FRONTIER – Flash Glucose Monitoring System Use in Ontario Among Patients with DM in the ICES Database – Evidence from Real-World Practice

1923-LB

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Introduction

- Diabetes mellitus (DM) is one of the most common chronic conditions in Canada, affecting 9.4% of the population (3.7 million people) in 2020–2021[1] and leading to treatment costs of $30 billion in 2019[2]
- Poor glucose control among people with DM can lead to acute events, including hypoglycemia and diabetic ketoacidosis (DKA), which can require emergency department (ED) visits or hospitalization[3,4]
- FreeStyle Libre Systems are advanced, factory-calibrated, sensor-based glucose monitoring devices which allow patients to monitor minute-by-minute glucose readings, variability and trends[5]
  - In Ontario, Canada, FreeStyle Libre is covered for all patients with DM who are using any insulin regimen; access is also possible for some patients on non-insulin therapies

Objectives

- This study aimed to investigate glycated hemoglobin (HbA1c) levels and healthcare resource utilization (HCRU) before and after adoption of FreeStyle Libre in people with DM using any diabetes therapy

Methods

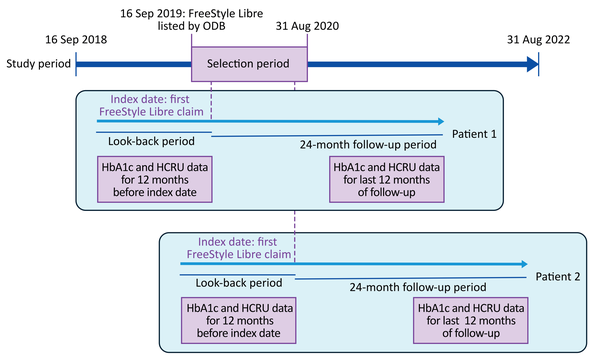
Data source

- This longitudinal retrospective cohort study used the Institute for Clinical Evaluative Sciences (IC/ES) database of publicly funded administrative health data in Ontario, Canada
  - The IC/ES database includes coded and linkable administrative health data for 13 million people (including up to 1,093,812 with type 2 DM [T2DM], depending on the criteria used to identify cases)[6,7]
  - IC/ES data include information on ED visits, hospitalizations, physician visits, and prescription drug use for all residents of Ontario who are covered by the Ontario Health Insurance Plan and Ontario Drug Benefit (ODB)

Study population

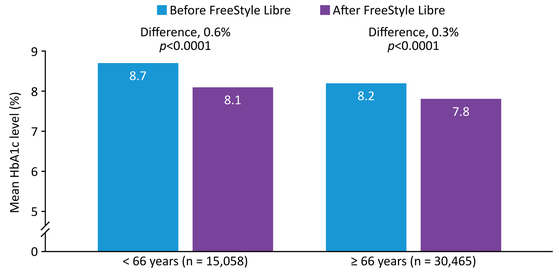
- The analysis cohort comprised people with DM who had a first FreeStyle Libre claim between 16 September 2019 and 31 August 2020 (index date) and remained active on FreeStyle Libre, with a ≥ 70% medication possession ratio (as a measure of adherence), for 24 months' follow-up after the index date (**Figure 1**)
  - The cohort was split into subgroups aged < 66 or ≥ 66 years at the index date (the ≥ 66 years age threshold ensures ODB coverage throughout the 12 month pre-index period)

Figure 1. Patient selection



HbA1c, glycated hemoglobin; HCRU, healthcare resource utilization; ODB, Ontario Drug Benefit.

Figure 2. Mean HbA1c before and after starting FreeStyle Libre



Data and *p* values are for patients with available data for both pre- and post-FreeStyle Libre periods.
HbA1c, glycated hemoglobin.

Identification of diabetes treatment and FreeStyle Libre claims

- Patients were required to have a confirmed diagnosis of DM in the Ontario Diabetes Database or at least one diagnosis or medication code for DM (International Classification of Diseases, Clinical Modification, 250.xx; Anatomical Therapeutic Chemical class, A10) as previously validated[8]

HbA1c data

- HbA1c data were taken from the most recent laboratory test before the index date, and from the latest test in the follow-up period

Measurement of HCRU

- HCRU was measured for 12 months before the index date and the last 12 months of the 24-month follow-up period
  - Annualized incidence rates were calculated for all-cause ED visits and hospitalizations, as well as for ED visits and hospitalizations specifically associated with 1) DKA and 2) hypoglycemia
- Resource intensity weight (RIW) data were used to compare the level of HCRU for each ED visit and hospitalization
  - The RIW system used in Canada provides a nationally comparable measure of resource use for each hospital stay. The RIW measure includes resource use associated with administration, staff, supplies, technology, and equipment.[9] The higher a person's RIW, the more hospital resources they consumed during their stay[10]

Statistical analysis

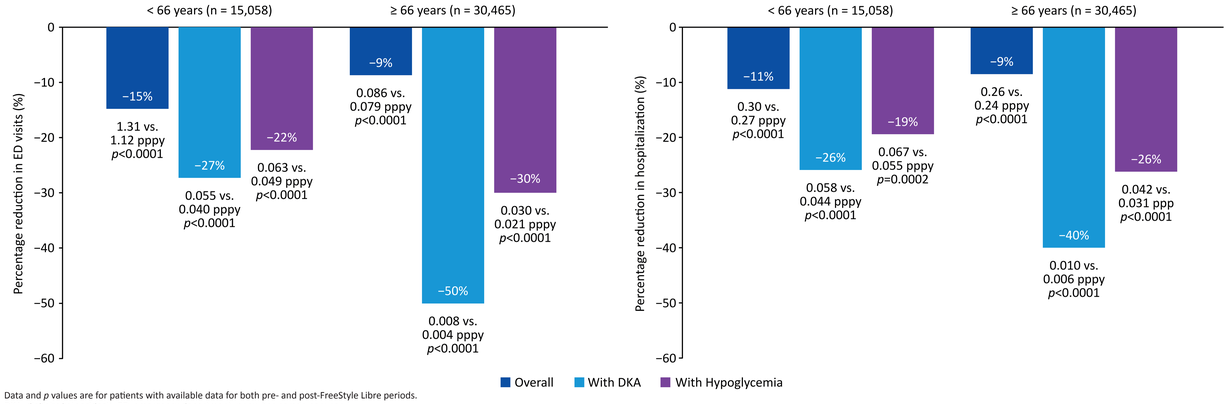
- Paired t-tests were conducted to compare HbA1c and HCRU before and after FreeStyle Libre use among patients with available data for both periods

Table 1. Patient characteristics

Characteristic	Age < 66 years (n = 15,058)	Age ≥ 66 years (n = 30,465)[a]
Demographics		
Mean age at index date, years (SD)	52.5 (14.9)	73.8 (6.1)
Male, %	53.1%	55.3%
DM type and treatment, n (%)		
Insulin pump (T1DM or T2DM)[b]	629 (4.2%)	267 (0.9%)
T1DM MDI	4249 (28.2%)	6261 (20.6%)
T2DM	10,180 (67.6%)	23,937 (78.6%)
MDI	3322 (32.6%)	9346 (39.0%)
Basal insulin	5085 (50.0%)	12,480 (52.1%)
GLP-1 RA and/or oral therapies	914 (9.0%)	1774 (7.4%)
No medication	859 (8.4%)	337 (1.4%)

[a]The ≥ 66 years age threshold ensures ODB coverage during the 12 month pre-index period.
[b]Because of the small expected number of people with T2DM using insulin pumps, insulin pump use was not analysed by diabetes type.
GLP-1, RA, glucagon-like peptide 1 receptor agonist; MDI, multiple daily injections of insulin; ODB, Ontario Drug Benefit; SD, standard deviation; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

Figure 3. Reduction in ED visits and hospitalizations overall, with DKA, and with hypoglycemia after starting FreeStyle Libre



Data and *p* values are for patients with available data for both pre- and post-FreeStyle Libre periods.
DKA, diabetic ketoacidosis; ED, emergency department; pppy, per person per year.

Results

Analysis cohort

- In total, 45,523 people with DM had a first FreeStyle Libre claim during the selection period (age < 66 years, n = 15,058; age ≥ 66 years, n = 30,465)
- Most people had T2DM (age < 66 years, 68%; age ≥ 66 years, 79%)
- The most common diabetes treatment among people with T2DM was basal insulin, followed by multiple daily injections of insulin, and GLP-1 RA and/or oral therapies (**Table 1**)

HbA1c level after initiation of FreeStyle Libre

- Before initiation of FreeStyle Libre, the mean HbA1c level was 8.7% among patients aged < 66 years and 8.2% among those aged ≥ 66 years
- After FreeStyle Libre use, HbA1c was statistically significantly improved in both age groups (age < 66 years, 0.6% reduction; age ≥ 66 years, 0.3% reduction; both $p < 0.0001$; **Figure 2**)
  - HbA1c reductions were seen for patients using insulin pumps, for patients with type 1 DM (T1DM), and for those with T2DM within each age group, regardless of treatment used (not shown)

Healthcare resource utilization

- Overall rates of ED visits and hospitalization were statistically significantly lower in both age groups after starting FreeStyle Libre, compared with the pre-index period (**Figure 3**)
  - In addition, there were statistically significant reductions in ED visits and hospitalization associated with DKA and hypoglycemia (**Figure 3**)
- No statistically significant differences were found between the RIW for ED visits and hospitalization before and after initiation of FreeStyle Libre (**Table 2**)

Table 2. RIW before and after starting FreeStyle Libre

Measure	Before FreeStyle Libre	After FreeStyle Libre	*p* value
Age < 66 years			
ED RIW	0.217	0.217	0.9945
Inpatient RIW	3.895	3.800	0.678
Age ≥ 66 years			
ED RIW	0.178	0.182	0.1134
Inpatient RIW	3.021	2.970	0.6984

Data and *p* values are for patients with available data for both pre- and post-FreeStyle Libre periods.
RIW is a measure of the intensity of resource use (relative cost) associated with different diagnostic, surgical procedure and demographic characteristics of an individual.
ED, emergency department; IW, resource intensity weight.

Discussion

- The results of this longitudinal retrospective cohort study showed that among people with DM in Ontario, adoption of FreeStyle Libre was associated with improved HbA1c and reduced overall HCRU
- Those aged < 66 years had larger changes in HbA1c and ED-specific HCRU than those aged ≥ 66 years
- It was not possible to measure costs directly, but RIW data showed that the quantity of resources used per ED visit or hospitalization did not change following initiation of FreeStyle Libre, while the frequency of visits decreased. This suggests that overall ED and hospitalization costs were reduced following the adoption of FreeStyle Libre
- Strengths of this population-based study include a large sample size and comprehensive scope, with patients selected from among all people with DM in Ontario receiving publicly funded health care
- One limitation of this analysis is that the cohort of patients aged < 66 years reflects a small proportion of people with DM in that age group, as public funding for health care for those aged < 65 years is limited to government-supported individuals who cannot work (e.g., those on welfare or the Ontario Disability Support Program)
- As a longitudinal retrospective study, further limitations of this analysis include the lack of a parallel control group and potential for confounding

Conclusion

- Among patients with DM, HbA1c levels and HCRU were reduced statistically significantly after initiation of FreeStyle Libre

Acknowledgments

Medical writing support was provided by Dr Paul Overton (Beacon Medical Communications Ltd, Brighton, UK) in accordance with Good Publication Practice (GPP 2022) guidelines and was funded by Abbott.

Funding

Abbott provided funding for the study.

Conflict of interest statement

SBH reports consulting with Abbott, Bayer, Dexcom, Eli Lilly, NovoNordisk, and Sanofi; and research grants from BIO, Eli Lilly, NovoNordisk, and Novartis.
RRL reports research grants from Diabetes Canada, Astra-Zeneca, Eli Lilly, Cystic Fibrosis Canada, CIHR, FFRD, Janssen, JDRF, Merck, NIH, Novo-Nordisk, Société Francophone du Diabète, Sanofi-Aventis, and Vertex Pharmaceutical; consulting/advisory panels for Abbott, Astra-Zeneca, Bayer, Boehringer Ingelheim, Dexcom, Eli Lilly, HLS therapeutics, INESSS, Insulet, Janssen, Medtronic, Merck, Novo-Nordisk, Pfizer, and Sanofi-Aventis; honoraria for conferences from Abbott, Astra-Zeneca, Boehringer Ingelheim, CPD Network, Dexcom, CMS Canadian Medical&Surgical Knowledge Translation Research group, Eli Lilly, Janssen, Medtronic, Merck, Novo-Nordisk, Sanofi-Aventis, Tandem, and Vertex Pharmaceutical; consumable gifts (in kind) from Eli Lilly and Medtronic; unrestricted grants for clinical and educational activities from Abbott, Dexcom, Eli Lilly, Medtronic, Merck, Novo Nordisk, and Sanofi-Aventis; patents for T2DM risk biomarkers and catheter life; and purchase fees from Eli Lilly (artificial pancreas).
ARL reports research support from Sanofi Canada and Sanofi Global; consulting for Novo Nordisk Global, Dexcom Canada, and Sanofi United States; advisory boards for Sanofi United States; and paid presentations for Sanofi Canada, Sanofi Global, Novo Nordisk Canada, Eli Lilly Canada, Abbott Canada, Dexcom Canada, Diabetes Canada, and the American Diabetes Association.
YP is an employee and shareholder of Abbott.

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Presented at the American Diabetes Association 84th Scientific Sessions, June 21–24 2024, Orlando, FL