8/7/13	08:35	7.4 H 	%
4/23/13	11:25	7.7 H 	%
1/21/13	08:22	7.6 H 	%
10/16/12	08:13	9.1 H 	%
7/25/12	11:44	10.4 H	%
3/21/12	08:14	10.4 H	%
11/29/11	08:05	10.5 H	%
7/28/11	08:15	10.2 H 	%
4/27/11	08:30	9.6 H	%
11/30/10	08:25	7.3 H	%
7/15/10	08:45	6.9 H 	%

MATH PROBLEM

John has 32 candy bars, he eats 28. What does he have now?

Diabetes! John has diabetes!

someecards
user card



QUESTIONS ABOUT CASE 1?

CASE 2: S.F.

Case 2 – S.F.

- 56/F first seen July 2017 during hospitalization for anterior abdominal wall abscess
 - ***No known h/o of DM***
 - Strong family h/o of DM in mother, mGF, maternal uncle, and possibly brother
 - Surgery 7/12/17: Open sigmoid resection with splenic flexure mobilization; found intraoperatively to have a perforated diverticulum

S.F. - Inpatient Fingerstick Glucose Readings

7/13/17	00:03	236 H	mg/dL
7/12/17	21:22	237 H	mg/dL
7/12/17	17:18	231 H	mg/dL
7/12/17	10:38	257 H	mg/dL
7/12/17	08:57	288 H	mg/dL
7/12/17	06:52	288 H	mg/dL
7/12/17	00:15	211 H	mg/dL
7/11/17	18:00	184 H	mg/dL

Case 2 – S.F.

- 7/13/17 HbA1c **8.9%**
- Was started on NPH 5 units bid and aspart sliding scale 2/50>150 ac and hs
- Consult placed for endocrinology
- Transitioned over to glargine and aspart
- Received inpatient DM Ed
- Sent home on:
 - Glargine 15 units qhs
 - Aspart 5 units tid ac

DSMES – INPATIENT FOCUS

DSMES – Inpatient Focus

- Survival skills
 - What is DM
 - Blood glucose monitoring
 - Medication/insulin administration
 - Hypoglycemia
 - Nutrition strategies
- Future referral for comprehensive outpatient education

DSMES – Dietitian Assessment

- Experience w/ mother's DM, carb counting, diet influence
- Current typical daily eating
- Recent appetite history
- Weight history
- Weight goals
- Medication regimen
- Cooking ability
- Where meals come from
- Identify strengths
 - Weight progress
 - Eating often enough

DSMES – Nutrition Goals

- Accurate carb identification
- Adhere to constant carb regimen
- Avoid sugary beverages
- Pursue balanced plate
 - Aid healing
 - Adequate protein

DSMES – Nutrition Education

- Constant carb for mealtime insulin dosing
- Carb identification
- Healthy eating
 - Cooking
 - Shopping
 - Resources
- Eating often enough

DSMES – Nurse Assessment

- Experience w/ mother's DM
- Feelings about DM dx when hospitalized with other primary dx
- Daily schedule
- Activity
 - Prior to admission
 - Desire to add/change
- Living situation
 - Number in home
 - Ability to assist
- Finances
 - Insurance status
 - Ability to pay for diabetes medications and supplies

DSMES – Other Goals & Education

- Explanation of DM and treatment plan
- Glucose monitoring
 - Provide/obtain meter (insurance considerations)
 - Check QID, record results, report to physician
- Insulin
 - Insurance coverage of vial/syringe or pen
 - Type, dose & time to take
 - Administration
- Hypoglycemia – symptoms & treatment
- Home schedule
- Discharge prescriptions

S.F. - 2-month Post-hospitalization Endocrine Follow-up

- Sept. 2017
- Pt had gotten confused with her discharge instructions and was taking glargine 5 units qhs and aspart 5 units tid ac
- Was now counting carbs, limiting to:
 - 15-30 g with breakfast
 - 15-45 g with lunch
 - 15-30 g with supper
 - Occasional snack, limiting to 15 g or less

S.F. Glucose Meter Download at 2-Month Follow-up (Sept. 2017)

Date	Overnight 12 AM - 6 AM	Early Morning 6 AM - 9 AM	Late Morning 9 AM - 11 AM	Early Afternoon 11 AM - 2 PM	Late Afternoon 2 PM - 5 PM	Early Evening 5 PM - 7 PM	Late Evening 7 PM - 10 PM	Bedtime 10 PM - 12 AM
9/27/2017 Wed				108 11:06 AM				
9/26/2017 Tue			113 10:24 AM		120 2:22 PM	100 6:48 PM		138 11:13 PM
9/25/2017 Mon			114 10:44 AM		114 3:13 PM	64 5:53 PM		133 10:26 PM
9/24/2017 Sun		122 8:10 AM			106 4:17 PM		111 7:43 PM	117 10:53 PM
9/23/2017 Sat			124 10:11 AM			109 5:28 PM		91 11:53 PM
9/22/2017 Fri				109 12:06 PM	116 2:57 PM		109 7:11 PM	94 11:40 PM
9/21/2017 Thu	103 12:01 AM		130 9:10 AM	113 1:09 PM		139 6:25 PM		106 11:08 PM
9/20/2017 Wed	103 12:21 AM			132 11:33 AM	127 2:05 PM	99 6:55 PM		
9/19/2017 Tue			145 9:24 AM	110 12:59 PM		111 6:26 PM		
9/18/2017 Mon			122 10:24 AM		90 2:01 PM	83 6:16 PM		101 11:08 PM
9/17/2017 Sun			109 10:51 AM		108 3:38 PM	106 6:17 PM		74 10:10 PM
9/16/2017 Sat			129 9:43 AM		124 3:25 PM		99 7:33 PM	79 11:43 PM
9/15/2017 Fri	102 1:03 AM			128 11:32 AM				121 11:07 PM
9/14/2017 Thu				127 11:19 AM	97 2:21 PM	116 6:46 PM		
9/13/2017 Wed	120 12:02 AM		107 10:04 AM	127 1:14 PM		100 6:28 PM		113 10:42 PM
9/12/2017 Tue			130 9:23 AM	117 1:59 PM		73 6:46 PM		
9/11/2017 Mon		115 7:44 AM			128 2:28 PM	120 5:51 PM		97 11:23 PM
9/10/2017 Sun			113 10:26 AM		96 2:31 PM	91 6:46 PM		102 10:54 PM
9/9/2017 Sat				128 11:25 AM	138 4:31 PM	94 6:37 PM		94 11:42 PM
9/8/2017 Fri	109 12:02 AM		126 9:55 AM	116 1:53 PM		109 6:16 PM		105 10:16 PM
9/7/2017 Thu			110 9:04 AM	105 1:13 PM		109 6:52 PM		

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9/5/2017 Tue			122 9:15 AM	139 1:28 PM		119 6:28 PM		
9/4/2017 Mon	107 12:20 AM			132 11:38 AM	95 3:52 PM	124 5:41 PM		
9/3/2017 Sun	105 12:18 AM			106 12:04 PM	93 4:32 PM		110 7:24 PM	
9/2/2017 Sat				123 11:24 AM	99 4:26 PM	97 6:13 PM		
9/1/2017 Fri	117 12:08 AM			128 11:40 AM	102 3:51 PM	89 5:35 PM		125 10:28 PM
8/31/2017 Thu	99 12:48 AM			112 11:41 AM		109 6:48 PM		
8/30/2017 Wed			100 10:26 AM		126 2:41 PM		141 7:44 PM	
8/29/2017 Tue	113 12:05 AM			110 11:47 AM	133 3:49 PM	97 6:46 PM		98 11:35 PM

Hyper. / Hypo. Threshold: 180 / 69 mg/dL (Plasma)

Above/Below Target Hypoglycemic

Glucose Statistics - mg/dL (Plasma)

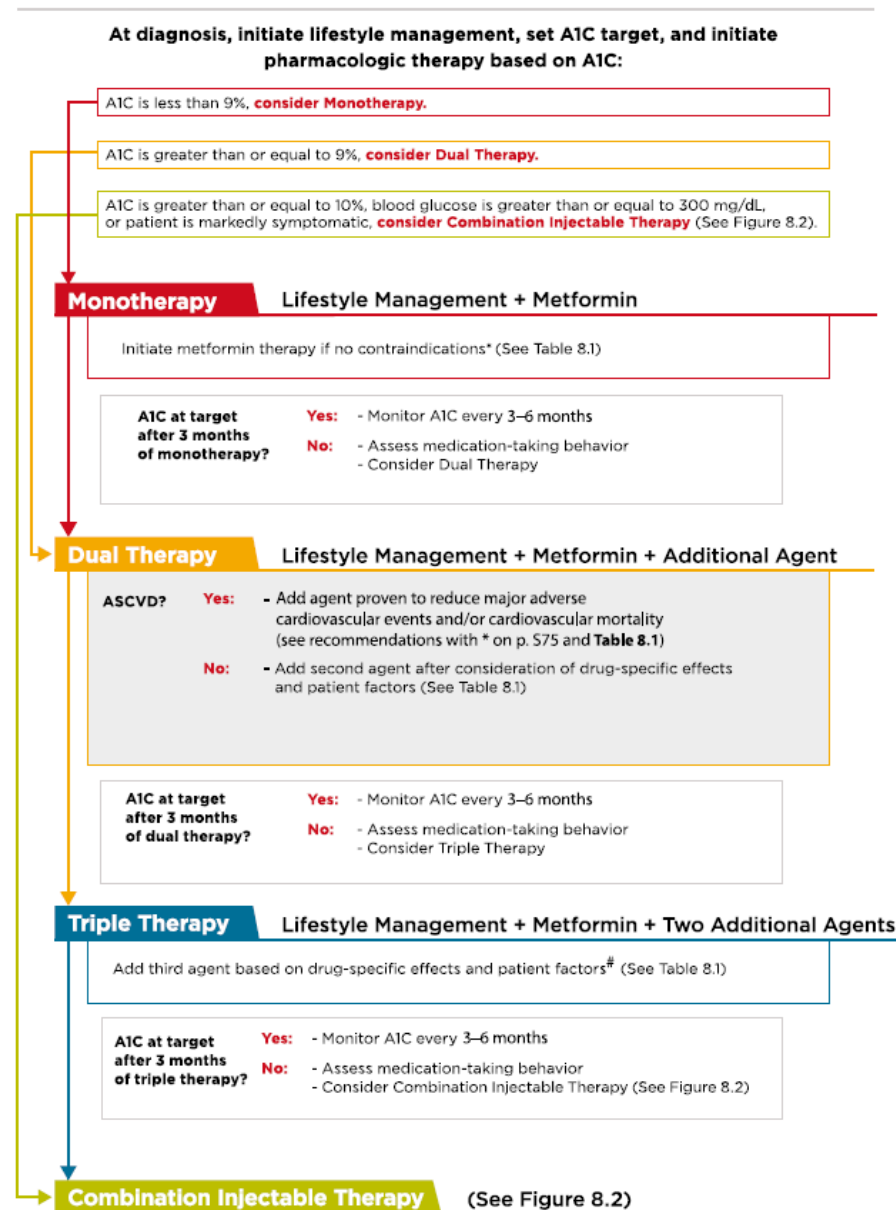
	Overall	Overnight 12 AM - 6 AM	Early Morning 6 AM - 9 AM	Late Morning 9 AM - 11 AM	Early Afternoon 11 AM - 2 PM	Late Afternoon 2 PM - 5 PM	Early Evening 5 PM - 7 PM	Late Evening 7 PM - 10 PM	Bedtime 10 PM - 12 AM
Highest	145	120	122	145	139	138	139	141	138
Median	110.0	107.0	118.5	120.5	117.0	108.0	106.0	110.0	102.0
Mean	111.0	108.1	118.5	119.6	119.5	111.0	102.9	114.0	105.3
Variability*	22.5	10.0		16.0	18.0	29.0	17.0	22.0	27.0
Standard Deviation	15.2	6.6	4.9	11.2	10.5	15.2	16.6	15.8	17.5
Lowest	64	99	115	100	105	90	64	99	74
No. of Tests	114	11	2	16	19	19	23	5	19
% Hypoglycemic	0.9	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0
% Above Target	1.8	0.0	0.0	6.3	0.0	0.0	0.0	20.0	0.0

* Variability is the difference between the 75th and 25th percentiles. It is also known as the 'Inter-Quartile Range'.

S.F. 2-Month Follow-up

- HbA1c **5.7%** ← 8.9%

Antihyperglycemic Therapy in Adults with Type 2 Diabetes



Start with Monotherapy unless:

A1C is greater than or equal to 9%, **consider Dual Therapy**.

A1C is greater than or equal to 10%, blood glucose is greater than or equal to 300 mg/dL, or patient is markedly symptomatic, **consider Combination Injectable Therapy** (See Figure 8.2).

Monotherapy Metformin

Lifestyle Management

EFFICACY*	high
HYPO RISK	low risk
WEIGHT	neutral/loss
SIDE EFFECTS	GI/lactic acidosis
COSTS*	low

If A1C target not achieved after approximately 3 months of monotherapy, proceed to 2-drug combination (order not meant to denote any specific preference — choice dependent on a variety of patient- & disease-specific factors):

Dual Therapy Metformin +

Lifestyle Management

	Sulfonylurea	Thiazolidinedione	DPP-4 inhibitor	SGLT2 inhibitor	GLP-1 receptor agonist	Insulin (basal)
EFFICACY*	high	high	intermediate	intermediate	high	highest
HYPO RISK	moderate risk	low risk	low risk	low risk	low risk	high risk
WEIGHT	gain	gain	neutral	loss	loss	gain
SIDE EFFECTS	hypoglycemia	edema, HF, fxs	rare	GU, dehydration, fxs	GI	hypoglycemia
COSTS*	low	low	high	high	high	high

If A1C target not achieved after approximately 3 months of dual therapy, proceed to 3-drug combination (order not meant to denote any specific preference — choice dependent on a variety of patient- & disease-specific factors):

Triple Therapy Metformin +

Lifestyle Management

Sulfonylurea +	Thiazolidinedione +	DPP-4 inhibitor +	SGLT2 inhibitor +	GLP-1 receptor agonist +	Insulin (basal) +
TZD	SU	SU	SU	SU	TZD
or DPP-4-i	or DPP-4-i	or TZD	or TZD	or TZD	or DPP-4-i
or SGLT2-i	or SGLT2-i	or SGLT2-i	or DPP-4-i	or SGLT2-i	or SGLT2-i
or GLP-1-RA	or GLP-1-RA	or Insulin*	or GLP-1-RA	or Insulin*	or GLP-1-RA
or Insulin*	or Insulin*		or Insulin*		

If A1C target not achieved after approximately 3 months of triple therapy and patient (1) on oral combination, move to basal insulin or GLP-1 RA, (2) on GLP-1 RA, add basal insulin, or (3) on optimally titrated basal insulin, add GLP-1 RA or mealtime insulin. Metformin therapy should be maintained, while other oral agents may be discontinued on an individual basis to avoid unnecessarily complex or costly regimens (i.e., adding a fourth antihyperglycemic agent).

Combination Injectable Therapy (See Figure 8.2)

Table 8.1—Drug-specific and patient factors to consider when selecting antihyperglycemic treatment in adults with type 2 diabetes

		Efficacy*	Hypoglycemia	Weight Change	CV Effects		Cost	Oral/SQ	Renal Effects		Additional Considerations
					ASCVD	CHF			Progression of DKD	Dosing/Use considerations	
Metformin		High	No	Neutral (Potential for Modest Loss)	Potential Benefit	Neutral	Low	Oral	Neutral	<ul style="list-style-type: none"> Contraindicated with eGFR <30 	<ul style="list-style-type: none"> Gastrointestinal side effects common (diarrhea, nausea) Potential for B12 deficiency
SGLT-2 Inhibitors		Intermediate	No	Loss	Benefit: canagliflozin, empagliflozin [†]	Benefit: canagliflozin, empagliflozin	High	Oral	Benefit: canagliflozin, empagliflozin	<ul style="list-style-type: none"> Canagliflozin: not recommended with eGFR <45 Dapagliflozin: not recommended with eGFR <60; contraindicated with eGFR <30 Empagliflozin: contraindicated with eGFR <30 	<ul style="list-style-type: none"> FDA Black Box: Risk of amputation (canagliflozin) Risk of bone fractures (canagliflozin) DKA risk (all agents, rare in T2DM) Genitourinary infections Risk of volume depletion, hypotension ↑LDL cholesterol
GLP-1 RAs		High	No	Loss	Neutral: lixisenatide, exenatide extended release Benefit: liraglutide [†]	Neutral	High	SQ	Benefit: liraglutide	<ul style="list-style-type: none"> Exenatide: not indicated with eGFR <30 Lixisenatide: caution with eGFR <30 Increased risk of side effects in patients with renal impairment 	<ul style="list-style-type: none"> FDA Black Box: Risk of thyroid C-cell tumors (liraglutide, albiglutide, dulaglutide, exenatide extended release) Gastrointestinal side effects common (nausea, vomiting, diarrhea) Injection site reactions ?Acute pancreatitis risk
DPP-4 Inhibitors		Intermediate	No	Neutral	Neutral	Potential Risk: saxagliptin, alogliptin	High	Oral	Neutral	<ul style="list-style-type: none"> Renal dose adjustment required; can be used in renal impairment 	<ul style="list-style-type: none"> Potential risk of acute pancreatitis Joint pain
Thiazolidinediones		High	No	Gain	Potential Benefit: pioglitazone	Increased Risk	Low	Oral	Neutral	<ul style="list-style-type: none"> No dose adjustment required Generally not recommended in renal impairment due to potential for fluid retention 	<ul style="list-style-type: none"> FDA Black Box: Congestive heart failure (pioglitazone, rosiglitazone) Fluid retention (edema; heart failure) Benefit in NASH Risk of bone fractures Bladder cancer (pioglitazone) ↑LDL cholesterol (rosiglitazone)
Sulfonylureas (2nd Generation)		High	Yes	Gain	Neutral	Neutral	Low	Oral	Neutral	<ul style="list-style-type: none"> Glyburide: not recommended Glipizide & glimepiride: initiate conservatively to avoid hypoglycemia 	<ul style="list-style-type: none"> FDA Special Warning on increased risk of cardiovascular mortality based on studies of an older sulfonylurea (tolbutamide)
Insulin	Human Insulin	Highest	Yes	Gain	Neutral	Neutral	Low	SQ	Neutral	<ul style="list-style-type: none"> Lower insulin doses required with a decrease in eGFR; titrate per clinical response 	<ul style="list-style-type: none"> Injection site reactions Higher risk of hypoglycemia with human insulin (NPH or premixed formulations) vs. analogs
	Analog						High	SQ			

*See ref. 31 for description of efficacy. [†]FDA approved for CVD benefit. CVD, cardiovascular disease; DKA, diabetic ketoacidosis; DKD, diabetic kidney disease; NASH, nonalcoholic steatohepatitis; RAs, receptor agonists; SQ, subcutaneous; T2DM, type 2 diabetes.

S.F. 2-Month Follow-up

- Plan:
 - Stop glargine and aspart
 - Pt was given the option of starting 2 oral medications or Soliqua[®] (glargine and lixisenatide)
 - Pt chose Soliqua[®]
 - Start Soliqua[®] 15 units daily

S.F. Glucose Meter Download at 10-Month Follow-up (May 2018)

Date	Overnight	Early Morning	Late Morning	Early Afternoon	Late Afternoon	Early Evening	Late Evening	Bedtime
	12 AM - 6 AM	6 AM - 9 AM	9 AM - 11 AM	11 AM - 2 PM	2 PM - 5 PM	5 PM - 7 PM	7 PM - 10 PM	10 PM - 12 AM
4/9/2018 Mon					105 2:43 PM			
4/8/2018 Sun							86 7:03 PM	
4/7/2018 Sat					125 2:41 PM			
4/6/2018 Fri					105 2:59 PM			
4/5/2018 Thu					251 3:07 PM			
4/4/2018 Wed					118 4:13 PM			

Hyper. / Hypo. Threshold: 180 / 69 mg/dL (Plasma)

Above/Below Target

Glucose Statistics - mg/dL (Plasma)

	Overall	Overnight	Early Morning	Late Morning	Early Afternoon	Late Afternoon	Early Evening	Late Evening	Bedtime
		12 AM - 6 AM	6 AM - 9 AM	9 AM - 11 AM	11 AM - 2 PM	2 PM - 5 PM	5 PM - 7 PM	7 PM - 10 PM	10 PM - 12 AM
Highest	251					251	86	107	
Median	113.0					114.0		96.5	
Mean	119.3					122.4	86.0	96.5	
Variability*	21.0					21.5			
Standard Deviation	32.4					32.7		14.8	
Lowest	84					84	86	86	
No. of Tests	28					25	1	2	
% Hypoglycemic	0.0					0.0	0.0	0.0	
% Above Target	10.7					12.0	0.0	0.0	

S.F. 10-Month Follow-up

- On Soliqua® 15 units daily
- Checks glucoses 2H post-lunch
- HbA1c **6.3%**
- Plan:
 - Continue Soliqua® 15 units daily

S.F. Current Status

- Pt called me early Sept., noticed pustules over previous sites of Soliqua[®] injection
- States she has a h/o allergy to metals and thinks she is allergic to the needles
- Has also noticed some pustules after fingerstick glucoses are checked with lancet
- Pt requested to go off Soliqua[®]

S.F. Current Status

- Plan:
 - Stop Soliqua®
 - Start Metformin 1000 mg bid and Jardiance 10 mg daily

QUESTIONS?

Laughter is the best medicine.... Well, unless you're a diabetic. Then, insulin is probably better.



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