Costs for diabetic patients receiving dipeptidyl peptidase-4 inhibitors in US Medicare and commercial insurance plans

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Background

Dipeptidyl peptidase-4 (DPP-4) inhibitors are a newer class of oral hypoglycemic medications which prevent the breakdown of incretin, resulting in decreased glucagon levels and increased insulin release, thereby reducing blood glucose. This medication class is primarily indicated for management of type 2 diabetes as either monotherapy or in combination with other oral hypoglycemic agents.[1-4] There are four DPP-4 inhibitors presently available in the US: sitagliptin marketed as Januvia, saxagliptin marketed as Onglyza, linagliptin marketed as Tradjenta, and alogliptin marketed as Nesina. A systematic review showed that adding a DPP-4 inhibitor may be more cost-effective than other medication combinations in patients whose diabetes is not well controlled on monotherapy.[5] However, direct cost comparisons using claims data are lacking.

Objective

To compare post-index direct medical costs for patients prescribed DPP-4 inhibitors in both Medicare and commercial plan cohorts.

Methods

Study Design: Historical cohort study

Data Source: Pharmacy and medical claims, and enrollment data, from the Humana Research Database, which includes data from approximately 17.1 million members nationwide across commercial (private insurance purchased individually or through an employer), Medicare Advantage (insurance provided to individuals age ≥65 and individuals of any age with disability) and prescription drug plans from 2007 to present.

Inclusion and Exclusion Criteria:

- Patients with Humana Medicare and commercial coverage, with ≥1 filled prescription for a DPP-4 inhibitor between July 1, 2011 and March 31, 2013 were identified.
- The first prescription claim for a DPP-4 inhibitor was defined as the index date and index medication.
- Continuous enrollment was required for the 12 months prior to, and after, the index date.
- Patients without at least one refill of their index medication were excluded from analysis.

Outcomes and Analyses:

- Medicare and commercial populations were analyzed separately.
- Demographic characteristics (age, gender, and geographic region), and the following pre-index clinical and cost characteristics, were described:
  - A mean Diabetes Complications Severity Index (DCSI) score, which quantifies the severity of 7 diabetes complication categories, was used to asses patients' risk of adverse outcomes, including hospitalizations and death.
  - Mean hemoglobin A1(HbA1c) levels were calculated from lab results 6 and 18 months after the index date for the subset of patients with available data.
  - Unadjusted mean pre-index health care costs (sum of plan and patient paid), which were considered a proxy for clinical severity, were reported as total, pharmacy (Rx) and medical costs.
- Post-index costs (in 2013 US dollars) were compared, adjusting for pre-index costs, DCSI, pre-index insulin (defined as a prescription for insulin during the 365 days prior to the index date), age and gender, using generalized linear models (GLMs) and $p<0.05$.

Results

Table 1. Sample Selection and Attrition

Since few patients were prescribed alogliptin, it was removed from analysis. Based on study criteria, 22,860 patients with Medicare coverage (17,292 sitagliptin; 4,282 saxagliptin and 1,286 linagliptin) and 3,229 patients with commercial coverage (2,368 sitagliptin; 643 saxagliptin and 218 linagliptin) were included.

Table 1a: Medicare sample selection and attrition

Criteria	Patients Excluded		Patients Remaining	
	n	%	n	%
At least one prescription claim for a DPP-4 inhibitor during the identification period of July 1, 2011, to March 31, 2013			53,342	100%
12 months continuous enrollment before index DPP-4 inhibitor claim	23,216	43.5%	30,126	56.5%
12 months continuous enrollment after index DPP-4 inhibitor claim	2,794	5.2%	27,332	51.2%
At least one refill of index DPP-4 inhibitor	4,461	8.4%	22,871	42.9%
DPP-4 inhibitor was alogliptin (excluded)	11	0.0%	22,860	42.9%
Final count			22,860	42.9%

Table 1b: Commercial Sample Selection and Attrition

Criteria	Patients Excluded		Patients Remaining	
	n	%	n	%
At least one prescription claim for a DPP-4 inhibitor during the identification period of July 1, 2011, to March 31, 2013			9,047	100%
12 months continuous enrollment before index DPP-4 inhibitor claim	4,167	7.8%	4,880	53.9%
12 months continuous enrollment after index DPP-4 inhibitor claim	1,057	2.0%	3,823	42.3%
At least one refill of index DPP-4 inhibitor	587	1.1%	3,236	35.8%
DPP-4 inhibitor was alogliptin (excluded)	7	0.0%	3,229	35.7%
Final count			3,229	35.7%

Table 2. Demographic Characteristics

Medicare patients were older and more likely to be female compared with the commercial cohort.

Table 2a. Medicare Baseline Demographics

Measure	Sitagliptin (n=17,292)	Saxagliptin (n=4,282)	Linagliptin (n=1,286)
Female, n (%)	8,999 (52.0)	2,180 (51.0)	647 (50.3)
Age, years, mean (SD)	70.7 (±8.5)	70.2 (±8.5)	71.6 (±8.2)
Age category, n (%)			
<65	2,842 (16.4)	760 (17.8)	180 (14.0)
65-69	4,285 (24.8)	1,146 (26.8)	276 (21.5)
70-74	4,674 (27.0)	1,112 (26.0)	388 (30.2)
75-79	3,018 (17.5)	724 (16.9)	235 (18.3)
80+	2,473 (14.3)	540 (12.6)	207 (16.1)
Geographic region, n (%)			
Northeast	401 (2.2)	59 (1.3)	22 (1.7)
Midwest	3,769 (21.8)	827 (19.3)	214 (16.6)
South	11,794 (68.2)	3,064 (71.6)	970 (75.4)
West	1,328 (7.7)	332 (7.8)	80 (6.2)

Table 2b. Commercial Baseline Demographics

Measure	Sitagliptin (n=2,368)	Saxagliptin (n=643)	Linagliptin (n=218)
Female, n (%)	1,046 (44.2)	282 (43.9)	95 (44.0)
Age, years, mean (SD)	55.8 (±9.6)	55.5 (±9.7)	55.1 (±9.2)
Age category, n (%)			
<50	537 (22.7)	165 (25.7)	51 (23.4)
50-54	440 (18.6)	105 (16.3)	47 (21.6)
55-59	533 (22.5)	146 (22.7)	45 (20.6)
60-64	540 (22.8)	150 (23.3)	51 (23.4)
65+	318 (13.4)	77 (12.0)	24 (11.0)
Geographic region, n (%)			
Northeast	4 (0.2)	0 (0.0)	0 (0.0)
Midwest	714 (30.2)	120 (18.7)	33 (15.1)
South	1,589 (67.1)	511 (79.5)	179 (82.1)
West	61 (2.6)	12 (1.9)	6 (2.8)

Table 3. Baseline Clinical Characteristics

Compared to other DPP-4 inhibitors, patients taking linagliptin had a higher DCSI score, used more insulin, and had higher pre-index costs in both the Medicare and commercial populations.

Table 3a. Medicare Baseline Clinical Characteristics

Measure	Sitagliptin	Saxagliptin	Linagliptin
DCSI score	n=17,292	n=4,282	n=1,286
Mean (SD)	2.4 (±2.2)	2.2 (±2.0)	3.0 (±2.3)
HbA1c levels	n=6,616	n=1,583	n=507
Mean (SD)	7.8 (±1.5)	7.7 (±1.4)	7.7 (±1.4)
***Pre-index total costs**	n=17,292	n=4,282	n=1,286
Mean (SD)	$11,817 (±19,974)	$10,398 (±15,659)	$14,448 (±20,800)
*Pre-index Rx costs, mean (SD)	$2,925 (±4,480)	$2,991 (±4,074)	$4,078 (±6,420)
*Pre-index medical costs, mean (SD)	$8,892 (±18,882)	$7,406 (±14,457)	$10,369 (±19,105)
Pre-index insulin use, n (%)	n=2,561 (14.8)	n=600 (14.0)	n=282 (21.9)

Table 3b. Commercial Baseline Clinical Characteristics

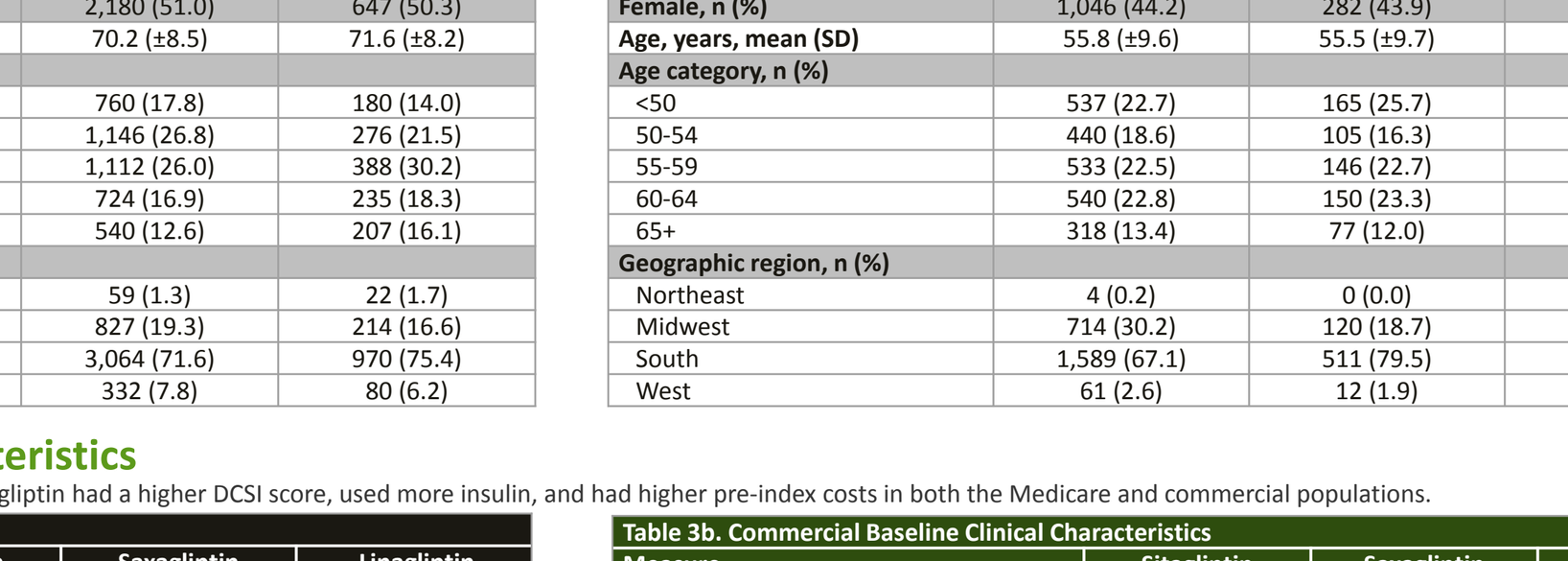
Measure	Sitagliptin	Saxagliptin	Linagliptin
DCSI score	n=2,368	n=643	n=218
Mean (SD)	0.9 (±1.4)	0.9 (±1.4)	1.2 (±1.8)
HbA1c levels	n=673	n=190	n=60
Mean (SD)	8.1 (±1.7)	8.2 (±1.6)	8.2 (±1.9)
***Pre-index total costs**	n =2,368	n =643	n =218
Mean (SD)	$9,356 (±25,473)	$8,222 (±15,182)	$13,868 (±41,372)
*Pre-index Rx costs, mean (SD)	$2,576 (±4,350)	$2,940 (±6,162)	$4,060 (±7,941)
*Pre-index medical costs, mean (SD)	$6,780 (±24,507)	$5,282 (±13,625)	$9,808 (±39,030)
Pre-index insulin use, n (%)	n=253 (10.7)	n=63 (9.8)	n=39 (17.9)

*All costs are reported as 2013 dollars.

Figure 1. Direct Medical Costs

There were no differences in adjusted medical and total health care costs between treatment groups in the Medical and commercial cohorts.

Adjusted pharmacy costs for sitagliptin were significantly higher than linagliptin in the commercial cohort.



*p<0.001 compared to linagliptin

Conclusions

- Although baseline demographics in Medicare and commercial populations were similar across the DPP-4 inhibitor medication groups, patients on linagliptin may have been more complex (i.e., higher DCSI, more insulin use at baseline).
- When controlling for baseline factors, 12-month post-index total healthcare costs were similar across all index DPP-4 medications.

Limitations

- Results were subject to limitations inherent in all claims databases, such as missing and miscoded data.
- While Humana is a large national health plan with members throughout the U.S., results may not be generalizable to other populations.
- Medication refills do not ensure the patient consumed their medication.
- The study sample was limited to those with HbA1c results available in the database.

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