

# Is Fructosamine A Reliable Measure of Glycemic Variability?

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**INTRODUCTION:** Ensuring glycemic control is a cornerstone in reducing risk of periprosthetic joint infection (PJI). Preoperative patient optimization involves obtaining labs such as HbA1c and more recently, fructosamine. Fructosamine is increasingly used as it can represent sugar levels over a two to three week period in contrast to HbA1c which represents over a three-month period. The purpose of this study was to see if preoperative fructosamine is a reliable marker for glycemic variability in the perioperative period for total joint arthroplasty.

**METHODS:** Continuous glucose monitoring (CGM) devices were provided to a total of 177 patients undergoing total hip or knee arthroplasty. Glucose levels up to postoperative day 14 were obtained. Demographics and glucose metrics were summarized descriptively. Subjects were stratified based on preoperative fructosamine level using a cutoff of 270 µmol/L as this was described in the literature corresponding to diagnosis of diabetes, namely an HbA1c of 6.5. The coefficient of variation (CV), a validated metric for glycemic variability, was calculated. CV stability was defined as stable (CV ≤36%) or unstable (CV >36%). Between-group differences in glucose variability were evaluated using independent samples t-tests. Linear regression was performed to assess the association between continuous fructosamine levels and postoperative glucose CV, adjusting for potential confounders.

## RESULTS:

Of the 177 surgical patients included, the mean preoperative fructosamine level was 232.5 µmol/L (SD = 26.2). Across 546,315 total glucose readings, 88% (480,939) were within the target range of 70–180 mg/dL. The mean postoperative CV across the cohort was 21.5% (SD = 5.17), with 97.2% (n = 172) demonstrating stable glucose variability (CV ≤36%). Stratification identified 7.9% (14/177) of patients as fructosamine ≥ 270, and 92.1% (163/177) as fructosamine < 270. Patients with levels ≥270 µmol/L had higher CV compared to those below the cutoff (23.5% vs 21.3%, p = 0.037). Linear regression adjusting for sex, BMI, and surgery type however showed no significant association between continuous fructosamine and CV (F = 0.31, p = 0.933; R<sup>2</sup> ≈ 0).

## DISCUSSION AND CONCLUSION:

In patients undergoing total joint arthroplasty, although those with fructosamine levels above 270 µmol/L exhibited statistically significant greater postoperative glucose variability compared to those with lower levels, the difference of 2.2% is likely not clinically significant. We did not find a strong association between fructosamine level and coefficient of variation. Although fructosamine can be a valuable tool in determining PJI risk, our findings suggest that in the context of TJA, it is not a reliable marker of postoperative glucose variability.

	Count	Percentage
<b>Surgery type</b>		
TKA	114	64.4%
THA	63	35.6%
<b>Glucose Variability</b>		
Stable	172	97.2%
Unstable	5	2.8%
<b>Sex</b>		
Female	120	67.8%
Male	57	32.2%
<b>Stratified</b>		
<270 µmol/L	163	92.1%
≥270 µmol/L	14	7.9%
<b>Preoperative diabetes status</b>		
No diabetes	154	87.0%
prediabetes	12	6.8%
Diabetes on oral med	56	31.3%
Diabetes on insulin	5	2.8%

Figure 1. Distribution of patient demographics and clinical characteristics (N = 177). Categories include surgery type (total knee arthroplasty (TKA) and total hip arthroplasty (THA)), glucose variability status (stable: CV ≤36%; unstable: CV >36%), sex, preoperative diabetes status, and fructosamine groupings based on a 270 µmol/L cutoff.

	Mean	Maximum	Minimum
<b>Age at Surgery</b>	60	80	35
<b>BMI</b>	31.58	49.60	17.49
<b>Fructosamine</b>	233	324	143
<b>Glucose Variability</b>	21.65	37.63	0.86

Figure 2. Summary of continuous patient characteristics. Displayed are the mean, minimum, and maximum values for age at surgery, body mass index (BMI), preoperative fructosamine level (µmol/L), and postoperative glucose variability measured by coefficient of variation (%).

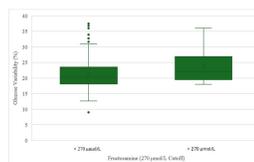


Figure 3. Boxplot of postoperative glucose variability (CV) stratified by preoperative fructosamine levels using a 270 µmol/L cutoff. Patients with fructosamine ≤270 µmol/L (n = 163) are compared to those with fructosamine >270 µmol/L (n = 14).

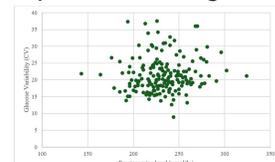


Figure 4. Scatter plot of preoperative fructosamine (µmol/L) versus postoperative glucose variability (CV). Each point represents a patient (N = 177).