Evaluation of weight loss with insulin and sodium-glucose cotransporter-2 inhibitors or glucagon-like peptide-1 receptor agonists in medically underserved patients with type 2 diabetes

Lourdes M. Vega, Pharm.D.

PGY1 Pharmacy Resident
St. Louis College of Pharmacy/
St. Louis County Department of Public Health

ST. LOUIS COLLEGE of PHARMACY

Saint Louis COUNTY PUBLIC HEALTH

Background

- Mortality reduction and improved metabolic outcomes observed with > 5% weight loss in patients with T2DM
- Achieving meaningful weight loss complicated by the use of antihyperglycemic agents associated with weight gain:
  - Insulin
  - Insulin secretagogues
  - Thiazolidinediones
- Antihyperglycemic agents associated with weight loss:
  - SGLT-2i
  - GLP-1 RA

Diabetes Care. 2000 Oct;23(10):1499-504.
J Acad Nutr Diet 2015;115:1447–1463.
Diabetes Care. 2015;38(9):1730-1735.

SGLT-2i: SGLT-2 inhibitor
GLP-1 RA: GLP-1 Receptor Agonist
T2DM: type 2 diabetes mellitus

Weight loss with SGLT-2 Inhibitors and GLP-1 Receptor Agonists

SGLT-2i

Expected Weight Loss:
13.2 lb (100 kcal/day)

Observed weight loss after 26 weeks:
Monotherapy: 5.3-7.5 lb (2.8-3.9%)
With insulin: 3.5-4.8 lb (1.8-2.3%)

★ Majority of weight loss in first 8 weeks of therapy

GLP-1 RA

Expected Weight Loss:
Unclear

Observed weight loss after 52 weeks:
Monotherapy: 4.6-5.5 lb (2.3-2.7%)
With Insulin: 2.9- 4.2 lb (1.5-2.2%)

★ Majority of weight loss in first 12 weeks of therapy

BMJ. 2012;344:d7771.
Obes Rev. 2018;19(12):1630-1641
Obes Rev. 2019;20(6):816-828.

Weight Trends in Medically Underserved Populations

- Higher risk for obesity
- Environmental and psychosocial stresses
- Lower success rates of achieving and maintaining weight loss

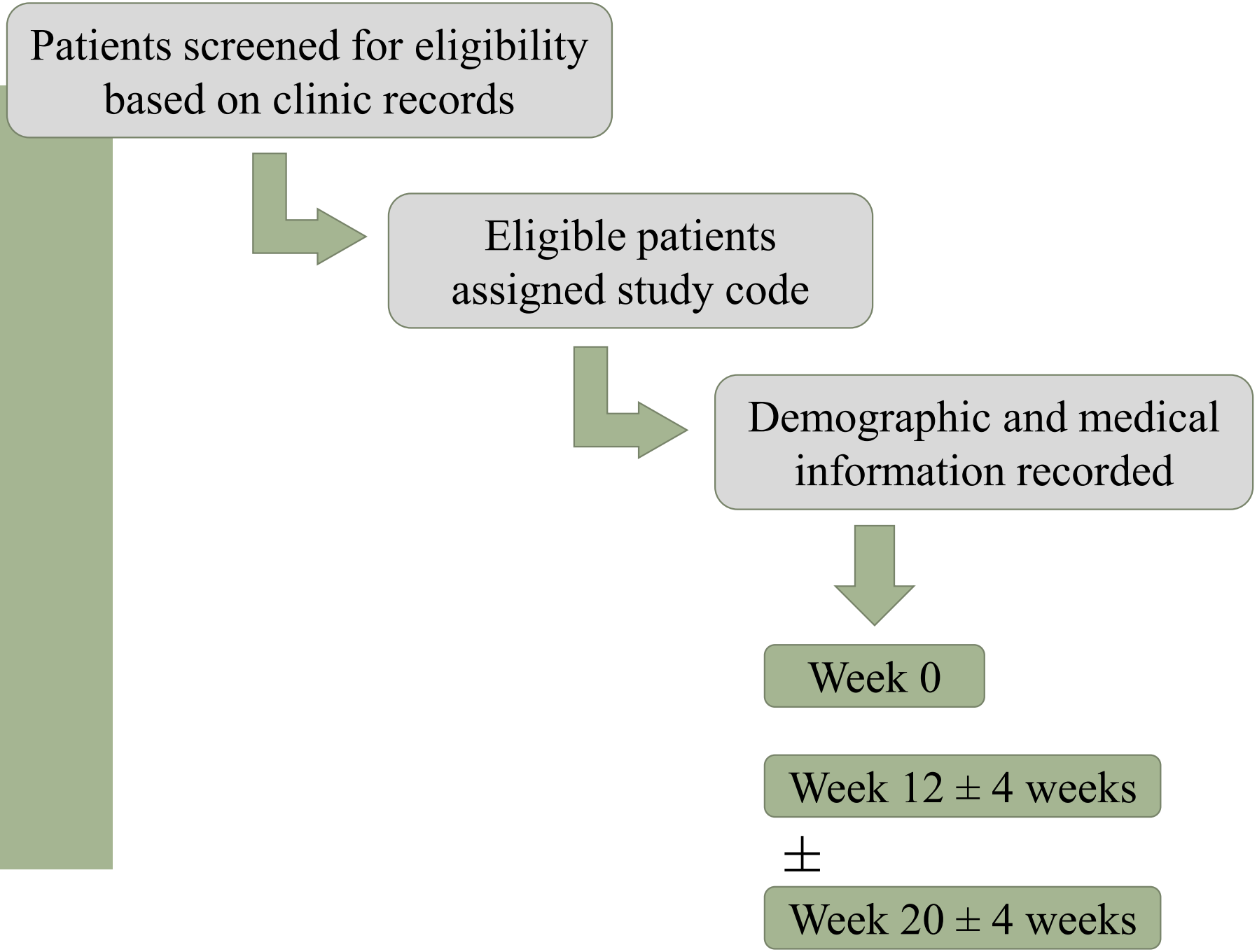
Prev Med. 2014;68:71-5.

Am J Prev Med. 2014;46(6):585-92.

Objective

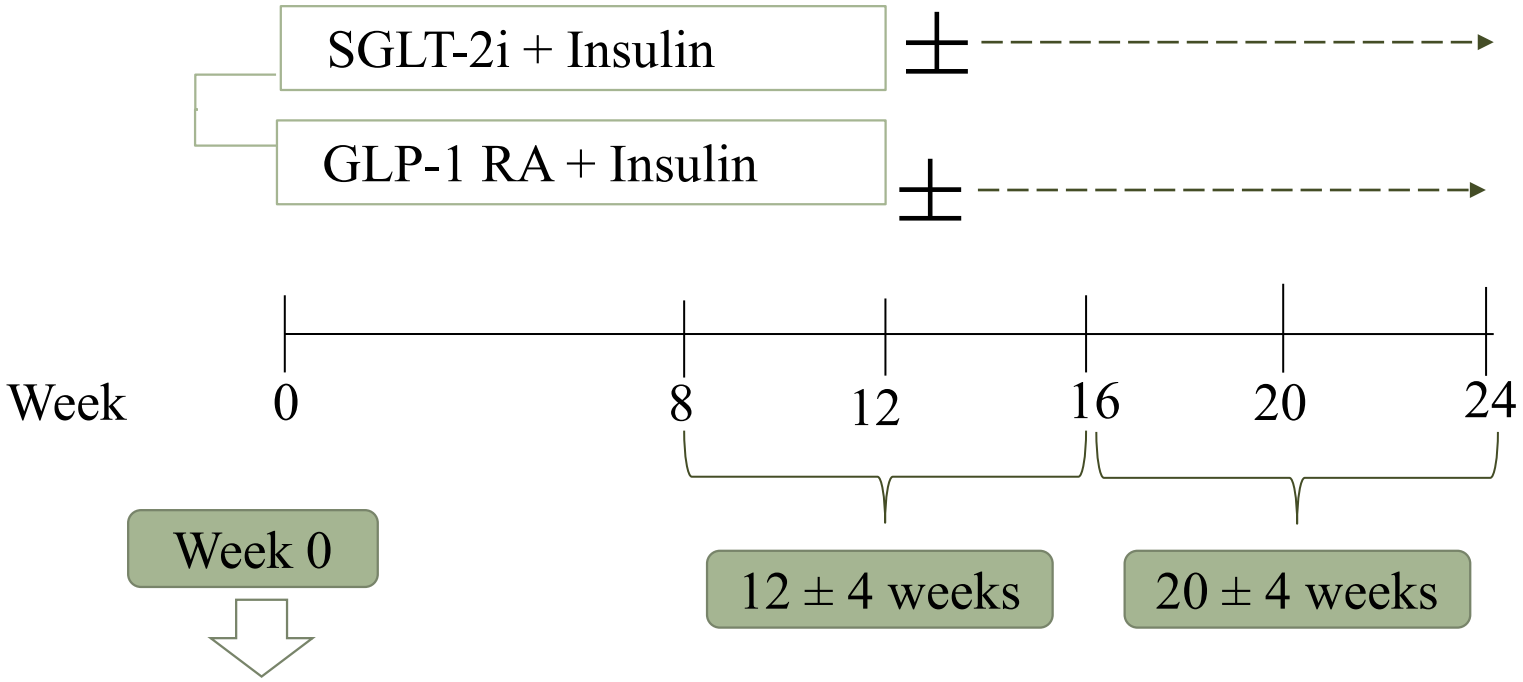
Evaluate real world weight loss in patients with T2DM in a medically underserved area with the use of SGLT-2i or GLP-1 RA agonists and concomitant insulin use

Methods


Patients screened for eligibility based on clinic records
Eligible patients assigned study code
Demographic and medical information recorded
Week 0
Week 12 ± 4 weeks
±
Week 20 ± 4 weeks

Methods cntd.

Data collected

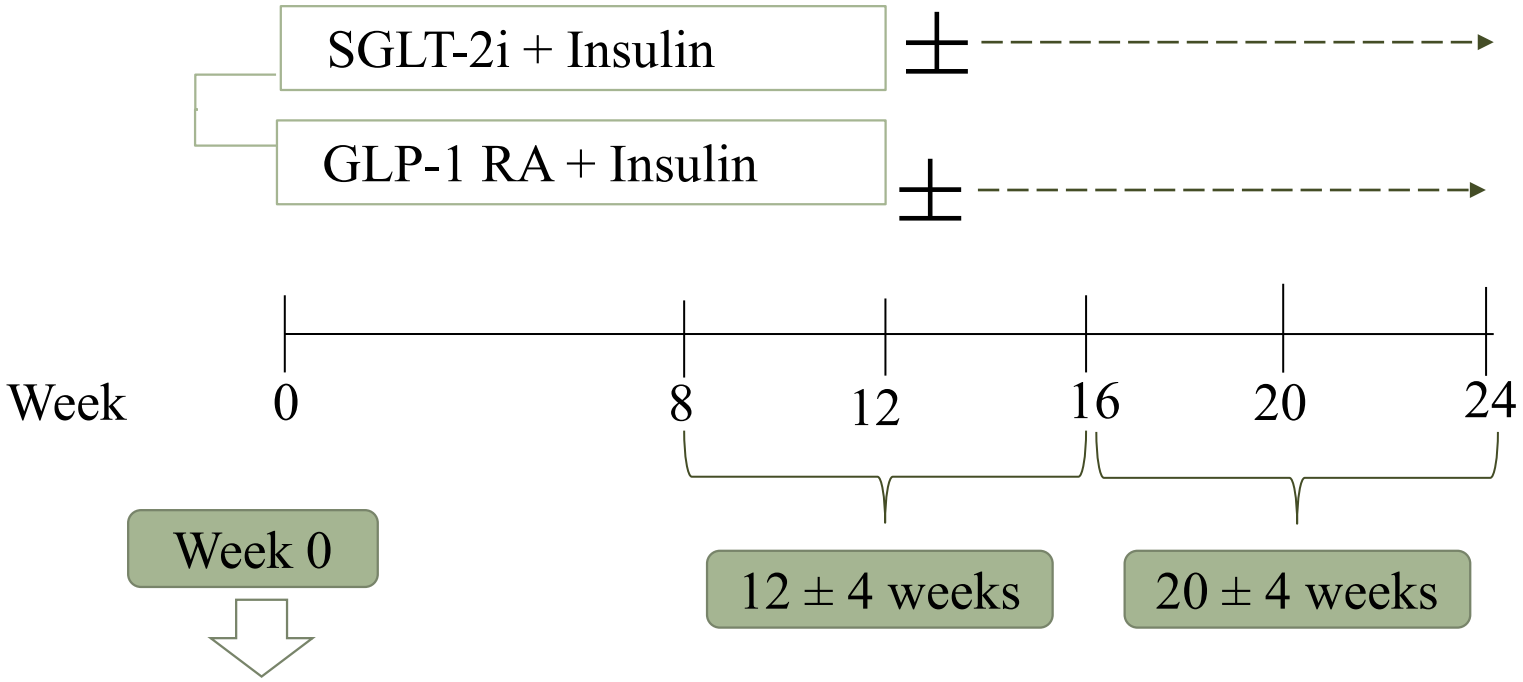


Date therapy initiated:

- Date medication picked up from clinic
- Date prescription written

Methods cntd.

Data collected

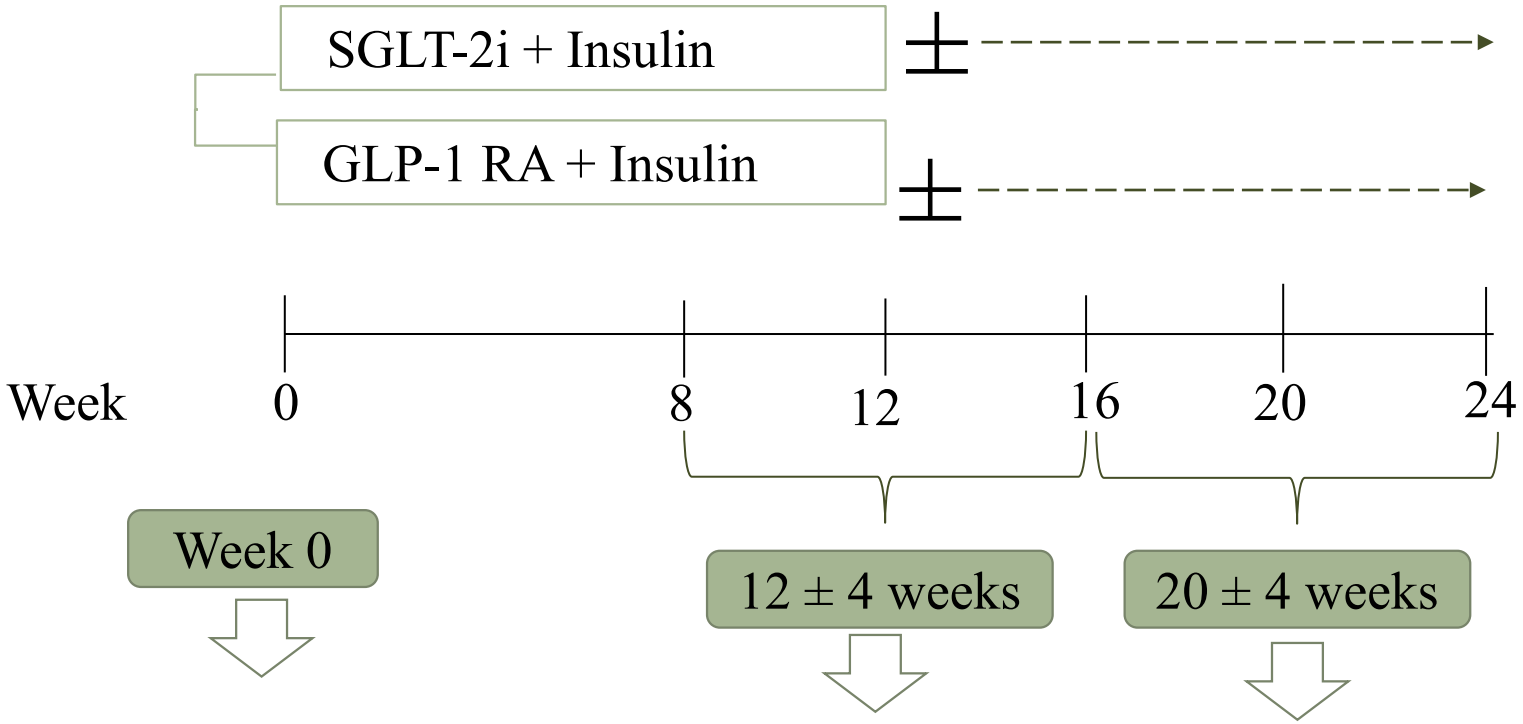


Baseline Demographics:

- Age
- Sex at birth
- Race
- Ethnicity
- Height

Methods cntd.

Data collected



Medical Information:

- Weight
- Blood pressure
- SGLT-2i/GLP-1 RA name and dose
- Insulin total daily dose
- Concomitant diabetes medications
- Patient report of blood glucose ≤ 70
- A1c (included as far back as ≤ 90 days prior to week 0 and anytime available thereafter)

Statistical Design

Inclusion Criteria

- Initiated on SGLT-2i or GLP-1 RA at STLCDPH clinic from 2015 to 2019
- Concomitant insulin therapy at least during first 12 weeks of therapy

Exclusion Criteria

- No recorded weight at week 0 and 12 ± 4 weeks
- Concomitant use of SGLT-2i and GLP-1 RA
- Discontinuation of SGLT-2i or GLP-1 RA before follow-up weight (12 ± 4 weeks after initiation)
- Use of SGLT-2i or GLP-1 RA < 6 months prior to analysis
- History of bariatric surgery
- BMI < 25 kg/m²
- Pregnancy at any time of analysis
- Weight loss drug < 3 months prior to week 0 or at any time during analysis

STLCDPH: St. Louis County Department of Public Health

Primary outcome:

Change in body weight from baseline to week 12

Secondary outcomes:

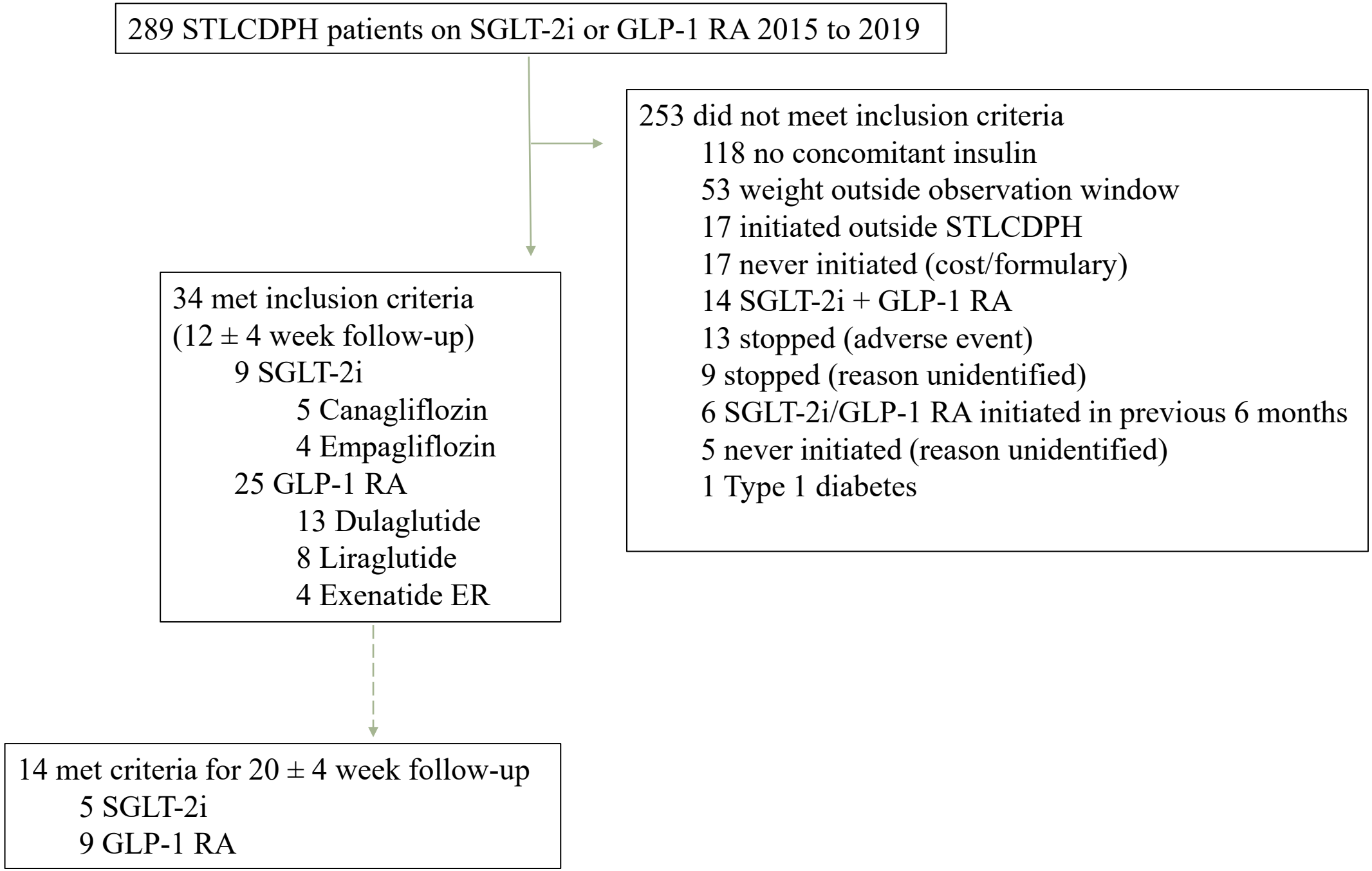
Change in:

- Body weight from baseline to week 20
- BMI
- A1c
- Insulin dose
- Presence of hypoglycemic episodes
- Blood pressure

Statistical Analysis

Primary endpoint and all continuous secondary endpoints: student t-test

Categorical endpoint: McNemar's test


289 STLCDPH patients on SGLT-2i or GLP-1 RA 2015 to 2019
253 did not meet inclusion criteria
118 no concomitant insulin
53 weight outside observation window
17 initiated outside STLCDPH
17 never initiated (cost/formulary)
14 SGLT-2i + GLP-1 RA
13 stopped (adverse event)
9 stopped (reason unidentified)
6 SGLT-2i/GLP-1 RA initiated in previous 6 months
5 never initiated (reason unidentified)
1 Type 1 diabetes
34 met inclusion criteria
(12 ± 4 week follow-up)
9 SGLT-2i
5 Canagliflozin
4 Empagliflozin
25 GLP-1 RA
13 Dulaglutide
8 Liraglutide
4 Exenatide ER
14 met criteria for 20 ± 4 week follow-up
5 SGLT-2i
9 GLP-1 RA

Baseline Demographics

N	34
Age (yrs)	52 ± 10
Sex at birth – no. (%)	
Male	22 (65)
Female	12 (35)
Race – no (%)	
Black or African American	21 (88)
White	13 (38)
Asian	0 (0)
American Indian or Alaska native	0 (0)
Other	0 (0)
Ethnicity – no (%)	
Not Hispanic or Latino	34 (100)
Hispanic or Latino	0 (0)
Body weight (lb)	250 .7 ± 67.9
Body mass index (kg/m^2)	39.8 ± 9.9
A1c (%)	10.1 ± 2.3
Values are expressed as mean ± SD unless otherwise noted	

Outcomes

Primary Endpoint

Week 12 ± 4 weeks (n=34)	Baseline	Follow-up	Difference from Baseline	Percent Difference from Baseline	P-value
Body weight (lb)	250 .7 ± 67.9	248.7 ± 68.5	-2.003 ± 6.4	0.80 ± 2.73	0.077
Values are expressed as mean ± SD unless otherwise noted					

Body Weight and BMI

Week 12 ± 4 weeks (n=34)	Baseline	Follow-up	Difference from Baseline	Percent Difference from Baseline	P-value
Body weight (lb)	250 .7 ± 67.9	248.7 ± 68.5	-2.003 ± 6.4	0.80 ± 2.73	0.077
Body mass index (kg/m^2)	39.8 ± 9.9	39.52 ± 9.9	-0.309 ± 1.03	-0.709 ± 2.69	0.090
Week 20 ± 4 weeks (n=14)					
Body weight (lb)	252.63 ± 85.8	250.3 ± 87.5	-2.311 ± 9.72	-1.05 ± 4.57	0.390
Body mass index (kg/m^2)	41.06 ± 13.59	40.68 ± 13.68	-0.379 ± 1.66	-0.845 ± 4.58	0.407
Values are expressed as mean ± SD unless otherwise noted					

A1c

Week 12 ± 4 weeks (n=34)	Baseline	Follow-up	Difference from Baseline	P-value
A1c (%)	10.1 ± 2.35	8.59 ± 2.21	-1.536 ± 2.29	0.004
Week 20 ± 4 weeks (n=9)				
A1c (%)	10 ± 2.25	8.29 ± 2.30	-1.711 ± 2.18	0.046
Values are expressed as mean ± SD unless otherwise noted				

Insulin dose, Blood pressure, Hypoglycemia

Week 12 ± 4 weeks (n=34)	Baseline	Follow-up	Difference from Baseline	Percent Difference from Baseline	P-value
Insulin dose (units)	74.38 ± 50.9	68.35 ± 52.53	-6.03 ± 24.48	-5.15 ± 26.84	0.160
Blood pressure (mm Hg) Systolic Diastolic	 141 ± 20.4 74 ± 10.4	 141 ± 24.8 79 ± 12.4	 0 ± 18.2 4.7 ± 8.4	 -- 	 0.88 0.003
Presence of hypoglycemia (n=10)	2	4	--	--	0.61
Week 20 ± 4 weeks (n=14)					
Insulin dose (units)	77.62 ± 49.2	72.15 ± 62.06	-5.46 ± 24.95	-7.06 ± 26.64	0.445
Blood pressure (mm Hg) Systolic Diastolic	 135 ± 16.4 72.3 ± 10.9	 140 ± 19.6 75 ± 13	 5 ± 15.7 3.1 ± 12.24	 -- 	 0.24 0.35
Presence of hypoglycemia (n=5)	2	1	--	--	1
Values are expressed as mean ± SD unless otherwise noted					

Benefits

- First study to evaluate outcome specifically in medically underserved patients
- Better utilization of funds in medically underserved overweight patients with T2DM

Limitations

- Difficult to determine true start date of treatment
- Presumed adherence to therapy
- Limited study population due to high no-show rate at clinics
- Point of care A1c test performed at clinic goes up to 14%

Conclusions

- No significant change in body weight from SGLT-2i or GLP-1 RA initiation to week 12
- Additional confounding factors of patients in medically underserved areas may blunt weight loss with SGLT-2i or GLP-1 RA therapy

Questions?

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