

Rates and Predictors of 30-Day Readmission in Adults with Type 1 Diabetes Hospitalized for Diabetic Ketoacidosis in the U.S.: A Nationwide Study

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Introduction: Diabetic ketoacidosis (DKA) is an endocrinological emergency that may be associated with inpatient mortality. This hyperglycemic state is more common in type 1 diabetics (T1DM) as insulin deficiency promotes lipolysis and ketogenesis. Due to the difference in epidemiologic and comorbidity profiles between T1DM and other types of diabetes, it is important to investigate factors affecting this unique group. This study assessed the rate and predictors of readmission in adults with T1DM hospitalized for DKA.

Methods: The National Readmission Database for 2017 was searched for hospitalizations involving persons 18 years or older with T1DM who were principally admitted for DKA from January 1 to November 30, 2017. Patients admitted electively or traumatic admissions were excluded from the analysis. Outcomes assessed were 30-day readmission rates, mortality, length of stay (LOS) and hospitalization charges (THC). Multivariate cox regression model was adapted to identify independent predictors of readmission.

Results: A total of 91,625 hospitalizations involved adult with T1DM for DKA with 91,401 discharged alive. Of the patients discharged alive, the rate of 30-day readmission was 20.2%, involving 18,553 patients. A majority of patients had a principal readmission for DKA. Compared to the index admission, a 30-day readmission was associated with over two times the mortality rate (Risk ratio 2.06, 95% CI: 1.74 - 2.43, $p < 0.001$). Readmission was associated with increased mean LOS in days (1.0, 95% CI: 0.9 - 1.2, $p < 0.001$) and THC in USD (8217, 95% CI: 6940 - 9492, $p < 0.001$). Independent predictors of readmission included female sex (Hazard Ratio [HR]: 1.14, 95% CI: 1.04 - 1.25, $p < 0.001$), discharge against medical advice (HR: 1.54, 95% CI: 1.43 - 1.66, $p < 0.001$), hypertension (HR: 1.28, 95% CI: 1.20 - 1.35, $p < 0.001$), chronic kidney disease (HR: 1.13, 95% CI: 1.04 - 1.22, $p < 0.001$) and anemia (HR: 1.42, 95% CI: 1.34 - 1.51, $p < 0.001$). However, obesity (HR: 0.70, 95% CI: 0.62 - 0.79, $p < 0.001$) and hyperlipidemia (HR: 0.92, 95% CI: 0.87 - 0.98, $p = 0.007$) were associated with lower rate of readmission for DKA.

Conclusion: About a fifth of T1DM patients hospitalized for DKA are readmitted within 30 days of discharge. A 30-day readmission following hospitalization for DKA is associated with higher inpatient mortality in this group. Hypertension, chronic kidney disease, and anemia are amongst the predictors of readmission in patients with DKA. However, comorbid obesity and hyperlipidemia were associated with lower rates of readmissions. Healthcare utilization costs are significantly higher in readmitted patients compared to index admissions for DKA. Efforts should be channeled towards identifying these predictors in hospitalized patients as well as proper discharge planning to decrease the burden of readmissions.