Elevation of Point of Care Glucose in the Emergency Department: How High Is Too High in the Geriatric Hip Fracture Patient?

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Purpose: The American Diabetes Association recommends the use of a new metric for measuring diabetes control, the Estimated Average Glucose (eAG); this metric correlates with HA1c (hemoglobin A1c) but is easier for the patient to understand. This study aims to assess the extent to which elevation of a patient's admission point of care glucose (POCG) compared to their eAG is a marker of worse overall health and physiologic compensation to injury in the geriatric hip fracture population.

Methods: An IRB-approved prospectively collected hip fracture registry at an urban academic medical center was queried for all patients with a diagnosis of diabetes from October 2014 to November 2021. Each patient was reviewed for demographics, hospital quality measures, and outcomes. The HA1c and glucose levels at time of admission for the diabetic cohort were recorded. Each patient's eAG was calculated utilizing their recorded HA1c. Based on the ratio POCG/eAG, patients were split into 4 cohorts. Multivariable regression analyses were performed to independently assess the impact of elevated POCG compared to eAG on mortality rates.

Results: From a total cohort of 2430, 565 patients (23%) had a diagnosis of diabetes at the time of their injury. There were no differences in demographics or injury details between cohorts apart from a lower proportion of community ambulators as the POCG/eAG ratio increased. Stratification by POCG/eAG ratios found patients with a presenting POCG 40% higher than their eAG had longer hospitalizations and significantly higher rates of minor complications, readmissions within 30 and 90 days, and mortality within 30 days and 1 year. Multivariable regression found an elevated POCG/eAG ratio to be independently associated with a higher rate of 30-day and 1-year mortality when controlling for other confounding variables (Table 1).

Conclusion: This is the first study to examine the relationship between elevated point of care glucose and Estimated Average Glucose in geriatric hip fractures. Point of care glucose elevated >140% of a patient's eAG is associated with significantly higher rates of complications, readmission, and mortality. Patients with a POCG/eAG ratio >1.4 should be identified early in their admission to coordinate care planning accordingly.

Table 1. Hospital Quality Measures and Outcomes of the Diabetic Cohort Stratified by POCG/eAG Ratio with Multivariable Regression Analyses Assessing the Independent Association of POCG/eAG Ratio to 30-Day and 1-Year Mortality

Outcomes	**Glucose < eAG n (%)**	**1-1.2% n (%)**	**1.2-1.4% n (%)**	**>1.4% n (%)**	***P-Value***
N	186	120	74	74	
Complications					
Major Complications	21 (11.29%)	13 (10.83%)	11 (14.86%)	16 (21.62%)	0.119
Minor Complications	75 (40.32%)	40 (33.33%)	35 (47.30%)	40 (54.05%)	**0.025**
Hospital Quality Measures					
LOS *(d, mean ± std)*	6.29 ± 4.23	6.45 ± 3.48	8.49 ± 7.79	8.34 ± 6.28	**<0.001**
Need for ICU	37 (19.89%)	25 (20.83%)	18 (24.32%)	14 (18.92%)	0.847
Discharged Home	43 (23.12%)	32 (26.67%)	19 (25.68%)	12 (16.22%)	0.392
Readmissions					
Within 30 days	18 (9.68%)	12 (10.00%)	3 (4.05%)	14 (18.92%)	**0.015**
Within 90 days	24 (12.90%)	24 (20.00%)	12 (16.22%)	23 (31.08%)	**0.002**
Mortality					
Inpatient	4 (2.15%)	3 (2.50%)	1 (1.35%)	4 (5.41%)	0.414
Within 30 days	9 (4.84%)	7 (5.83%)	1 (1.35%)	16 (21.62%)	**<0.001**
1 Year	13 (6.99%)	15 (12.50%)	19 (25.68%)	25 (33.78%)	**<0.001**
Multivariable Analyses for the Overall Cohort					
30 Day Mortality*	***Odds Ratio***	***Standard Error***	***95% Confidence Interval***		***P Value***
CCI	1.414	0.097	1.169-1.710		**<0.001**
Ambulatory Status	2.203	0.310	1.201-4.043		**0.011**
HA1c >8%	3.466	0.440	1.463-8.209		**0.005**
POCG/eAG Ratio	1.791	0.177	1.267-2.533		**<0.001**
1 Year Mortality	***Odds Ratio***	***Standard Error***	***95% Confidence Interval***		***P Value***
Age	1.048	0.019	1.009-1.088		**0.014**
Female Gender	0.368	0.319	0.197-0.688		**0.002**
CCI	1.260	0.081	1.075-1.476		**0.004**
HA1c >8%	7.195	0.414	3.198-16.188		**<0.001**
POCG/eAG Ratio	2.159	0.147	1.618-2.881		**<0.001**

LOS=Length of Stay; CCI=Charlson Comorbidity Index;

**Non-Significant Variables=Age; Female Gender; Body Mass Index;*

***Non-Significant Variables=Ambulatory Status; Body Mass Index;*