

**Title: Prevalence of Hypoglycemic Symptoms after Roux-en-Y Gastric Bypass and  
Vertical Sleeve Gastrectomy and Associated Risk Factors**

Clare J. Lee<sup>1</sup>, Jeanne M. Clark<sup>2</sup>, Michael Schweitzer<sup>3</sup>, Thomas Magnuson<sup>3</sup>, Kimberley Steele<sup>3</sup>, Olivia Koerner<sup>4</sup>, Todd T. Brown<sup>1</sup>.

<sup>1</sup>Division of Endocrinology, Diabetes and Metabolism, The Johns Hopkins University, Baltimore, Maryland, USA, <sup>2</sup>Department of Medicine, Division of General Internal Medicine, The Johns Hopkins University, Baltimore, Maryland, USA <sup>3</sup>Department of Surgery, The Johns Hopkins University, Baltimore, Maryland, USA <sup>4</sup>The Johns Hopkins University, Baltimore, Maryland, USA

Key words: Bariatric surgery, gastric bypass, glucose metabolism, treatment outcomes, questionnaire design

Running Title: Postsurgical hypoglycemic symptoms

Corresponding Author: Clare J. Lee, MD 1830 East Monument St. Suite 333  
Baltimore MD 21287, clee158@jhmi.edu

Supplemental Table 1  
 Characteristics of the Survey Respondents (N=450) versus Non-responders (N=724)

	Respondents N=450	Non-Respondents N=724	P-value
Race			0.103
Caucasian	324 (72.0%)	472 (65.2%)	
African-American	111 (24.7%)	225 (31.1%)	
Other	15 (3.3%)	27 (3.7%)	
Sex			0.773
Male	95 (21.1%)	158 (21.8%)	
Female	355 (78.9%)	566 (78.2%)	
Age (year)			<0.001
Mean (SD)	50.8 (11.2)	46.4 (11.5)	
Procedure			0.351
RYGB	360 (80.0%)	595 (82.2%)	
VSG	90 (20.0%)	129 (17.8%)	
Time since surgery			0.172
Months (SD)	47.1 (14.4)	49.1 (13.6)	
Surgeon			0.192
A	84 (18.7%)	100 (13.8%)	
B	82 (18.2%)	154 (21.3%)	
C	44 (9.8%)	74 (10.2%)	
D	151 (33.6%)	238 (32.9%)	
E	89 (20.0%)	158 (21.8%)	
Baltimore City*			0.010
Yes	133 (29.6%)	267 (36.9%)	
No	317 (70.4%)	457 (63.1%)	

Baltimore City was defined by zip code 212XX

**1. Please enter the Study Number from the letter you received.**

**2. When was your bariatric surgery?**

MM DD YYYY  
Surgery Date  /  /

**3. Who was your bariatric surgeon?**

- Dr. Steele  Dr. Schweitzer  Dr. Nguyen  
 Dr. Magnuson  Dr. Lidor  Other

**4. What type of bariatric surgery did you receive?**

- Roux-en-Y Gastric Bypass  
 Sleeve Gastrectomy

**5. What is your current height?**

Feet

Inches

**6. What is your current weight?**

Pounds

**7. What was the highest body weight you have ever had?**

Pounds

**8. What was your weight right before the bariatric surgery?**

Pounds

**9. What was your lowest weight after the bariatric surgery?**

Pounds

**BEaM Study:  
Bariatric surgery's  
Effect on Metabolism**

Your completion of this survey will serve as your consent to be in this research study.

**10. In the past, has a doctor or other healthcare provider ever told you that you have diabetes?**

- Yes  
 No --> Please skip to question #15.

**11. What year were you diagnosed with diabetes?**

**12. What was the range of your hemoglobin A1c right before your surgery?**

- 6 - 6.9 %                       8 - 8.9 %                       Above 10 %  
 7 -7.9 %                       9 - 9.9 %                       I don't know/ remember

**13. What medications did you take for diabetes BEFORE the bariatric surgery? Please choose ALL that apply.**

- Metformin (Glucophage, Fortamet or Glumetza)                       Sitagliptin (Januvia), Saxagliptin (Onglyza), Linagliptin (Tradjenta), Liraglutide (Victoza), or Exenatide (Byetta)  
 Glyburide or Glipizide, Glimepiride, Amaryl, Diabeta Micronase, Glucotrol, or Glynase                       Insulin  
 Pioglitazone (Actos)                       I did not take medication. I managed with diet only.  
 Repaglinide (Prandin) or Nateglinide (Starlix)

**14. What medications do you now take for diabetes? Please choose ALL that apply.**

- Metformin (Glucophage, Fortamet or Glumetza)                       Sitagliptin (Januvia), Saxagliptin (Onglyza), Linagliptin (Tradjenta), Liraglutide (Victoza) or Exenatide (Byetta)  
 Glyburide or Glipizide, Glimepiride, Amaryl, Diabeta Micronase, Glucotrol, or Glynase                       Insulin  
 Pioglitazone (Actos)                       I don't take any medications for diabetes.  
 Repaglinide (Prandin) or Nateglinide (Starlix)

Now we will ask you several questions on any symptoms after eating a meal BEFORE the bariatric surgery.

**15. BEFORE the surgery, have you felt any of the following symptoms within 5 HOURS after eating? If yes, please check ALL that apply.**

- Sweating                       Confusion                       Incoordination / clumsiness  
 Heart racing / palpitation                       Drowsiness                       Nausea  
 Shaking                       Odd behavior/ irritability                       Headache  
 Hunger                       Speech difficulty                       No -> Skip to Question #26

**16. When did you experience the above symptoms after eating a meal?**

- Immediately to within 1 hour                       Later than 5 hours after a meal  
 1-5 hours after eating a meal                       I do not remember



**24. Has anyone needed to help you to treat your low blood sugar? For example, did anyone give you orange juice because you were too sleepy or brought you to the hospital because you had a seizure or passed out?**

- Yes
- No

**25. Have you been confirmed to have a low blood sugar by a doctor or other healthcare provider with a blood test?**

- Yes
- No

Now we will ask you several questions on symptoms of low blood sugar AFTER the bariatric surgery. Please note that these are the same questions as above, but now we are asking about your symptoms AFTER your surgery.

**26. AFTER the surgery, have you experienced any of the following symptoms within 5 HOURS after eating? If yes, please check ALL that apply.**

- |                                                     |                                                     |                                                      |
|-----------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> Sweating                   | <input type="checkbox"/> Confusion                  | <input type="checkbox"/> Incoordination / clumsiness |
| <input type="checkbox"/> Heart racing / palpitation | <input type="checkbox"/> Drowsiness                 | <input type="checkbox"/> Nausea                      |
| <input type="checkbox"/> Shaking                    | <input type="checkbox"/> Odd behavior/ irritability | <input type="checkbox"/> Headache                    |
| <input type="checkbox"/> Hunger                     | <input type="checkbox"/> Speech difficulty          | <input type="checkbox"/> No -> Skip to Question #29. |

**27. When did you experience above symptoms after eating a meal?**

- |                                                     |                                                       |
|-----------------------------------------------------|-------------------------------------------------------|
| <input type="radio"/> Immediately to within 1 hour  | <input type="radio"/> Later than 5 hours after a meal |
| <input type="radio"/> 1-5 hours after eating a meal | <input type="radio"/> I do not remember               |

**28. How often did you experience above symptoms after eating a meal?**

- |                                              |                                        |
|----------------------------------------------|----------------------------------------|
| <input type="radio"/> Less than once a month | <input type="radio"/> 3-4 times a week |
| <input type="radio"/> 1-2 times a month      | <input type="radio"/> 5-6 times a week |
| <input type="radio"/> 1-2 times a week       | <input type="radio"/> daily            |

**29. AFTER the bariatric surgery, have you experienced symptoms of low blood sugar?**

- Yes
- No -> skip to Question # 38.

**30. What symptoms did you feel at the time of your low blood sugar? Please check ALL that apply. Please note that these symptoms may be the same symptoms described in question #26.**

- |                                                     |                                                     |                                                      |
|-----------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> Sweating                   | <input type="checkbox"/> Confusion                  | <input type="checkbox"/> Incoordination / clumsiness |
| <input type="checkbox"/> Heart racing / palpitation | <input type="checkbox"/> Drowsiness                 | <input type="checkbox"/> Nausea                      |
| <input type="checkbox"/> Shaking                    | <input type="checkbox"/> Odd behavior/ irritability | <input type="checkbox"/> Headache                    |
| <input type="checkbox"/> Hunger                     | <input type="checkbox"/> Speech difficulty          | <input type="checkbox"/> None of the above           |

**31. When did you experience symptoms of low blood sugar? Please choose all that apply.**

- |                                                                |                                                                        |
|----------------------------------------------------------------|------------------------------------------------------------------------|
| <input type="checkbox"/> Early in the morning before breakfast | <input type="checkbox"/> Immediately to within 1 hour of eating a meal |
| <input type="checkbox"/> In the middle of the night            | <input type="checkbox"/> Between 1-5 hours after a meal                |
| <input type="checkbox"/> Randomly without a pattern            | <input type="checkbox"/> I don't remember                              |

**32. How soon after the surgery did you start to experience symptoms of low blood sugar?**

- |                                             |                                        |
|---------------------------------------------|----------------------------------------|
| <input type="radio"/> in less than 6 months | <input type="radio"/> 3-4 years        |
| <input type="radio"/> 6-11 months           | <input type="radio"/> 4-5 years        |
| <input type="radio"/> 1-2 years             | <input type="radio"/> 6 years or later |

**33. How often did you experience symptoms of low blood sugar?**

- |                                              |                                        |
|----------------------------------------------|----------------------------------------|
| <input type="radio"/> Less than once a month | <input type="radio"/> 3-4 times a week |
| <input type="radio"/> 1-2 times a month      | <input type="radio"/> 5-6 times a week |
| <input type="radio"/> 1-2 times a week       | <input type="radio"/> daily            |

**34. Did you treat the low blood sugar with orange juice, glucose tablet or another type of food?**

- Yes
- No -> Please skip to Question #36.

**35. What happened to your symptoms after above treatment?**

- |                                                       |                                                                               |
|-------------------------------------------------------|-------------------------------------------------------------------------------|
| <input type="radio"/> Symptoms remained.              | <input type="radio"/> Symptoms went away 1-2 hours after the treatment.       |
| <input type="radio"/> Symptoms went away immediately. | <input type="radio"/> Symptoms went away 3 or more hours after the treatment. |

**36. Has anyone needed to help you to treat your low blood sugar? For example, did anyone give you orange juice because you were too sleepy or brought you to the hospital because you had a seizure or passed out?**

- Yes
- No

**37. Have you been confirmed to have a low blood sugar by a doctor or other healthcare provider with a blood test?**

- Yes
- No

**38. AFTER the surgery, have you felt dizzy or faint when you stand up?**

- |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| No                    | Sometimes             | Often                 | Usually               | Always                |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**39. AFTER the surgery, have you felt dizzy or faint after a long walk, a meal, hot shower or hot weather?**

- |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| No                    | Sometimes             | Often                 | Usually               | Always                |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**40. AFTER the surgery, how long can you stand without experiencing dizziness?**

- |                                            |                                          |
|--------------------------------------------|------------------------------------------|
| <input type="radio"/> As long as necessary | <input type="radio"/> 1-4 minutes        |
| <input type="radio"/> More than 15 minutes | <input type="radio"/> Less than 1 minute |
| <input type="radio"/> 5-14 minutes         |                                          |

**41. On average, how many meals do you eat PER DAY?**

- |                       |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1                     | 2                     | 3                     | 4                     | 5                     | 6 or more             |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**42. How many times a WEEK do you skip meals?**

- |                                    |                                 |
|------------------------------------|---------------------------------|
| <input type="radio"/> Never        | <input type="radio"/> 3-4 times |
| <input type="radio"/> Occasionally | <input type="radio"/> 5-6 times |
| <input type="radio"/> 1-2 times    | <input type="radio"/> Daily     |

**43. How many snacks / small meals in between your regular meals do you eat PER DAY?**

- |                            |                                   |
|----------------------------|-----------------------------------|
| <input type="radio"/> None | <input type="radio"/> 3-4         |
| <input type="radio"/> 1-2  | <input type="radio"/> more than 4 |

**44. How often are you following the diet plan given to you by the dietician/ nutritionist?**

- |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| always                | very often            | sometimes             | rarely                | never                 |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

THIS IS THE END OF THE SURVEY. THANK YOU SO MUCH FOR YOUR PARTICIPATION.