A Retrospective Longitudinal Analysis of the Effect of Pre-operative Weight Loss and Type of Bariatric Surgery on Total Body Weight Loss

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Introduction

❑Obesity is associated with many comorbidities including hypertension, diabetes, dyslipidemia, obstructive sleep apnea, and joint disease.

❑ Patients who can achieve and maintain significant weight loss are able to alleviate many of their comorbidities.

❑Patients generally undergo bariatric surgery when lifestyle modifications and medical treatments have not produced the desired weight loss.

❑Patients who can lose 5-10 % or >10% of total body weight (TBW) prior to bariatric surgery have been shown increased total body weight loss (TBWL) and resolution of some comorbidities within the first year of surgery. [1-4]

Objectives

❑ To determine the utility of using early weight loss thresholds within the first 2 months of routine preoperative workup on successful TBWL after the surgery;

❑ To compare surgical modalities, Roux-en-Y gastric bypass and Gastric Sleeve, to determine the most effective procedure in the Hispanic population.
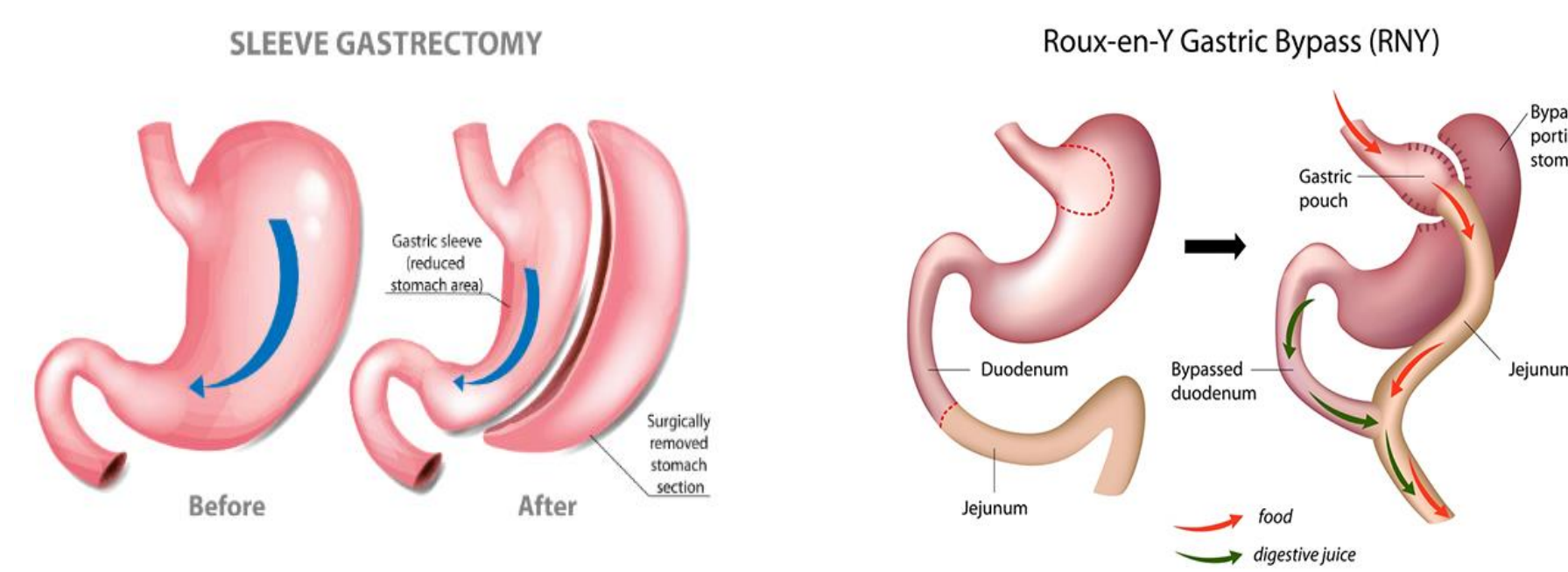
Methods

❑ Retrospective longitudinal study with 7 follow- up visits (1, 3, 6, 9,12, 18, and 24 months) of patients who have undergone bariatric surgery at the Renaissance Bariatric and Metabolic Institute at Doctors Hospital at Renaissance (DHR).

❑ Summarized and examined baseline data using descriptive statistics: frequencies and percentages for categorical variables and means and standard deviations for continuous variables.

❑Distributions of continuous and categorical variables by surgery types were compared using Students' t-test/ Mann–Whitney U test or chi-squared/Fisher exact test, respectively.

❑To address the study objectives we conducted linear mixed-effects regressions with random intercept and slope for time with time-varying and time-invariant factors.

❑ To identify group difference in %TBWL change over time, we tested for significant interaction effects TIME*TYPE and TIME*%pre-op WL.

❑2-sided statistical tests performed at α=0.05.

❑ SAS software version 9.4 (SAS Institute Inc).

Results

Table 1. Patients demographics and metabolic characteristics

Characteristic	All patients (n=281)	Roux-en-Y gastric bypass (n=131)	Gastric sleeve (n=150)	P-value [a]
Continuous Variable (n)	mean (SD)	mean (SD)	mean (SD)	
Age [years] (281)	44.31 (12.74)	42.02 (10.91)	46.32 (13.87)	0.0039
Weight [kg] (281)	123.31 (24.41)	125.66 (24.79)	121.26 (23.97)	0.1317
BMI [kg/m^2] (281)	46.30 (7.31)	47.20 (7.26)	45.52 (7.29)	0.0391*
Systolic blood pressure [mmHg] (280)	135.33 (15.20)	134.71 (15.05)	135.88 (15.36)	0.5217
Diastolic blood pressure [mmHg] (280)	80.59 (9.48)	80.60 (9.01)	80.58 (9.90)	0.9919
HbA1c [mmol/L] (165)	6.55 (1.62)	6.93 (1.87)	6.20 (1.25)	0.0049*
Fasting blood glucose [mg/dL] (275)	119.73 (56.56)	104.1 (41.0)	99.3 (26.5)	0.2967*
Cholesterol level (159)	176.30 (36.16)	173.56 (39.05)	178.46 (33.79)	0.3977
Low density lipoprotein (158)	108.04 (32.02)	104.45 (34.76)	110.90 (29.54)	0.2097
High density lipoprotein (156)	43.53 (11.17)	42.52 (10.65)	44.36 (11.58)	0.3082
Categorical Variable (N)	n (%)	n (%)	n (%)	P-value [b]
Female (281)	211 (75.09)	99 (75.57)	112 (74.67)	
Hispanic (281)	253 (90.04)	119 (90.84)	134 (89.33)	0.6741
Diabetes Mellitus history (280)	123 (43.93)	65 (49.62)	58 (38.93)	0.0721
Hypertension history (280)	169 (60.36)	80 (61.07)	89 (59.73)	0.8195
Hyperlipidemia history (281)	150 (53.38)	70 (53.44)	80 (53.33)	0.9864
Alcohol history (281)	139 (49.47)	64 (48.85)	75 (50.00)	0.8481

[a] Student's t-test P-value; [b] Chi-squared test P-value;* Mann–Whitney U test .

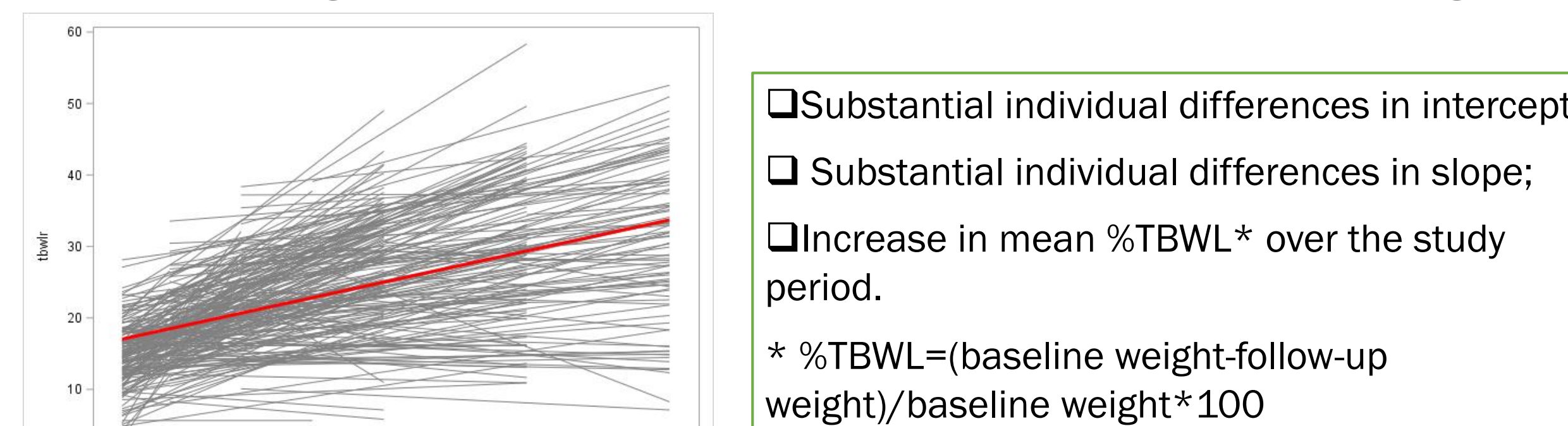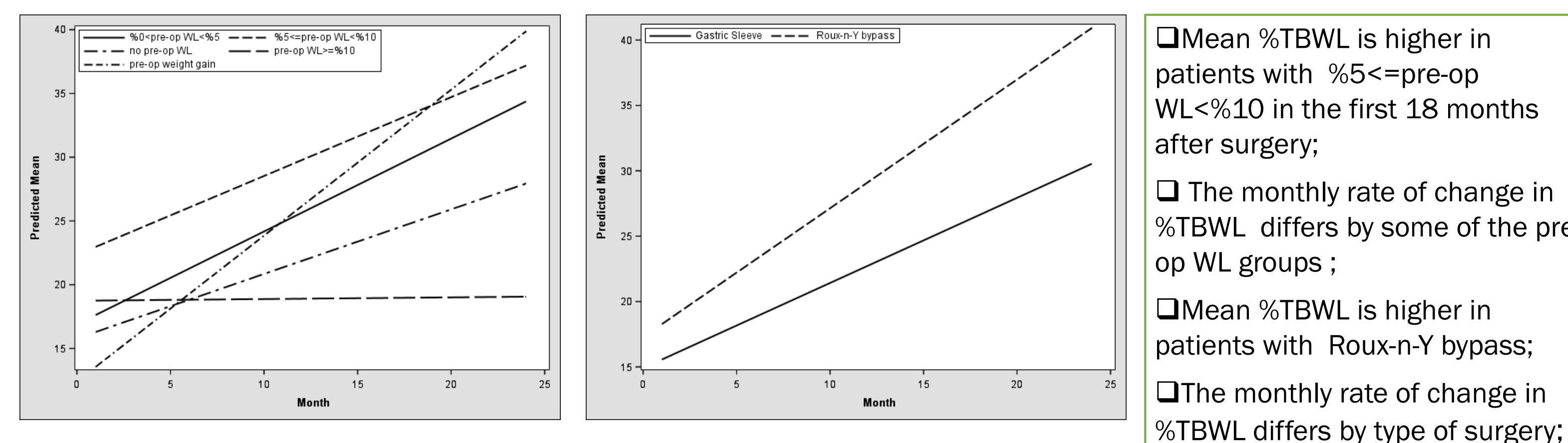Figure 1. Individual OLS growth trajectories for %TBWL in 24 months after the surgery

❑Substantial individual differences in intercept;

❑ Substantial individual differences in slope;

❑Increase in mean %TBWL* over the study period.

* %TBWL=(baseline weight-follow-up weight)/baseline weight*100

Table 2. Solution for fixed effects based on linear mixed effects regression model for %TBWL change.

Effect	Estimate	Standard Error	P-value
Intercept	20.2	1.68	<.0001
Time (months)	-0.1	0.14	0.5057
Type of surgery: Roux-n-Y bypass vs. Gastric Sleeve	2	0.64	0.0019
Pre-op WL >=%10 vs. no pre-op WL	3.9	3.41	0.2501
%5<=pre-op WL<%10 vs. no pre-op WL	7.2	1.3	<.0001
%0<pre-op WL <%10 vs. no pre-op WL	1.8	1.04	0.0809
Pre-op weight gain vs. no pre-op WL	-2.9	1.01	0.0067
Baseline age (years)	-0.1	0.02	0.0024
Type 2 DM history	0.5	0.64	0.3979
Alcohol use history	1.3	0.53	0.0156
Depression history	2.3	0.78	0.003
Time (months)*Type of surgery: Roux-n-Y bypass vs. Gastric Sleeve	0.4	0.08	<.0001
Time (months)*pre-op WL >=%10 vs. no pre-op WL	-0.4	0.42	0.3301
Time (months)*%5<=pre-op WL<%10 vs. no pre-op WL	0.1	0.17	0.6143
Time (months)*%0<pre-op WL <%10 vs. no pre-op WL	0.2	0.13	0.1095
Time (months)*pre-op weight gain vs. no pre-op WL	0.6	0.14	<.0001

Figure 2. Predicted mean % TBWL in a fitted linear mixed effects model for change*. (Left) Significant interaction effect: Time *% pre-op WL; (Right) Significant interaction effect: Time* Surgery type

❑Mean %TBWL is higher in patients with %5<=pre-op WL<%10 in the first 18 months after surgery;

❑ The monthly rate of change in %TBWL differs by some of the pre-op WL groups ;

❑Mean %TBWL is higher in patients with Roux-n-Y bypass;

❑The monthly rate of change in %TBWL differs by type of surgery;

Results (cont.)

❑ 281 participants with 2 or more follow-up times resulting in a total of 1338 records were included in this analysis (Table 1).

❑ The mean baseline age of the patients was 44.3 ±12.7 years where patients with Roux-en-Y bypass were younger than patients with gastric sleeve surgery (42.0±10.91 vs. 46.3±13.9, p=0.0039 (Table 1).

❑The mean baseline weight was 123.31±24.41 kg and there was no significant difference in mean baseline weight between patients according to the type of the surgery (Table 1).

❑Majority of the patients were females (75.1%) and Hispanic (90.0%) ; 43.9% of the patients had history of type 2 Diabetes, 60.4% - history of hypertension, 53.4% - history of hyperlipidemia, and 50% history of alcohol consumption (Table 1).

❑Unconditional mean and growth models revealed that 63.3% of the variability of the patients' weight is due to *between-subject variability*; and 58.7% of the variability of the patients' weight over the study period is *explained by the time*.

❑Based on a *linear mixed effects regression model* with random intercept and slope for time, the overall and monthly mean rate %TBWL was with 2% (SE=0.64) and 0.4% (SE=0.08), respectively, higher in Roux-en-Y compared to gastric bypass, controlling for the effect of age, diabetes history, depression history, alcohol use history, and pre-surgery weight loss (Table 2).

❑The monthly rate of change in %TBWL differs by type of surgery, controlling for the effect of the rest of the variables included in the model.

❑The mean longitudinal %TBWL was significantly lower in older patients (p=0.0024).

Discussion

❑We did not find significantly high %TBWL after surgery in patients with early pre-operative weight loss of 10% or more compared to patients who did not have any pre-op weight lose, but only in patients who lost between 5% and %10 even gained weight before the surgery. However, in our data only 33 patients in total had lost more than 5% of their body weight before the surgery.

❑Our study showed that Roux-en-Y gastric bypass surgery is more effective in post-operative weigh lost than gastric sleeve bypass surgery considering patients' age, sex, diabetes, depression, and alcohol use history.

❑ This study is in progress and we are fitting growth models for patients' weight (kg), metabolic outcomes, and hospital length of stay.

References

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4. Gerber P, Anderin C, Gustafsson UO, Thorell A. Weight loss before gastric bypass and postoperative weight change: data from the Scandinavian Obesity Registry (SOReg). Surg Obes Relat Dis. 2016;12(3):556-562. doi:10.1016/j.soard.2015.08.519.

Abbreviations: BMI- Body Mass Index, DHR- Doctors Hospital at Renaissance, DM- Diabetes Mellitus, pre-op WL- pre-operative weight loss, TBW- Total Body Weight, TBWL- Total Body Weight Loss, %TBWL- percent Total Body Weight Loss