Rate of Diabetes Ketoacidosis Among the Pediatric Population Living with Type 2 Diabetes in the United States: A Real-World Study Using Administrative Claims Data

Laya Ekhlaspour, MD[1], Abraham Lee, MS[2], Eileen Huang, MPH [2]

[1]University of California School of Medicine, San Francisco, CA, USA; [2]Abbott Diabetes Care, Alameda, CA, USA

Background

- Diabetic ketoacidosis (DKA) is a life-threatening complication of diabetes mellitus (DM)
- A recent study reported initiation of continuous glucose monitoring (CGM) in the French population with type 2 DM (T2DM) to be associated with a reduction in DKA events[1]
- In the USA, prior studies have found CGM initiation to be associated with reductions in hospitalization,[2,3] but data on the possible effects of CGM on DKA are limited in children.

Objective

- This study evaluated the association of Libre CGM acquisition on DKA among children living with type 2 diabetes (T2D)

Methods

Study Design and data source

- This was an observational, retrospective cohort analysis using de-identified data from the Inovalon Insights closed administrative claims database, which includes comprehensive medical and pharmacy claims for commercial beneficiaries.

Study population

- The study population consisted of pediatric beneficiaries (aged < 18 years) with a diagnosis of T2DM who initiated FreeStyle Libre sensor between November 1, 2017, and December 31, 2024 (**Figure 1**)
- **Selection criteria:**

Inclusion	Exclusion
T2D diagnosis	T1D diagnosis
Ages 2 to <18 years	Gestational diabetes diagnosis
Initiated Libre between 2017 and 2024	Not CGM-naïve
12 months continuous insurance coverage pre- and post-Libre initiation	Denied claims for Libre
CGM-naive	

- Diabetes type is based on most frequently occurring from inpatient, outpatient, and ED visits
- **Study index date:** first claim of Libre

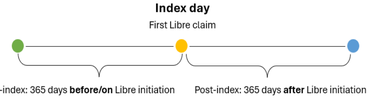
Outcome

- Diabetic ketoacidosis (ICD-10-CM diagnosis codes: E081, E0810, E0811, E091, E0910, E0911, E101, E1010, E1011, E111, E1110, E1111, E131, E1310, E1311) in the hospital inpatient and emergency department (ED) settings.

Variables and statistical analysis

- Zero inflated negative binomial regression was used to evaluate changes in DKA event rates following CGM initiation
  - Covariates included age, gender, race/ethnicity, insurance type, insulin therapy type, and comorbidities for depression, hypertension, lipid disorder, obesity, and pulmonary disease.

Figure 1. Study design



Results

Study Population

- There were 1,575 children with T2DM that met all inclusion and exclusion criteria.
- The mean age at index date was 14.7 years, predominantly Black, Hispanic, and White, and on Managed Medicaid (**Table 1**)
- The majority of children were on multiple daily injections (MDI) of insulin and were obese.

Diabetic ketoacidosis

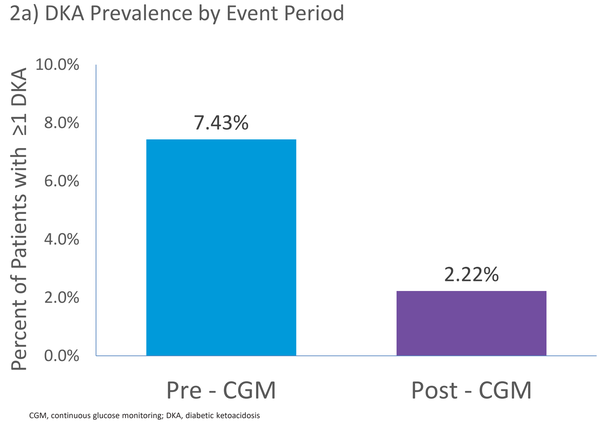
- In the 12 months before initiating CGM, there were a total of 279 DKA events (279 hospitalizations and 31 ED visits) resulting in 19.68 DKA events per 100 person-years
- In the 12 months after initiating CGM, there were a total of 69 DKA events (55 hospitalizations and 14 ED visits) resulting in 4.38 DKA events per 100 person-years
- Prior to initiating CGM, 117 (7.43%) children experienced DKA events and 35 (2.22%) after initiating CGM (**Figure 2a)**

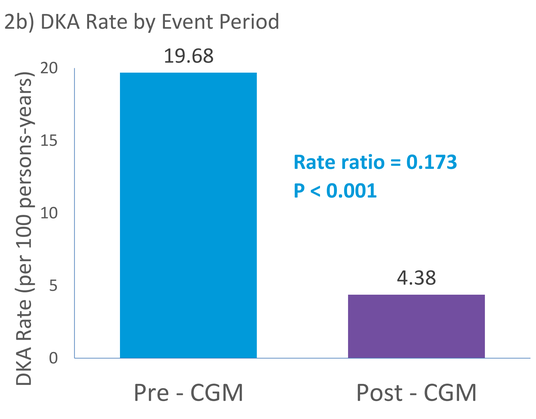
Table 1. Patient demographics at index data and pre-index comorbidities

Patient characteristic	Value
n	1,575
Age, mean (SD)	14.7 (2.1)
Female, %	60.4
Race, %	
Asian or Pacific Islander	2.5
Black	33.6
Hispanic	35.9
White	16.6
Other	3.8
Unknown	7.6
Insurance, %	
Private	6.1
Managed Medicaid	93.9
Treatment Method, %	
MDI (short-acting + long-acting)	54.6
Basal (long-acting only)	17.3
No insulin	12.6
No medication noted	15.5
Comorbidities, %	
Depression	27.8
Hypertension	24.3
Lipid disorder	46.0
Obesity	92.6
Pulmonary disease	38.5

MDI, multiple daily injections

Figure 2. DKA events rates and prevalence before and after CGM initiation





CGM, continuous glucose monitoring; DKA, diabetic ketoacidosis

Adjusted rate ratios

- In the zero-inflated negative binomial regression, the rate of DKA events was reduced by 83% after CGM initiation; this reduction was statistically significant (adjusted incidence rate ratio = 0.173, p < 0.001, **Figure 2b)**
- In the subgroup of children on multiple daily injections (MDI, n = 1,083), the rates reduced significantly from 27.91 to 5.72 events per 100 person-years (rate ratio = 0.166, P < 0.005)

Discussion

- Initiation of CGM by children with T2DM was associated with statistically significant reductions in diabetic ketoacidosis events requiring inpatient hospitalizations or emergency department visits
- The reduction in DKA events are more pronounced in the subgroup of children on MDI

- Limitations include generalizability of these results as nearly all of these patients are covered under Managed Medicaid plans; other data being presented at this conference report approximately two-thirds of DKA hospitalizations are in children covered by Medicaid

- In addition:
  - Administrative claims data are subject to data coding limitations and data entry error
  - Results may not be generalizable to patients without insurance or those with different health insurance
  - The study period included the coronavirus disease 2019 pandemic, which may have restricted access to care

Conclusion

- Incorporating CGM into diabetes management for children with T2DM may lessen the incidence of DKA events and reduce healthcare burden
- DKA events persist despite CGM use, indicating opportunities for further risk reduction in children

Funding source

This study, the preparation of the manuscript, and publication fees were funded by Abbott

Disclosures

LE: receives salary support from NIDDK. LE's institution has received research support from Breakthrough T1D, The Leona M. and Harry B. Helmsley Charitable Trust, Sanofi, Medtronic, MannKind, Tandem Diabetes Care, GentiBio, ITN, SAB bio, Prevention Bio and Abbott. She has served on the advisory board of Sanofi, Abbott, MannKind, Diabetes Center Berne, Sequel, and Medtronic. She has received consulting fees from Jaeb, Ypsomed, and Tandem Diabetes Care, and has received honorarium fees from ADA, Endocrine Society, Children with Diabetes (MannKind-sponsored event), Med Learning Group (Sanofi-sponsored grant), cgmEDUCATION (MannKind-sponsored program), Tandem Diabetes Care, Medtronic, and Insulet.

AL: Employee – Abbott.

EH: Employee – Abbott.

References

1. Roussel R *et al. Diabetes Care* 2021;44:1368–1376.
2. Garg SK *et al. Diabetes Obes Metab* 2024;26:5202–5210.
3. Hirsch IB *et al. J Manag Care Spec Pharm* 2024;30:S21–s29.

Presented at the American Diabetes Association 86th Scientific Sessions, June 5–8 2026, New Orleans, LA