

The Price Paradox of Biosimilar-Like Long-Acting Insulin

Morgane C. Mouslim, DVM, ScM; Emaan S. Rashidi, MHS; Joseph F. Levy, PhD; Mariana P. Socal, MD, PhD; and Antonio J. Trujillo, PhD

High out-of-pocket (OOP) costs for insulins are an important barrier to care for patients with diabetes. Between 2014 and 2019, the mean annual insulin price increased by 55%, with an 18% increase in OOP costs for Medicare patients.¹ It is important to note that, due to its formulations and clinical profiles, the insulin market is not a homogeneous block. Different types of insulin are available, which vary in terms of onset, peak time, and duration. These can be broadly categorized as rapid acting, regular acting, intermediate acting, long acting, and ultralong acting.² Patients may use 1 or multiple types for diabetes management depending on clinical presentation.

The introduction of biosimilar insulins has been proposed as a potential cost-saving alternative through (1) the adoption of a less expensive product and (2) an increase in price competition on the insulin market, which could theoretically result in lower prices across the entire product class.^{3,4} On December 15, 2016, Eli Lilly and Boehringer Ingelheim launched Basaglar, a 100-unit/mL formulation of insulin glargine, a type of long-acting insulin, at a 15% lower list price than its originator biologic Lantus, a 100-unit/mL formulation of insulin glargine that has been available on the US market since 2000.⁵ Note that although for all intents and purposes Basaglar is a biosimilar, due to technicalities surrounding its approval pathway,⁶ the FDA does not refer to it as such. However, because Basaglar meets the definition of (and was intended to be) a biosimilar,⁶ and to be consistent with the literature,⁷ we will refer to it as a biosimilar.

As previously noted, health economic theory suggests that biosimilars lead to lower drug costs through 2 separate mechanisms: (1) by the uptake of a less expensive product and (2) by encouraging price competition. Although the literature on whether biosimilars in the United States have been able to realize these goals remains limited, there is early empirical evidence that some biosimilars may in fact cost more to insurers and patients than their originator biologics.⁸⁻¹⁰ Moreover, a 2021 study of net prices of insulin glargine products estimated that Basaglar consistently had a higher net price than Lantus.¹⁰ Hence, for pharmacy benefit managers (PBMs)—and for insurers, to the extent that PBMs pass on their savings to

ABSTRACT

OBJECTIVES: To describe the uptake and out-of-pocket (OOP) costs of Basaglar, the first long-acting insulin biosimilar, in a commercially insured population in the United States.

STUDY DESIGN: Retrospective analysis of commercial pharmacy claims and pharmacy co-payment offsets.

METHODS: We assessed Basaglar uptake by examining trends in the composition of the long-acting insulin market in the United States from 2014 to 2018. As patient demographics and plan type may be important determinants of biosimilar uptake, we also assessed characteristics of all long-acting insulin users by drug. We examined Basaglar OOP costs by assessing mean OOP costs per claim for users of Basaglar and other long-acting insulins, overall and by plan type, and the number and source of co-payment offsets for Basaglar and other insulin glargine products from Basaglar market entry through 2018. We used multivariate linear models to examine the relationship between Basaglar OOP expenditures and insurer-negotiated amounts, overall and by plan type.

RESULTS: Basaglar experienced a rapid uptake. However, there was no evidence that Basaglar users had lower OOP costs than reference product (Lantus) users.

CONCLUSIONS: Given our results and the approval of the first interchangeable biosimilar, we recommend the empirical evaluation of biosimilar cost savings to patients and insurers prior to promoting their automatic substitution.

Am J Manag Care. 2022;28(11):e405-e410. doi:10.37765/ajmc.2022.89265

TAKEAWAY POINTS

In this analysis of commercially insured patients, Basaglar experienced a rapid uptake from 2014 to 2018. However, we did not find evidence that Basaglar was a less expensive alternative to Lantus for patients.

- ▶ Despite similar sex and age distributions and insulin glargine utilization, Basaglar users in most plan types had higher out-of-pocket costs per claim than Lantus users in the same plan types.
- ▶ Out-of-pocket costs for Basaglar greatly varied by plan type, suggesting that benefit design plays an important role in determining out-of-pocket costs.
- ▶ As biosimilars gain regulatory approval for automatic substitution, it will be important to empirically evaluate whether they provide a less expensive product for patients.

insurers—Basaglar was not a less expensive product.

It is important to note that OOP costs are a function of plan provisions, patient cumulative health care costs, and, if coinsurances and deductibles apply, the insurer-negotiated price, not the net price. Given this, it is possible for Basaglar to have a higher net price than Lantus yet still be less expensive than Lantus in terms of patient OOP costs. However, to our knowledge, OOP costs of commercially insured Basaglar users in the United States have never been described.

Because (1) early results suggest that the theoretical assumption that biosimilars will provide less expensive drug options to insurers and users may not be true,⁸⁻¹⁰ (2) policy makers continue to advocate for biosimilar adoption and uptake,¹¹ and (3) the FDA has recently approved its first interchangeable biosimilar,¹² it is crucial to evaluate whether biosimilars are less expensive than branded biologics to payers in the real world. This leads us to ask the question: What did Basaglar uptake and OOP costs look like for commercially insured individuals in the United States?

This study aims to answer this question by doing the following. First, we described Basaglar uptake by examining composition trends in the commercially insured long-acting insulin market in the United States from 2014 to 2018. As patient demographics and plan type may be important determinants of biosimilar uptake, we also assessed characteristics of long-acting insulin users by drug. Then, we described Basaglar OOP costs by examining mean OOP costs for Basaglar, overall and by plan type. Finally, we examined the number and source of co-payment offsets offered for Basaglar from its market entry to 2018. As a whole, our analysis can provide real-world data on the uptake and patient OOP costs of Basaglar, which we hope can inform research and policy efforts regarding biosimilar adoption.

METHODS

Data

We used the IBM MarketScan Commercial Claims and Encounters (CCA)E pharmacy claims database to derive OOP expenditures, insurer payments, patient characteristics, and plan type for all long-acting insulin claims from Basaglar market entry to December 31, 2018. When

Basaglar launched, 4 other long-acting insulin products were available, which were considered alternative therapeutic options by the American Diabetes Association¹³: originator insulin glargine (Lantus), a concentrated formulation of insulin glargine (Toujeo), insulin degludec (Tresiba), and insulin detemir (Levemir). We also used the CCAE data to derive quarterly numbers of long-acting insulin claims, by drug, from 2014 to 2018. CCAE pharmacy claims data contain longitudinal prescription drug claims for approximately 47 million patients aged 0 to 64 years who are covered by employer-

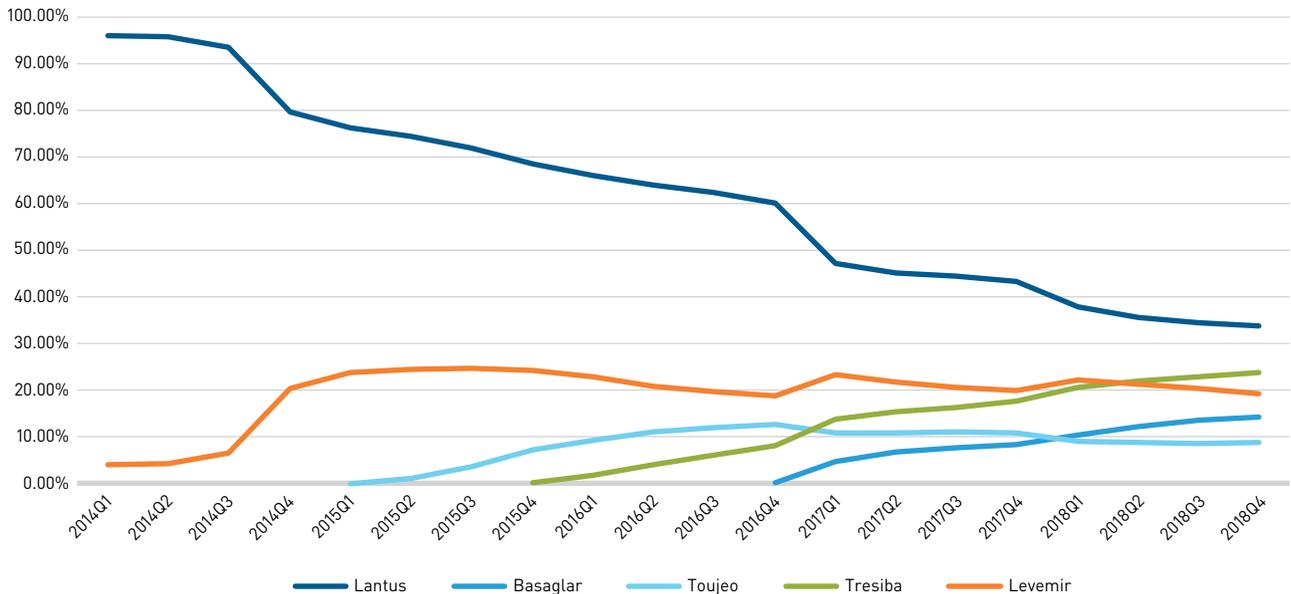
sponsored private health care in the United States.¹⁴ We used the IQVIA Formulary Impact Analyzer (FIA)¹⁵ to derive the number and source (manufacturer, PBM, or state/federal) of insulin glargine pharmacy transactions with co-payment offsets from Basaglar market entry to December 31, 2018. A transaction is counted as a co-payment offset if a “coupon, voucher, or discount program” was used as the primary or secondary payer.¹⁶ The FIA has individual-level pharmacy transaction information from approximately 95% of chain pharmacies and two-thirds of independent pharmacies in the United States. Because the study did not meet the criteria for human subject research, institutional review board approval was not sought.

Basaglar Uptake

We used National Drug Codes to identify all long-acting insulin pharmacy claims from January 1, 2014, to December 31, 2018. Claims without an enrollee identification number or payer information were excluded. Consistent with the current literature^{8,17} and inherent to the structure of capitated health plans, which means these plans may differentially respond to biosimilar market entry, we restricted our analysis to noncapitated health plans. To describe Basaglar uptake, we examined the quarterly number of claims and percent market share, by long-acting insulin, from January 1, 2014, to December 31, 2018. As patient demographics and plan type may be important factors in Basaglar uptake, we also estimated characteristics of long-acting insulin users, by drug type, from Basaglar market entry to December 31, 2018.

OOP Expenditures

OOP expenditures are made up of a fixed cost (co-payment) and variable costs (deductible and coinsurance). All plans have an annual OOP maximum limit. Plans will vary in what type of cost-sharing measures they use. Co-payment is determined by the plan provisions, whereas deductible and coinsurance amounts are determined by plan provisions, cumulative annual patient expenditures, and, when applicable, insurer-negotiated amount for a service/drug. To quantify Basaglar OOP costs, we estimated mean OOP cost per claim for Basaglar users from its market entry, which due to the data structure of the IQVIA FIA database is defined here as January 1,

FIGURE. Trends in the Long-Acting Insulin Market Composition, 2014-2018

Q, quarter.

2017, to December 31, 2018. OOP costs are estimated by aggregating the following MarketScan variables: co-payment + coinsurance + deductible. This cost does not reflect additional discounts, coupons, or vouchers that patients may receive from the manufacturer, PBMs, or state/federal initiatives. As plan distribution may vary among groups of drug users, we also estimated mean OOP cost per claim per plan type. To assess additional OOP discounts patients may receive that are not reflected in MarketScan data, we used the IQVIA FIA and the methodology described by Sen et al¹⁶ to describe the number and source (ie, manufacturer, PBMs, state/federal) of co-payment offsets for commercially insured Basaglar, Lantus, and Toujeo users from Basaglar entry through December 2018.

Statistical Analysis

OOP costs are determined by plan provisions, patient cumulative health care costs, and, in the case of deductibles and coinsurance, insurer-negotiated amounts. To assess to what extent Basaglar OOP costs are determined by its insurer-negotiated amount, we used level-level linear regression to model claim OOP amount, calculated as the sum of coinsurance, co-payment, and deductible, as a factor of insurer-negotiated amount. Insurer-negotiated amount is derived from the MarketScan variable “pay,” defined as the “amount eligible for payment under medical plan terms.”¹⁴ We included controls for enrollee age and gender, quarterly dummy variables to flexibly capture any seasonal effects, and year fixed effects to capture any exogenous factors that change yearly and influence OOP expenditures. We also included controls for mean insurer-negotiated amounts for Lantus,

Toujeo, Tresiba, and Levemir as of Basaglar claim date to account for any effect of plan-negotiated amounts of other long-acting insulins on Basaglar OOP expenditures. We ran these models for all users and by plan type. Plan type was defined according to the CCAE database’s subcategories as either comprehensive, exclusive provider organization (EPO), point of service (POS), preferred provider organization (PPO), consumer-directed health plan (CDHP), or high-deductible health plan (HDHP). Our specifications assumed that prices of products are exogenous.

RESULTS

Between January 1, 2014, and December 31, 2018, we identified a total of 3,982,446 claims for long-acting insulin products among noncapitated commercial health insurance plans. Of these, we excluded 1904 (0.05%) claims that did not have payer information and 157,647 (3.9%) claims that did not have enrollee identification numbers. Our final sample consisted of 3,822,895 claims: 2,281,099 prior to the launch of Basaglar (January 1, 2014–December 14, 2016) and 1,541,796 after the launch of Basaglar (December 15, 2016–December 31, 2018).

Basaglar Uptake

From 2014 to 2018, the overall number of long-acting insulin claims remained relatively constant (eAppendix Figure 1 [eAppendix available at ajmc.com]). However, market composition changed significantly over time (Figure and eAppendix Figure 1). At the time

TABLE 1. Characteristics of Users of Long-Acting Insulin, by Drug, From December 15, 2016, to December 31, 2018

	Basaglar	Lantus	Toujeo	Tresiba	Levemir
Total No. of claims	143,673	634,443	154,340	286,169	323,171
Unique users, n	35,968	126,401	28,821	58,133	67,930
Age in years, mean (SD)	46.9 (14.9)	48.7 (14.3)	51.1 (10.5)	49.3 (12.4)	49.7 (12.7)
Sex, n (%)					
Female	16,209 (45.1%)	56,422 (44.6%)	13,203 (45.8%)	26,799 (46.1%)	32,471 (47.8%)
Male	19,759 (54.9%)	69,979 (55.4%)	15,618 (54.2%)	31,334 (53.9%)	35,459 (52.2%)
Plan type, n (%)					
Comprehensive	1325 (3.7%)	5316 (4.2%)	406 (1.4%)	1323 (2.3%)	2439 (3.6%)
EPO	373 (1.0%)	1078 (0.9%)	182 (0.6%)	529 (0.9%)	644 (1.0%)
POS	3417 (9.5%)	13,345 (10.6%)	3587 (12.5%)	8046 (13.8%)	8564 (12.6%)
PPO	20,249 (56.3%)	79,243 (62.7%)	18,142 (63.0%)	34,288 (59.0%)	40,742 (60.0%)
CDHP	5944 (16.5%)	16,142 (12.8%)	4011 (13.9%)	8144 (14.0%)	8837 (12.0%)
HDHP	4660 (12.9%)	11,277 (8.9%)	2493 (8.7%)	5803 (10.0%)	6704 (9.9%)
Units dispensed per claim, median (IQR)	1500 (1500-3000)	1500 (1500-3000)	1350 (1350-2700)	1800 (1500-3000)	1500 (1500-3000)
Payment per claim in \$, mean (SD)	359.78 (224.09)	427.40 (259.05)	491.30 (254.52)	616.10 (366.78)	490.00 (299.45)
Out-of-pocket cost per claim in \$, mean (SD)	45.69 (40.68)	42.59 (37.12)	43.96 (37.19)	47.42 (42.96)	40.68 (36.60)

CDHP, consumer-directed health plan; EPO, exclusive provider organization; HDHP, high-deductible health plan; POS, point of service; PPO, preferred provider organization.

of Basaglar launch, Lantus made up most of the long-acting insulin market at 60.2% of claims, followed by Levemir, Toujeo, and Tresiba (18.8%, 12.8%, and 8.2% of claims, respectively). By the last quarter of 2018, Lantus still retained the largest market share of all long-acting insulins, but it represented only 33.8% of all claims. Meanwhile, Basaglar had gained 14.3% of the market and had experienced the largest growth in market share of all long-acting insulins with a growth rate of 87.4% in 2017 and 72.5% in 2018.

Characteristics of Long-Acting Insulin Users

Claims after Basaglar market entry represented 317,253 beneficiaries, most of whom (41.2%) were Lantus users, followed by Levemir users (21.0%), Tresiba users (18.6%), Basaglar users (14.4%), and Toujeo users (11.6%). Number of units dispensed per claim, mean enrollee age, and gender distribution were similar among the drugs (Table 1). Compared with other long-acting insulin users, a lower percentage of Basaglar users belonged to PPO plans (56.3% of Basaglar users vs 60.0%-63.0% of other drug users) but a higher percentage of Basaglar users belonged to CDHPs and HDHPs (16.5% vs 12.8%-14.0% and 13.0% vs 8.7%-10.0%, respectively).

OOP Expenditures

Between December 15, 2016, and December 31, 2018, Basaglar users spent more per claim than Lantus, Levemir, or Toujeo users, with mean (SD) OOP costs of \$45.69 (\$40.68) per claim. Within EPO, POS, PPO, CDHP, and HDHP plans, Basaglar users had higher OOP costs per claim than Lantus users in the same type of plan (Table 2). Moreover, 56.3% of Basaglar users filed as part of a PPO plan and incurred on average almost \$6 extra per claim in OOP costs than Lantus users in a PPO plan despite Basaglar and Lantus users filing for the same

median amount of insulin glargine (1500 units) and Basaglar users filing a lower mean number of claims (mean of 4 claims vs 5 for Lantus users over the study period). Mean OOP costs for Basaglar users and differences in mean OOP costs between users of Basaglar and other long-acting insulins varied by plan type: Compared with Lantus users in the same type of plan, Basaglar users in comprehensive plans paid approximately \$13 less per claim whereas those in EPO plans paid approximately \$11 more per claim. Meanwhile, insurers negotiated lower amounts per claim for Basaglar than for any other long-acting insulin (mean [SD] negotiated insured amount of \$359.78/claim [\$224.09] for Basaglar vs \$427.40/claim [\$259.05] for Lantus).

Across all plan types there was a small positive association between OOP expenditures and insurer claim payment for Basaglar (Table 3). This relationship varied by plan type: It was not significant in comprehensive and POS plans, but a \$1 increase in insurer-negotiated price was associated with a \$0.28 increase in patient OOP expenditures (95% CI, \$0.16-\$0.38) in EPO plans.

Co-payment Offsets

From Basaglar market entry, which due to the data structure of the IQVIA FIA database is defined here as January 1, 2017, to December 31, 2018, we identified a total of 42,808 partially or fully offset transactions for insulin glargine products. Lantus represented the majority of those at 60.3% of all offsets, followed by Toujeo (32.3%) and Basaglar (7.5%). Although we were unable to measure total transactions for each drug, which limits the inferences we can make about which product offers the most offsets, we know from the CCAE data that during that same time period Lantus, Toujeo, and Basaglar represented 67.2%, 16.5%, and 16.3% of all insulin

TABLE 2. Mean Out-of-Pocket Cost per Claim (in US\$), by Drug and Plan Type, From December 15, 2016, to December 31, 2018

	Basaglar	Lantus	Toujeo	Tresiba	Levemir
Out-of-pocket cost, mean (SD)					
Comprehensive	33.03 (30.00)	56.69 (36.61)	41.81 (39.98)	36.52 (39.26)	45.60 (35.40)
EPO	66.33 (33.17)	55.45 (36.44)	71.65 (46.81)	49.97 (40.09)	29.57 (42.15)
POS	46.16 (34.43)	41.76 (35.22)	39.86 (34.11)	40.10 (33.43)	39.90 (29.01)
PPO	48.27 (40.94)	42.29 (34.83)	44.52 (34.59)	49.77 (41.91)	41.97 (36.08)
CDHP	45.78 (44.39)	44.45 (44.62)	47.49 (45.47)	49.66 (51.31)	39.30 (41.83)
HDHP	35.68 (38.19)	33.67 (42.40)	38.06 (42.86)	41.71 (46.00)	34.53 (39.34)

CDHP, consumer-directed health plan; EPO, exclusive provider organization; HDHP, high-deductible health plan; POS, point of service; PPO, preferred provider organization.

TABLE 3. Relationship Between Claim-Level Patient Out-of-Pocket Expenditures and Insurer-Negotiated Amount for Basaglar*

	Patient out-of-pocket costs (in US\$)
Insurer-negotiated amount, estimate (95% CI)	0.064* [0.061-0.066]
By health plan type, estimate (95% CI)	
Comprehensive	0.005 [-0.027 to 0.038]
EPO	0.268* [0.155-0.380]
POS	0.000 [-0.016 to 0.013]
PPO	0.057* [0.053-0.061]
CDHP	0.052* [0.046-0.057]
HDHP	0.121* [0.113-0.129]

CDHP, consumer-directed health plan; EPO, exclusive provider organization; HDHP, high-deductible health plan; POS, point of service; PPO, preferred provider organization.

*P < .05.

*Regression adjusts for seasonality, year fixed effects and quantity dispensed, enrollee age and gender as stated in claim, and mean insurer payment per claim for Lantus, Toujeo, Tresiba, and Levemir as of claim date.

glargine product claims, respectively. This suggests that Basaglar offered fewer offsets to its users than Lantus or Toujeo. State and federal initiatives were a bigger source of offsets for Basaglar than for Lantus and Toujeo, at 8.8% vs 5.6% and 1.4%, respectively.

DISCUSSION

Basaglar experienced a constant and rapid uptake following its market entry: Its utilization rate grew by 87.4% in 2017 and 72.5% in 2018, the fastest market share growth out of all long-acting insulins during that time, to reach 14.3% of the long-acting insulin market share by quarter 4 of 2018. This is surprising, as previous research has shown that from the second quarter of 2017 through 2018 Basaglar had a higher net price than Lantus.¹⁰ Moreover, despite Basaglar and Lantus users having similar sex and age distributions and claiming similar amounts of insulin, Basaglar users in most plan types had higher OOP costs per claim than Lantus users in the same plan types.

To further illustrate what these differences in OOP costs between Basaglar and Lantus represent, we provide a rough approximation of the amount of money that Basaglar users in PPO plans might have saved had they been able to pay the price per claim that Lantus users in PPO plans did. Basaglar users in PPO plans filed 77,054 claims and paid a mean of \$48.27 per claim. Lantus users in PPO plans paid a mean of \$42.29 per claim. At a difference of \$5.98 per claim, this translates to \$460,783 in potential OOP cost savings. Moreover, our co-payment offset analysis suggests that Lantus users received comparatively more coupons, vouchers, and patient assistance program discounts to offset their OOP costs than Basaglar users. This further supports the fact that patients who used Basaglar did not have an advantage in terms of OOP costs compared with patients who used Lantus.

We offer one potential explanation for Basaglar's rapid uptake. PBMs are responsible for formulary design and negotiate prices with manufacturers and pharmacies.¹⁸ Studies have found that a growing source of PBM revenue comes from spread pricing,^{19,20} whereas revenue from manufacturer rebates has decreased as most of these rebates are passed through to the insurer/health plans. Basaglar could benefit from preferential PBM formulary placement (and thus uptake), despite offering lower rebates and its users having higher OOP costs than Lantus, if PBMs are able to generate more spread pricing revenue through its preferential uptake. We suggest that future research examine PBM spread pricing behavior in biosimilar adoption.

As previously discussed, total OOP cost is a complex aggregate measure that will be determined by plan provisions, a patient's cumulative health care costs, and, when deductibles and coinsurances apply, insurer-negotiated amounts (because these will be the numbers used to calculate coinsurances and deductibles). In most plan types, insurer-negotiated amount either had a small effect or no significant effect on Basaglar's OOP cost, suggesting that factors other than insurer-negotiated amounts determine Basaglar's OOP cost. Future research aimed at understanding patients' OOP costs for biosimilars may want to focus on factors such as benefit design, plan provisions, and a patient's total cost of care.

The FDA recently approved Semglee as the first interchangeable biosimilar and the first interchangeable insulin glargine.¹² Interchangeability status allows for automatic substitution. As our results suggest that biosimilars may not offer substantial (or any) cost savings to users, it will be important for future research to empirically evaluate cost savings to patients and insurers in "switchers": patients who switch from the reference biologic to its biosimilar.

Limitations

This study has limitations. The CCAE database is restricted to commercial claims, and data mainly come from large employers. This may limit generalizability to other forms of private insurance and public insurance. We also had limited patient socioeconomic data and did not have data on enrollment and utilization of health spending accounts, which are factors that may additionally influence OOP spending. We are limited in the level of inference we can make by the descriptive nature of this work and by the fact that between 2014 and 2018, there were important fluctuations in the long-acting insulin market beyond entrance of a biosimilar. These included the introduction of Toujeo—designed as a possible “product-hop” to move consumers from Lantus to Toujeo—and a novel long-acting insulin, Levemir (insulin detemir). However, to our knowledge, this is the first study that has examined Basaglar uptake and patient OOP costs in a commercially insured population in the United States. Due to data availability, our offset analysis was limited to insulin glargine products from January 1, 2017, to December 31, 2018. Although our results do provide evidence that suggests that Lantus users received more offsets than Basaglar users, we encourage future researchers to examine offsets for all insulin products and to assess trends in offsets prior to and after Basaglar entry. Finally, inherent to the nature of claims analyses, negotiated insurer amounts do not capture rebates. We acknowledge this limitation, and we leverage previously published data on rebates and net prices of insulin glargine products to frame our study results and discussion.

CONCLUSIONS

Our results have important ramifications in light of the FDA's August 2021 approval of Semglee,¹² the first interchangeable biosimilar and the first interchangeable insulin glargine. With this interchangeable designation, Semglee may be automatically substituted for Lantus. Given that we found that patients who used Basaglar, a product intended to be a less expensive insulin glargine alternative for patients, did not have lower OOP costs than Lantus users (both overall and within most plan types), despite having similar age and sex distributions and utilization patterns, it will be important to empirically evaluate whether Semglee will be less expensive for patients than Lantus before promoting efforts to automatically substitute it for Lantus. Moreover, we recommend that cost to insurers and patients for all biosimilars approved or applying for approval as interchangeable be empirically evaluated. As patient OOP expenditures seem to vary significantly across health plans, empirical evaluations of biosimilar cost savings to patients should also take the role of benefit design into consideration. ■

Author Affiliations: The Hilltop Institute, University of Maryland Baltimore County (MCM), Baltimore, MD; Department of Epidemiology (ESR), Department of International Health (JFL, AJT), and Department of Health Policy & Management (MPS), Johns Hopkins Bloomberg School of Public Health, Baltimore, MD.

Source of Funding: This work was supported by a grant from Arnold Ventures LLC.

Author Disclosures: Ms Rashidi, Dr Levy, and Dr Trujillo were supported by an Arnold Foundation grant; the funder had no role in this manuscript. Dr Socal received research grants from Arnold Ventures during the conduct of this research. Dr Mouslim reports no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (MCM, MPS, AJT); acquisition of data (JFL, AJT); analysis and interpretation of data (MCM, ESR, JFL, MPS, AJT); drafting of the manuscript (MCM, ESR, MPS, AJT); critical revision of the manuscript for important intellectual content (MCM, JFL, MPS, AJT); statistical analysis (MCM, ESR, AJT); and supervision (AJT).

Address Correspondence to: Morgane C. Mouslim, DVM, ScM, University of Maryland Baltimore County, 1000 Hilltop Circle, Baltimore, MD 21250. Email: mmouslii@umbc.edu.

REFERENCES

1. Tseng CW, Masuda C, Chen R, Hartung DM. Impact of higher insulin prices on out-of-pocket costs in Medicare Part D. *Diabetes Care*. 2020;43(4):e50-e51. doi:10.2337/dc19-1294
2. Types of insulin. CDC. March 25, 2021. Accessed July 30, 2021. <https://www.cdc.gov/diabetes/basics/type-1-types-of-insulin.html>
3. Blackstone EA, Fuhr JP. The economics of biosimilars. *Am Health Drug Benefits*. 2013;6(8):469-478.
4. McCamish M, Yoon W, McKay J. Biosimilars: biologics that meet patients' needs and healthcare economics. *Am J Manag Care*. 2016;22(13 suppl):S439-S442.
5. Drug approval package: Lantus (insulin glargine [rDNA origin]) injection. FDA. November 20, 2001. Accessed July 30, 2021. https://www.accessdata.fda.gov/drugsatfda_docs/nda/2000/21081_Lantus.cfm
6. Kim AP, Bindler RJ. The future of biosimilar insulins. *Diabetes Spectr*. 2016;29(3):161-166. doi:10.2337/diaspect.29.3.161
7. Hagen T. Study: Basaglar “biosimilar” had strong downward effect on insulin glargine prices. The Center for Biosimilars®. October 19, 2021. Accessed January 20, 2022. <https://www.centerforbiosimilars.com/view/study-basaglar-biosimilar-had-strong-downward-effect-on-insulin-glargine-prices>
8. Moustim MC, Trujillo AJ, Alexander GC, Segal JB. Association between filgrastim biosimilar availability and changes in claim payments and patient out-of-pocket costs for biologic filgrastim products. *Value Health*. 2020;23(12):1599-1605. doi:10.1016/j.jval.2020.06.014
9. Dusetzina SB, Jazowski S, Cole A, Nguyen J. Sending the wrong price signal: why do some brand-name drugs cost Medicare beneficiaries less than generics? *Health Aff (Millwood)*. 2019;38(7):1188-1194. doi:10.1377/hlthaff.2018.05476
10. Levy J, Chowdhury ZM, Socal MP, Trujillo AJ. Changes associated with the entry of a biosimilar in the insulin glargine market. *JAMA Intern Med*. 2021;181(10):1405-1407. doi:10.1001/jamainternmed.2021.2769
11. Patient advocacy organizations join forces to endorse BIOSIM Act. *The American Journal of Managed Care*®. July 7, 2021. Accessed January 20, 2022. <https://www.ajmc.com/view/patient-advocacy-organizations-join-forces-to-endorse-biosim-act>
12. FDA approves first interchangeable biosimilar insulin product for treatment of diabetes. News release. FDA; July 30, 2021. Accessed January 20, 2022. <https://www.fda.gov/news-events/press-announcements/fda-approves-first-interchangeable-biosimilar-insulin-product-treatment-diabetes>
13. Howard-Thompson A, Khan M, Jones M, George CM. Type 2 diabetes mellitus: outpatient insulin management. *Am Fam Physician*. 2018;97(1):29-37.
14. MarketScan Research Databases. IBM. Accessed July 30, 2021. <https://www.ibm.com/products/marketscan-research-databases>
15. Real world data sets. IQVIA. Accessed July 30, 2021. <https://www.iqvia.com/solutions/real-world-evidence/real-world-data-and-insights>
16. Sen AP, Kang SY, Rashidi E, Ganguli D, Anderson G, Alexander GC. Characteristics of copayment offsets for prescription drugs in the United States. *JAMA Intern Med*. 2021;181(6):758-764. doi:10.1001/jamainternmed.2021.0733
17. Preussler JM, Mau LW, Majhail NS, et al. Administrative claims data for economic analyses in hematopoietic cell transplantation: challenges and opportunities. *Biol Blood Marrow Transplant*. 2016;22(10):1738-1746. doi:10.1016/j.bbmt.2016.05.005
18. Werble C. Pharmacy benefit managers. *Health Affairs*. September 14, 2017. Accessed January 20, 2022. <https://www.healthaffairs.org/doi/10.1377/hpb20171409.000178/full/>
19. The prescription drug landscape, explored. Pew. March 8, 2019. Accessed January 20, 2022. <https://pew.org/ZNKWzef>
20. Massachusetts Health Policy Commission. Cracking open the black box of pharmacy benefit managers: PBM pricing for generic drugs in Massachusetts Medicaid programs and the commercial market. Mass.gov. June 5, 2019. Accessed January 20, 2022. <https://www.mass.gov/info-details/hpc-datapoints-issue-12-cracking-open-the-black-box-of-pharmacy-benefit-managers>

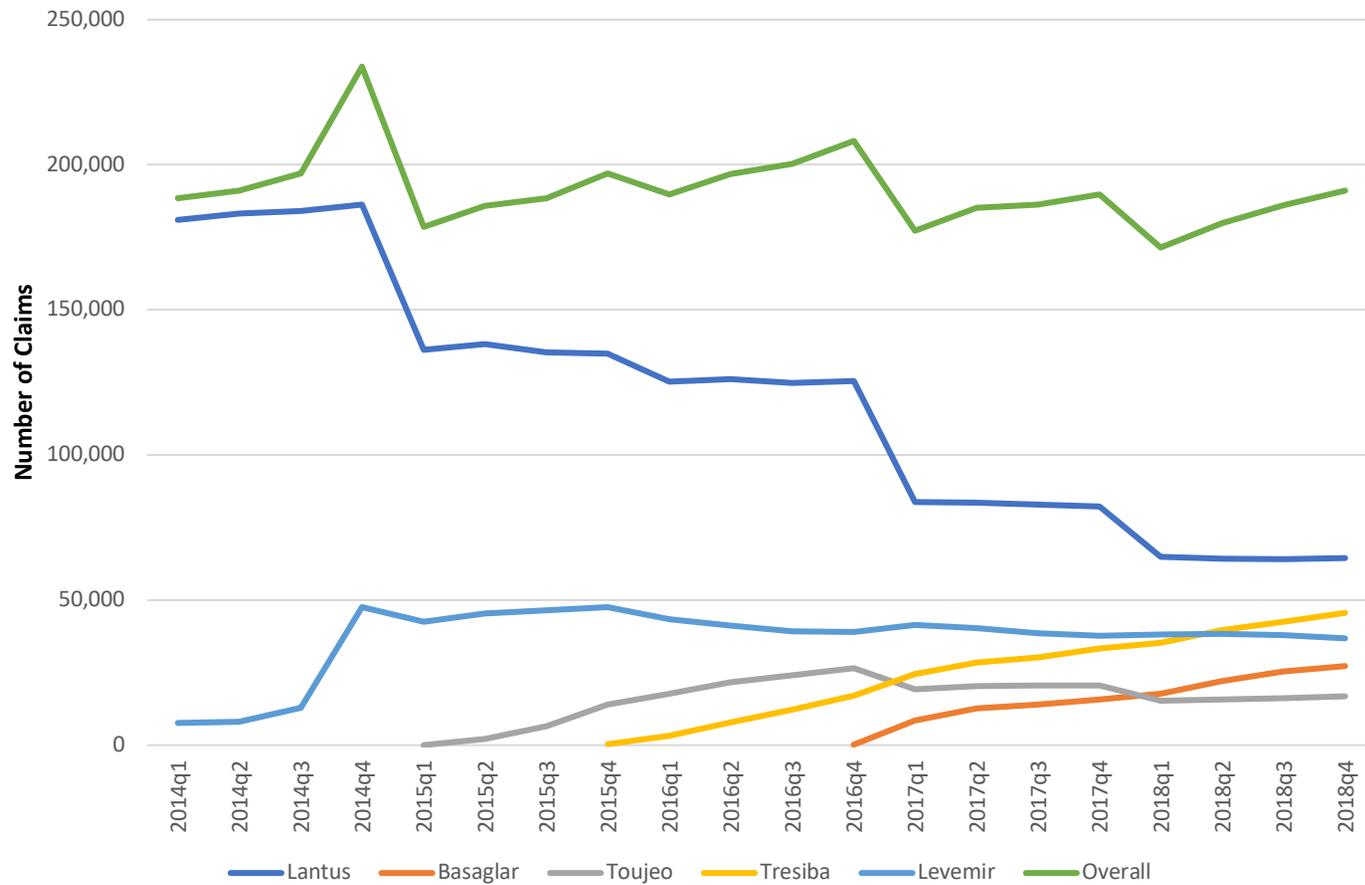
Visit ajmc.com/link/89265 to download PDF and eAppendix

eAppendix Table. Prevalence of Offsets for Insulin Glargine Products, 2017-2018

	All	Basaglar	Lantus	Toujeo
Transactions with offsets, No, (%)	42,808	3,197 (7.5%)	25,802 (60.3%)	13,809 (32.3%)
Type of offset, (%)				
Manufacturer	93.6%	88.2%	92.1%	98.1%
Pharmacy-PBM	1.81%	3.0%	2.3%	0.4%
State or Federal	4.59%	8.8%	5.6%	1.5%

PBM: Pharmacy benefit manager

eAppendix Figure 1. Trends in Utilization of Long-Acting Insulins, 2014-2018



eAppendix Figure 2. Trends in Out-of-Pocket Expenditures in the Long-Acting Insulin Market, 2017-2018

