

LABORATORY-DEFINED FRAILITY AND CGM-DERIVED GLYCEMIC INSTABILITY PHENOTYPES IN HOSPITALIZED OLDER ADULTS WITH TYPE 2 DIABETES

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Background

Frailty may reflect impaired metabolic resilience in older adults with type 2 diabetes mellitus (T2DM), but its association with short-term CGM-derived glycemic instability during hospitalization remains unclear.

Aim

This study aimed to identify CGM-derived glycemic instability phenotypes and examine their relationship with laboratory-defined frailty.

Methods

A total of 532 hospitalized older adults with T2DM who completed at least 72 hours of CGM were included. Frailty severity was assessed using the laboratory frailty index (FI-LAB). Twenty-four CGM-derived metrics were used to characterize glycemic exposure, variability, time in range, and glycemic risk. Principal component analysis and K-means clustering were applied to identify glycemic instability phenotypes. Multinomial logistic regression was used to examine the association between FI-LAB-defined frailty and CGM-derived phenotypes.

Results

Three glycemic instability phenotypes were identified: hyperglycemic high-instability, intermediate dysglycemic, and relatively stable with increased hypoglycemia tendency. Higher FI-LAB scores were associated with higher mean glucose, greater glycemic variability, increased hyperglycemic burden, and lower time in range. Moderate and severe frailty were associated with higher odds of the hyperglycemic high-instability phenotype in unadjusted and minimally adjusted models, although these associations were attenuated after further adjustment for diabetes-related and metabolic factors. Restricted cubic spline analyses showed approximately linear associations between FI-LAB scores and key CGM-derived metrics.

Conclusions

Laboratory-defined frailty was associated with adverse CGM-derived glycemic profiles in hospitalized older adults with T2DM. FI-LAB may serve as a practical marker of metabolic vulnerability and help identify patients at increased risk of glycemic instability. Further longitudinal studies are warranted to validate its clinical utility.