FEATURE ARTICLE

Real-World Persistence, Adherence, Hypoglycemia, and Health Care Resource Utilization in People With Type 2 Diabetes Who Continued With the Second-Generation Basal Insulin Analog Insulin Glargine 300 Units/mL or Switched to a First-Generation Basal Insulin (Insulin Glargine 100 Units/mL or Detemir 100)

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People with type 2 diabetes receiving a second-generation basal insulin (BI) analog may be switched to a first-generation formulation for financial reasons or changes in health insurance. However, because second-generation BI analogs have more even pharmacokinetic profiles, longer durations of action (>24 vs. ≤24 hours), and more stable action profiles than first-generation BI analogs, such a change may result in suboptimal treatment persistence and/or adherence. This study compared treatment persistence, treatment adherence, rates of hypoglycemia, and health care resource utilization outcomes in people with type 2 diabetes who either continued treatment with the second-generation BI Gla-300 or switched to a first-generation BI. The study showed that continuing with Gla-300 was associated with a lower risk of discontinuing therapy, fewer emergency department visits, and lower hypoglycemia event rates than switching to a first-generation BI.

Diabetes is a major health burden. In 2021, 32.2 million adults (aged 20–79 years) in the United States were estimated to have diabetes, of whom 90% had type 2 diabetes (1). One or more formulations of insulin are used by ∼7.4 million Americans with diabetes (2). Second-generation (longer-acting) basal insulin (BI) analogs (insulin glargine 300 units/mL [Gla-300] and insulin degludec 100 or 200 units/mL [U-100 or U-200]) provide stable and longer-acting pharmacokinetic and pharmacodynamic profiles, with longer durations of action (>24 vs. ≤24 hours) and less within-day and between-day glucose variability compared with first-generation (long-acting) BI analogs (insulin glargine 100 units/mL [Gla-100] and insulin detemir 100 units/mL [IDet]) (3,4). Clinical studies have demonstrated a reduced risk of hypoglycemia in people who received second- versus first-generation BIs, with a comparable reduction in A1C (5–10).

Patients receiving second-generation BIs may need to switch to first-generation formulations for nonclinical reasons such as changes in health insurance coverage (11). However, switching from a second- to a first-generation BI may result in suboptimal persistence (i.e., continuing to take the medication for the prescribed period) and adherence (i.e., correctly following the prescribed medication dosing regimen). Suboptimal persistence and/or adherence can negatively affect health care resource utilization (HRU). To our knowledge, no studies have compared outcomes in people who switched from a second- to a first-generation BI. This

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retrospective, observational study was conducted to compare treatment persistence and adherence, hypoglycemia, and HRU outcomes in adults with type 2 diabetes who either continued treatment with the second-generation BI Gla-300 or switched to a first-generation BI.

Research Design and Methods

Study Design

This analysis used the US Optum Clinformatics Data Mart with Socio-Economic Status database and included data from adults (aged ≥18 years) with a diagnosis of type 2 diabetes using *International Classification of Diseases*, 10th revision (ICD-10), codes who were receiving the second-generation BI Gla-300 and either continued treatment with it or switched to a first-generation BI between 1 January 2016 and 30 April 2021, inclusive (the study period). The date of treatment initiation (i.e., switching to a first-generation product or continuing Gla-300) was considered the index date. The baseline period was the 12 months before the index date, and the follow-up period, in which outcomes were measured, was the 12 months after the index date (Figure 1). Eligible participants had at least one pharmacy fill of Gla-300 or a first-generation BI during the identification period (1 January 2017 through 30 April 2020) and had continuous medical and prescription drug coverage and three or more claims for Gla-300 during the baseline period. Participants were excluded if they had a diagnosis of type 1 diabetes, were pregnant, or had gestational diabetes or polycystic ovarian syndrome during the study period. They were also excluded if they had any claims for NPH insulin, Gla-100, or IDet during the baseline period. An infographic summarizing this study is available (Supplementary Figure S1).

Participants were matched on previous number of claims for Gla-300 during the baseline period. For those who switched from Gla-300 to a first-generation BI, the cohort included people who switched to either Gla-100 or IDet during the identification period; the switch date to the first-generation BI was defined as the index date. To avoid selection bias, the cohort who continued therapy with Gla-300 also included people who initially continued therapy with Gla-300 and later switched to a first-generation BI during the identification period; therefore, people included in this cohort had one or more fills for Gla-300. The index date for the cohort who continued treatment with Gla-300 was defined by the fill date of Gla-300 relative to the cohort of those who switched from Gla-300 to a first-generation BI.

Propensity score–matching (PSM) was used with a greedy nearest neighbor matching algorithm without replacement. For PSM, first a caliper (i.e., a measure of the required closeness of the match, defined based on a proportion of the SD of the logit of the propensity score) was identified. The algorithm then selected a participant who continued treatment with Gla-300 and a match who switched to Gla-100 or IDet, whose propensity score was closest to that of the Gla-300 participant within the caliper distance of each other. Matches were chosen one at a time for each Gla-300 participant.

Study Outcomes

The primary outcome was treatment persistence, defined as no discontinuation of the index treatment until the end of the follow-up period. Using the traditional measure of persistence with a fixed gap of "days' supply" does not accurately reflect use of titratable injectable therapy. Therefore, this study used an alternative methodology as described by Wei et al. (12), which accounts for individual variation in treatment periods. The prescription for the index BI was considered discontinued if it was not refilled within the expected time of medication coverage, which

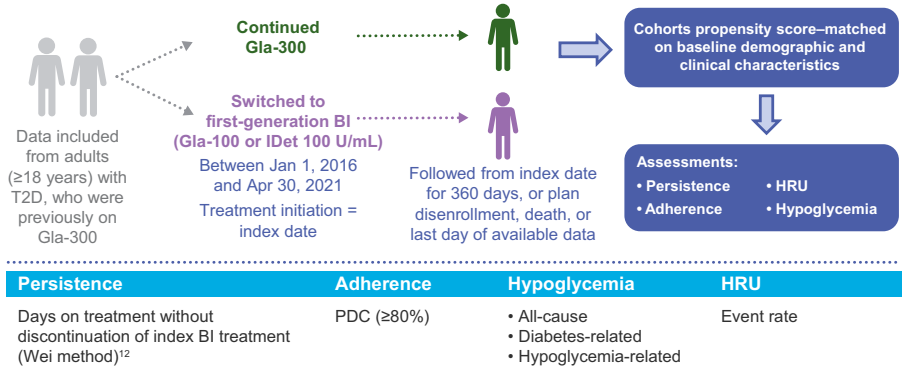

FIGURE 1 Study design. BI, basal insulin; Gla-100, insulin glargine 100 units/mL; Gla-300, insulin glargine 300 units/mL; HRU, health care resource utilization; IDet, insulin detemir 100 units/mL; PDC, proportion of days covered; T2D, type 2 diabetes.

was defined by the 90th percentile of the time for which medication was used. The metric quantity of BI supplied between patients' first and second fills was calculated, and patients were grouped according to different metric quantities. The 90th percentile of the duration between first and second fill within each metric quantity group was then calculated. Persistence was measured by assigning the estimated allowable time of medication coverage according to the metric quantity of BI received (12). Sensitivity analyses were conducted using the 75th and 95th percentiles of time period of medication use. Participants were considered nonpersistent if they did not have continuous coverage of the index BI during the follow-up period (whether that was through 12 months, plan disenrollment, start of another therapy, or death).

Secondary outcome measures were treatment adherence, HRU, hypoglycemia events, and A1C change from baseline. Treatment adherence was defined as the proportion of days covered and calculated by dividing the total days supplied on the claim by the number of days in the refill interval (assuming all medications were consumed as prescribed), using a cutoff of ≥80% to define adherence and <80% for poor adherence.

All-cause, diabetes-related, and hypoglycemia-related HRU was assessed during the follow-up period and included hospital admissions and emergency department (ED) visits. Hypoglycemia incidence and event rates were calculated during the follow-up period, with hypoglycemia defined by either ICD-10 codes or by laboratory results. Change in A1C from baseline to 12 months was assessed in a subgroup of the propensity score–matched population who had valid A1C values at both baseline and 12 months.

Statistical Analyses

For treatment persistence, a Cox proportional hazards model with baseline imbalances adjusted as covariates was used to compare the risk of treatment discontinuation between the treatment groups, and Kaplan–Meier analyses were performed to compare the time to discontinuation. The percentage of participants with treatment persistence throughout the 12-month follow-up period was calculated along with the mean duration of persistence in days.

For treatment adherence, differences in the proportion of participants covered for ≥80% of days were assessed using a Cox proportional hazard model. Incidence rates for hospitalizations, ED visits, and hypoglycemia were reported as mean number of events and event rates per 100 person-years of follow-up [100 PYFU]). Change in A1C was calculated between baseline and 12 months (270–390 days) after the index date. A1C values closest to baseline and 12 months were used.

Sensitivity Analyses

Sensitivity analyses were conducted to assess any impact on study outcomes of any treatment groups of interest. Sensitivity analysis 1 compared outcomes in those who either continued treatment with Gla-300 or switched to Gla-100 only. Sensitivity analysis 2 was conducted using data from individuals who had at least one follow-up outpatient visit to account for any imbalance in care that may have occurred (e.g., if those who switched therapy required extra physician visits during the transition in therapies). Sensitivity analysis 3 was conducted using data from individuals who had a valid baseline A1C measurement, because a baseline A1C value was not required for the main analysis. For sensitivity analyses 1–3, the PSM algorithm used the same set of variables as the main analyses.

Sensitivity analysis 4 was conducted using data from individuals who had a valid baseline A1C measurement to account for any imbalance in baseline A1C between treatment cohorts. The treatment cohorts in sensitivity analysis 4 underwent PSM incorporating their baseline A1C value.

Data and Resource Availability

The data that support the findings of this study are available from Optum Clinformatics, but restrictions apply to the availability of these data, which were used under license for the current study and therefore are not publicly available. Only aggregated data can be shared with a third party, subject to approval by Optum and under the provisions of a signed agreement between Optum and that third party.

Results

Baseline Characteristics

From an initial sample of 637,260 people with type 2 diabetes who had at least one pharmacy claim of Gla-300 or a first-generation BI during the identification period, 2,760 people who continued therapy with Gla-300 and 1,109 who switched from Gla-300 to either Gla-100 (n = 838; 75.6%) or IDet (n = 271; 24.4%) were identified as eligible for PSM (Supplementary Table S1). After PSM, there were 1,104 participants in each group. The Gla-300 and first-generation BI

groups were well balanced. The mean ages of the groups were 67.9 and 67.2 years, respectively, and the proportions of females in each group were 50.3 and 51.9%, respectively (Table 1). The between-group standardized mean difference was >1 for race, year of index treatment initiation, hyperlipidemia, baseline number of oral antidiabetic medications, and proportion of participants with one or more office visits at baseline. These characteristics were adjusted for in models as covariates.

Primary Outcome: Treatment Persistence

During the 12-month follow-up period, a higher proportion of individuals who continued Gla-300 versus those who switched to a first-generation BI were persistent with therapy (64.6 vs. 44.1%; hazard ratio [HR] 0.59, 95% CI 0.52–0.68) (Figure 2). The mean (SD) number of persistent days was 237 (130.7) for Gla-300 and 191 (138.6) for first-generation BIs. Results of sensitivity analyses of the proportion at the 75th percentile and 95th percentile were consistent with those of the main analysis (75th percentile 38.2 vs. 23.8%; 95th percentile 74.6 vs. 54.7%).

Results from sensitivity analysis 1 (Supplementary Table S2) were consistent with the main analyses, with a greater proportion of individuals who continued Gla-300 being persistent with therapy compared with those who switched to Gla-100. In addition, persistence with treatment was also greater for those who received Gla-300 than for those switching to a first-generation BI in the subgroups who had one or more outpatient visits at baseline (sensitivity analysis 2), a valid baseline A1C value (sensitivity analysis 3), or a valid A1C value included in PSM (sensitivity analysis 4) and continued treatment with Gla-300 compared with those who switched to a first-generation BI (Supplementary Table S2).

Secondary Outcomes

A similar proportion of participants who continued Gla-300 versus those who switched to a first-generation BI were adherent to therapy (34.1 vs. 32.3%; odds ratio 0.91, 95% CI 0.76–1.10) (Figure 2). The mean (SD) number of adherent days during the 12-month follow-up period was 214 (115.1) for participants who continued Gla-300, and 192 (125.65) for those who switched to a first-generation BI. Results of sensitivity analyses 1–4 were consistent with those of the main analysis (Supplementary Table S3).

During follow-up, 122 participants in the Gla-300 group experienced a total of 289 hypoglycemia events, and 162 participants who switched to a first-generation BI experienced a total of 473 hypoglycemia events. The incidence rate was lower for those continuing Gla-300 than for those switching to a first-generation BI (26.2 vs. 42.8 per 100 PYFU). In sensitivity analyses 1, 2, and 4, those who continued treatment with Gla-300 had lower hypoglycemia event rates compared with those who switched to a first-generation BI (Supplementary Table S4); in sensitivity analysis 3, the differences in hypoglycemia rates were comparable between those continuing Gla-300 and those who switched to a first-generation BI (Supplementary Table S4).

ED visit event rates were lower for participants who continued Gla-300 versus those who switched to a first-generation BI (all-cause 100.5 vs. 146.8 per 100 PYFU; diabetes-related 79.3 vs. 116.2 per 100 PYFU; hypoglycemia-related: 3.8 vs. 7.4 per 100 PYFU) (Figure 3). In sensitivity analyses 1–3, those who continued treatment with Gla-300 had lower ED visit event rates compared with those who switched to a first-generation BI (Supplementary Table S5); in sensitivity analysis 4, ED visit rates were comparable between those continuing Gla-300 and those who switched to a first-generation BI (Supplementary Table S5). Event rates for all-cause (53.8 vs. 69.9 per 100 PYFU), diabetes-related (21.3 vs. 28.2 per 100 PYFU), and hypoglycemia-related (1.2 vs. 1.5 per 100 PYFU) hospitalizations were comparable between groups (Figure 4).

Follow-up data for A1C were available for only 228 of 1,104 people (21%) in the Gla-300 group and 205 of 1,104 people (18.6%) in the first-generation BI group. Mean (SD) A1C at 12 months was similar between groups (8.15 [1.69] and 8.18 [1.64]% for those who continued Gla-300 and those who switched to a first-generation BI, respectively).

Reductions in A1C from baseline were smaller for participants who continued Gla-300 versus those who switched to a first-generation BI (difference in least squares means 0.29%). However, mean baseline A1C values were imbalanced between groups: 8.17 and 8.63% in the Gla-300 and first-generation BI groups, respectively. In sensitivity analysis 4, which included baseline A1C in the PSM algorithm, mean baseline A1C was comparable between groups (8.68 and 8.62% in the Gla-300 and first-generation BI groups, respectively). At 12 months, a reduction in A1C of 0.16% was observed in those who continued Gla-300 compared with a reduction of 0.45% in those who switched to a first-generation

TABLE 1 Baseline Characteristics of the Propensity Score–Matched Population

	Propensity Score–Matched Population		
	Continued Gla-300 (n = 1,104)	Switched to First-Generation BI (n = 1,104)	SMD*
Age, years			0.066
Mean (SD)	67.90 (10.69)	67.21 (10.34)	
Median (Q1–Q3)	70 (62–75)	69 (61–74)	
Sex, *n* (%)			0.032
Male	548 (49.7)	531 (48.1)	
Female	556 (50.3)	573 (51.9)	
Race/ethnicity, *n* (%)			**0.101**
Asian	23 (2.1)	25 (2.3)	
African American	194 (17.6)	193 (17.5)	
Hispanic	247 (22.4)	206 (18.7)	
White	591 (53.5)	629 (57.0)	
Other/unknown	49 (4.5)	51 (4.6)	
Health plan type, *n* (%)			0.084
Commercial	263 (23.9)	313 (28.4)	
Medicare	841 (76.1)	791 (71.6)	
Region, *n* (%)			0.098
West	200 (18.1)	182 (16.5)	
Midwest	119 (10.8)	171 (15.5)	
South	708 (64.1)	648 (58.7)	
Northeast	75 (6.8)	102 (9.2)	
Unknown	2 (0.3)	1(0.1)	
Education level, *n* (%)			0.073
Less than 12th grade	14 (1.3)	11 (1.0)	
High school diploma	444 (40.2)	456 (41.3)	
Less than bachelor's degree	549 (49.7)	521 (47.2)	
Bachelor's degree plus	63 (5.7)	78 (7.1)	
Unknown	34 (3.2)	38 (3.4)	
Home ownership status, *n* (%)			0.046
Probable homeowner	795 (71.9)	772 (69.9)	
Probable renter	100 (9.0)	111 (10.1)	
Unknown	210 (19.0)	221 (20.0)	
Year of index treatment initiation, *n* (%)			**0.523**
2017	161 (14.7)	324 (29.4)	
2018	351 (31.8)	342 (31.0)	
2019	382 (34.6)	345 (31.2)	
2020	210 (19.0)	93 (8.4)	
Baseline Gla-300 fills			<0.001
Mean (SD)	6.00 (3.25)	6.00 (3.25)	
Median (Q1–Q3)	5 (3–8)	5 (3–8)	
Baseline common comorbidities and diabetes complications of interest, *n* (%)			
Hypertension	918 (83.1)	932 (84.4)	0.036
Hyperlipidemia	750 (67.9)	800 (72.5)	**0.100**
Obesity	400 (36.2)	433 (39.2)	0.062
Chronic kidney disease	418 (37.8)	389 (35.2)	0.054
Neuropathy	432 (39.1)	416 (37.7)	0.029
Depression	293 (26.5)	294 (26.6)	0.003
Nephropathy	126 (11.5)	130 (11.8)	0.009

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TABLE 1 Baseline Characteristics of the Propensity Score–Matched Population (Continued)

	Propensity Score–Matched Population		
	Continued Gla-300 (*n* = 1,104)	Switched to First-Generation BI (*n* = 1,104)	SMD*
Baseline A1C, continuous			0.014
n	638	592	
Mean (SD)	8.17 (4.25)	8.68 (4.53)	
Median (Q1–Q3)	7.8 (6.9–9.1)	8.4 (7.3–9.7)	
Baseline hypoglycemia, *n* (%)	82 (7.4)	96 (8.7)	0.047
Baseline number of OADs, *n* (%)			**0.382**
0	152 (13.8)	305 (27.6)	
1	270 (24.4)	252 (22.8)	
2	320 (29.0)	308 (27.9)	
≥3	362 (32.9)	239 (21.6)	
Using GLP-1 receptor agonist at baseline, *n* (%)	372 (33.7)	378 (34.2)	0.012
Baseline health care utilization, *n* (%)			
≥1 hospitalization	306 (27.7)	376 (34.1)	0.097
≥1 ED visit	160 (14.5)	162 (14.7)	0.025
≥1 office visit	550 (49.8)	508 (46.0)	**0.102**

*An SMD >0.1, shown in bold type, is indicative of an imbalance. GLP-1, glucagon-like peptide 1; OAD, oral antidiabetic drug; Q, quartile; SMD, standardized mean difference.

BI (difference in least squares mean 0.29%, 95% CI 0.285–0.289).

Discussion

The results of this retrospective, real-world, observational study in people with type 2 diabetes suggest that, compared with switching to a first-generation BI, continued use of the second-generation BI Gla-300 was associated with increased persistence with treatment. In addition, lower all-cause, diabetes-related, and hypoglycemia-related ED visits and a reduced number of hypoglycemia events were observed for participants who continued treatment with Gla-300 versus those who switched to a first-generation BI analog. The proportions of participants who were adherent to therapy were comparable between groups, as were rates of all-cause, diabetes-related, and hypoglycemia-related hospitalizations.

The rates of adherence and persistence for insulin therapy observed in this study are within the ranges observed for insulin in other studies, which have reported adherence rates of between 30 and 86% (13) and 1-year persistence

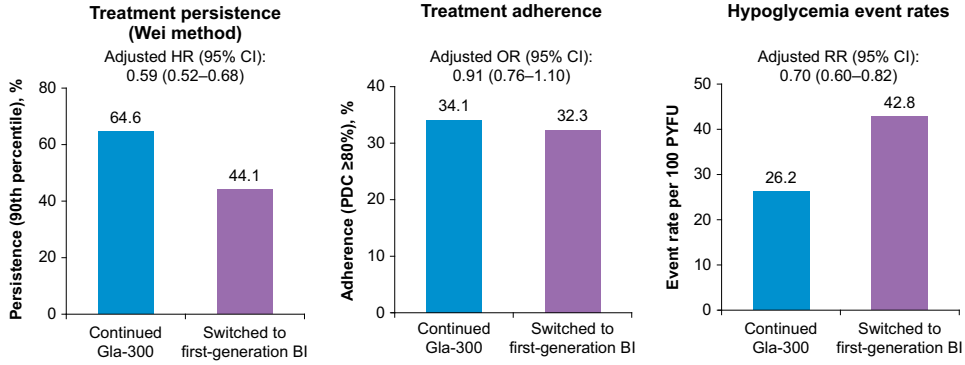

FIGURE 2 Persistence, adherence, and hypoglycemia event rates. Cox proportional hazard model. 100 PYFU, 100 person-years of follow-up; BI, basal insulin; CI, confidence interval; Gla-300, insulin glargine 300 units/mL; HR, hazard ratio; OR, odds ratio; PDC, proportion of days covered; RR, rate ratio.

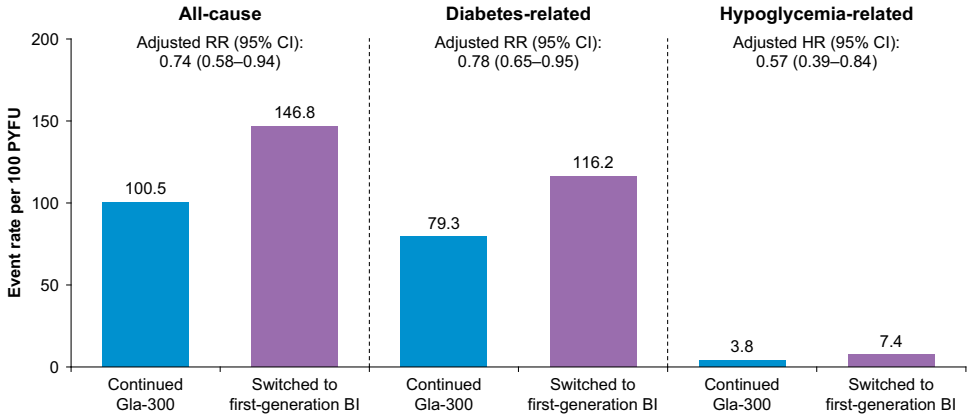

FIGURE 3 ED visit event rates. 100 PYFU, 100 person-years of follow-up; BI, basal insulin; CI, confidence interval; Gla-300, insulin glargine 300 units/mL; HR, hazard ratio; RR, rate ratio.

rates in the range of 21–66% (14). To our knowledge, no studies have been conducted to compare persistence in people continuing treatment with a second-generation BI versus those who switch to a first-generation BI. In a study using data from the Optum Clinformatics database that compared outcomes for people with type 2 diabetes who switched to Gla-300 versus other BIs, after 6 months of follow-up, discontinuation of treatment was lower for those who received Gla-300 versus other BIs (20.4 vs. 36.4%) (15).

Although treatment persistence improved with continuing Gla-300 versus switching to a first-generation BI, in the current study, adherence to therapy was comparable between groups. A possible explanation for this finding is that, in those who switched to a first-generation BI, the insulin dose and the number of refills were similar to those when they were receiving Gla-300, which may be expected if the switch was not for medical reasons. This would mean that their insulin regimens were similar after switching to a first-generation BI from Gla-300 and would not considerably affect their lifestyle (i.e., they would have been taking doses at the same time, same number of injections, and so forth). Therefore, it would be fair to assume that factors affecting adherence would not change significantly after switching to a first-generation BI from Gla-300. This may have contributed to there being no detectable difference in adherence between the two regimens observed in this study. Additionally, it is possible that adherence rates are good when people first switch to a new insulin or therapy. However, it is likely that discontinuation rates were higher for those who switched to a first-generation BI versus those who continued with Gla-300 because of higher rates of hypoglycemia and ED visits. Increased hypoglycemia and ED visits could have resulted in a reduction in persistence while not affecting adherence because of the more serious nature of these types of events.

In the current study, continued use of Gla-300 was associated with fewer hypoglycemia events compared with switching to a first-generation BI. These findings

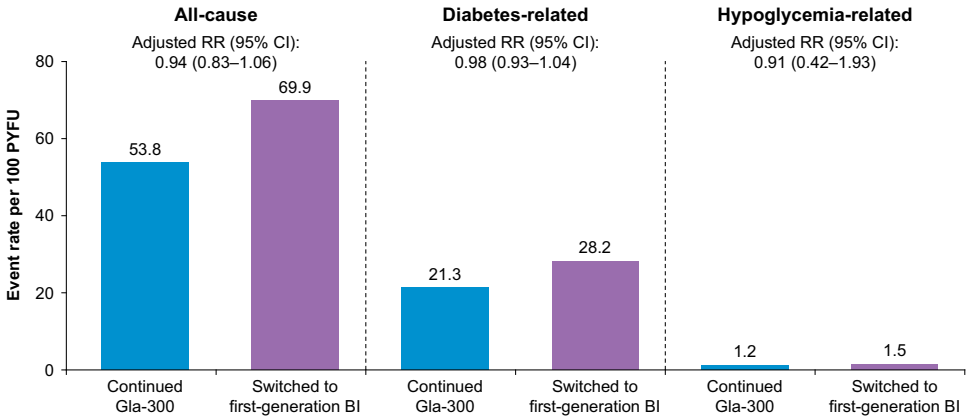

FIGURE 4 Hospitalization event rates. 100 PYFU, 100 person-years of follow-up; BI, basal insulin; CI, confidence interval; Gla-300, insulin glargine 300 units/mL; RR, rate ratio.

support those in the literature demonstrating that second-generation BIs are associated with reduced risk of overall documented or severe hypoglycemia and of severe nocturnal hypoglycemia compared with first-generation BIs (4–9,16–19). It is important to note that, in the current study, the incidence of hypoglycemia events was determined either by laboratory values or by an ICD-10 code. Therefore, the true incidence of hypoglycemia was likely underreported. However, because this methodology was consistently used across the different treatment groups, the overall documentation of hypoglycemia would have been balanced between groups; therefore, any between-group differences that were detected were likely real.

Continuing treatment with Gla-300 was associated with fewer all-cause, diabetes-related, and hypoglycemia-related ED visits compared with switching to a first-generation BI (or to Gla-100 only), and hospitalization rates were similar between groups. These findings may have been driven by lower rates of hypoglycemia observed in the Gla-300 group, suggesting that hypoglycemia was treated in the ED and patients were then discharged without requiring hospitalization. Results of a retrospective study revealed that the risks of hospitalization or ED visit and the costs associated with these events were higher in those who experienced hypoglycemia in the 6 months after initiating BI therapy versus those who did not experience hypoglycemia early in their BI treatment (20). The findings of the current study may have implications for the cost of care, as the potential reduction in costs associated with the reduction in ED visits could offset the higher pharmacy costs associated with second-generation BIs compared with first-generation BIs. However, it was not possible to analyze cost data in this study; thus, no firm conclusions can be drawn.

The improved persistence observed with continued use of Gla-300 compared with switching to a first-generation BI also may have been driven by hypoglycemia rates, since hypoglycemia has been linked to poor persistence (20). Fear of hypoglycemia is a major concern for people with diabetes; 55.5% of patients who participated in the questionnaire-based Diabetes Attitudes, Wishes and Needs second study (21) reported that they were "very worried about the risk of hypoglycemia."

Data for baseline and 12-month follow-up A1C values were available for only 21% of participants who continued Gla-300 and 18.6% of those who switched to a first-generation BI. This limitation in available data resulted in an imbalance in baseline A1C, with a higher baseline A1C in the group who switched to a first-generation BI compared with those who continued Gla-300. Sensitivity analysis 4 was conducted to try to account for this imbalance by matching baseline A1C in the PSM algorithm. The results showed no difference in the change in A1C between baseline and 12 months between those who continued treatment with Gla-300 compared with those who switched to a first-generation BI, although the difference remained greater in the group who switched. It is possible that the greater reduction in the group who switched may have been driven in part by more intensified titration or other support received at the time of switching; those continuing therapy with Gla-300 were maintaining therapy and likely not titrating their doses. Previous studies have demonstrated similar glycemic control between second- and first-generation BIs, with the main difference being a reduction in hypoglycemia observed with second-generation BIs, as observed in the current study (5,7–9).

Limitations

The Optum claims database has a large population with long-term follow-up and breadth of coverage; however, caution is required in interpreting these results because of the nature of retrospective studies. Generalizability of this study may be limited to the populations represented. The lack of randomization may have introduced bias, although confounding factors should have been mitigated by using PSM. Additionally, electronic medical records data are not designed specifically for research purposes, so some data may have been missing, erroneous, or misclassified (22). In the current analyses, baseline A1C values were available for a limited number of participants, and this imbalance likely drove the greater reduction in A1C from baseline observed in the group who switched to first-generation BIs. Persistence with and adherence to therapy can be estimated only from claims data owing to the lack of individualized dosing information. It was also not possible to determine why participants switched to first-generation BIs from Gla-300. Furthermore, it was not possible to determine how individualized A1C targets may have affected glycemic outcomes or whether medication was taken or titrated to the maximum effective dose. Additionally, the database is current only to 2019, and treatment patterns may have since changed.

Conclusion

Compared with those who switched to a first-generation BI, those who continued with Gla-300 had a lower risk

of discontinuing therapy; fewer all-cause, diabetes-related, and hypoglycemia-related ED visits; and fewer hypoglycemia events. The lower rates of hypoglycemia observed in the Gla-300 group could potentially have driven the lower rates of ED visits observed in this study, translating into better persistence observed with Gla-300 versus first-generation BIs. These results suggest that improving coverage for and access to second-generation BIs may be beneficial for people with type 2 diabetes who need insulin therapy to control their diabetes.

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DUALITY OF INTEREST

S.E. has served on advisory boards and speakers' bureaus for AstraZeneca, MannKind, and Xeris and on an advisory board for BrightSight and is a board member for Senseonics and TeamType1. J.Go. serves on speakers' bureaus for Abbott Diabetes, Amarin, Lilly, Novo Nordisk, and Xeris. D.C.M. is or has been a consultant to Avidity, Novartis, Pharmacyclics, Sarepta, and Seres. R.P. and J.Gi. are employees of and stockholders in Sanofi. K.M. and X.L. are employees of Sanofi. S.G. has been a speaker for Sanofi. No other potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

R.P., K.M., and X.L. contributed to the study design and acquisition and analyses of data. All authors were involved in the interpretation of the data and in drafting and revising the manuscript for important intellectual content, and all approved the publication for submission and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. S.E. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

PRIOR PRESENTATION

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