Health Care Costs Associated With Treatment Modification in Type 2 Diabetes Mellitus Patients Taking Oral Anti-diabetic Drugs

A comparison of health care costs in patients with diabetes who do not initially respond to oral therapy suggests that it might be appropriate and clinically beneficial for providers to consider adding another oral agent, rather than up-titrating the current medication, particularly beyond intermediate dose levels.


ABSTRACT

Objectives: To compare health care costs among patients with type 2 diabetes mellitus (T2DM) who added a new oral anti-diabetes drug (OAD) to an initial regimen with those who up-titrated their initial OAD.

Methods: Insurance claims data were obtained from 94 health plans for patients aged ≥18 years with ICD-9-CM diagnosis of T2DM during the period Jan. 1, 2001–June 30, 2007, and a newly prescribed metformin or sulfonylurea monotherapy. Patients were followed after initiating monotherapy to identify occurrence of first-treatment modification (addition or up-titration). Health care costs were analyzed during 360 days after first treatment modification. Subgroup analyses included comparison of addition cohort with two titration subgroups: 1) titration up to or below intermediate doses and 2) titration to beyond intermediate doses.

Results: During the post-treatment modification period, all-cause medication costs were 9% higher (p <0.0001), while inpatient costs were 14% lower for the addition cohort (p<0.008) as compared to the up-titration cohort. The total risk-adjusted health care costs were slightly lower but statistically insignificant for the addition cohort compared to the up-titration cohort (ratio of cost = 0.99; p = 0.052). These costs patterns remained similar for both the up-titration subgroups.

Conclusions: While addition of another OAD to the initial OAD regimen may result in higher medication costs, the lower inpatient costs and overall offset in the subsequent total costs may indicate clinical benefits with the add-on treatment. When appropriate and clinically beneficial, physicians may want to consider adding an OAD rather than up-titrating the current OAD, particularly beyond intermediate dose levels.

INTRODUCTION

Diabetes represents a growing epidemic worldwide and is a major global health and economic concern. Evidence indicates that both the prevalence and incidence of T2DM are on the rise, each increasing by approximately 5% annually in the United States over the past 15 years—leading to increased demand and costs for medical care (CDC 2005, Mainous 2007). According to a study by the American Diabetes Association, diabetes in the United States costs an estimated $174 billion in 2007 in medical expenditures and lost productivity, $116 billion of which were attributed to medical costs (ADA 2008).

When lifestyle modifications alone cannot achieve glycemic control, first-line choices for pharmacotherapy are typically sulfonylurea or metformin monotherapy (Boccuzzi 2001). If glycemic control is not achieved with lifestyle intervention and initial monotherapy dose, the initial dose is often up-titrated (intensifying therapy), and standard of care for second-line treatment is a combination regimen with metformin and sulfonylurea, followed by further step-wise additions of other oral medications or insulin to achieve glycemic control (Nathan 2009).

Prior research indicates that the use of monotherapy as initial treatment, as well as a lack of timely oral antidiabetic treatment modifications, are common in the United States and appear to contribute substantially to inadequate control of blood glucose levels in patients with T2DM (Brown...
who subsequently had either addi-
OAD regimen with new prescriptions
stricted to patients who started an
pective database analysis was re-
prescribed OADs, the current retro-
Study design
was therefore exempt from Institu-
ance Portability and Accountability
compliance with the Health Insur-
sive of health plan enrollment. In
variables; product and payer type;
records. It also includes demographic
International Classification of Dis-
tion of 966,892 individuals
with ≥2 claims for diabetes mellitus
ICD-9-CM code 250.xx) during the study period (Jan. 1, 2001 through
Members of this initial
group were eligible for study in-
and post-index-event periods.
Study population
Initial database screening led to the
identification of 966,892 individuals
with ≥2 claims for diabetes mellitus
ICD-9-CM code 250.xx) during the study period (Jan. 1, 2001 through
Members of this initial
group were eligible for study in-
and post-index-event periods.
Study design
Although data were collected for all
prescribed OADs, the current retro-
spective database analysis was re-
stricted to patients who started an
OAD regimen with new prescriptions
for metformin or sulfonylurea and
who subsequently had either addi-
tion or up-titrated as treatment
modifications. Metformin and sul-
fonylureas are the most commonly
used first-line single-agent regimens
and were defined as index regimens.
The first incidence of either up-titra-
tion or medication addition after ini-
tiating the index regimen was defined
as the index event, and the date of
occurrence was considered the index
event date. The pre-index-event pe-
riod was defined as the 180-day pe-
period preceding the index event date;
the post-index-event period was de-
ined as the 360-day period following
the index event date. For study inclu-
sion, patients were required to be
continuously enrolled in a health in-
surance plan during both the pre-
and post-index-event periods.
Index regimen
Index regimen was defined as a
new prescription for either met-
formin or sulfonylurea monotherapy.
A new prescription was defined as a
prescription fill following a “clean”
period of ≥180 days prior to the fill
date during which the patient was
continuously enrolled in a health plan.
A treatment regimen was con-
sidered continuous if ≥1 prescrip-
tion(s) was filled for the same OAD
index medication for ≥120 days with
no gap in coverage >3 days between
refills, and the patient remained con-
tinuously enrolled in a health plan
throughout the period covered by
the days’ supply of the index medication.
Regimen censorship occurred in one
of three ways: the occurrence of sec-
ond modification following the index
event of up-titration or addition, dis-
enrollment (a gap of >10 days be-
tween the “end date” of one enroll-
ment period and the “effective start
date” for the health plan), or when the
patient follow-up reached the end of
the study period.
Regimen modifications
Regimen modification was defined as
the first observed change in the
index regimen following the index
event date. Initial regimen modifica-
tions that were of interest for this study
were addition and up-titration.
Addition was defined as the occur-
rence of ≥1 prescription fill(s) for ≥1
new OAD (glyburide, glipizide, glip-
izide GITS, glimepiride, repaglinide,
nateglinide, metformin, metformin
XR, rosiglitazone, pioglitazone, acar-
bose, miglitol, glyburide/metformin, glipizide/metformin, rosiglita-
zone/metformin) following initiation of an index OAD, with a refill of the
index OAD within 90 days of the pre-
scription fill date for the new, addi-
tional OAD. (Note that patients with
post-index insulin use were included
in this study, and that dipeptidyl pep-
tidase 4 inhibitors were not yet on
the market for most of the study pe-
period.). Up-titration was defined as
the occurrence of a dose increase of
the index medication; dose was de-
termined using prescription claims
information on drug strength, quan-
tity dispensed, and days supplied.
Index and new OADs must have been
prescribed for ≥90 days to allow suf-
ficient time for clinical effects.

**Study measures and outcomes**

**Demographic and clinical characteristics**

Demographic and clinical charac-
teristics were evaluated based on data
obtained on the index date or during
the pre-index-event period. Comor-
bidty burden was estimated using the
Dartmouth-Manitoba adaptation of the
Charlson Comorbidity Index
(termed as modified CCI) (Romano
1993).

**Economic measures**

Economic measures included co-
payment (out-of-pocket costs) for
index medications and total health
utilization and costs during the pre-
index-event period.

**Health care costs**

For each patient, total health care
costs during the 360-day follow-up
period were evaluated and compared
across study cohorts (addition vs. up-
titration). Health care costs were fur-
ther divided into the following cost
components: all-cause medication
costs, office visit costs, hospital in-
patient visit costs, hospital outpatient
visit costs, emergency room visit
costs, home health care costs, and lab-
oratory costs.

**Statistical analysis**

Descriptive statistics were used to
describe differences in patient char-
acteristics for the addition versus up-
titration cohorts. Summary statistics
were presented as percentages for cat-
egorical variables and as mean ± stan-
dard deviation (SD) for continuous
variables.

Health care costs were compared in
the addition versus up-titration co-
horts using parametric (chi-square
tests) and non-parametric (Wilcoxon
rank-sum) analyses, as appropriate;
p-values <0.05 were considered sta-
tistically significant. Because the cost
data were highly skewed, tests for sta-
tistical significance were run on me-
dian costs rather than means. Multi-
variable analyses of 12-month health
care costs was performed using Gen-
eralized Linear Models (GLM) with a
gamma distribution and log-link
function, to make inferences about
the statistical significance of cost dif-
fences. The ratio of costs was cal-
culated by exponentiating and divid-
ing beta estimates obtained in the
regression model, interpreted as the
percentage difference in the depend-
ent variable across the study cohorts.
(For example, if the ratio of costs =
0.85, this means an expected 15%
lower cost among the average patient
in the reference group, holding all
other variables constant). All data
management and analyses were con-
ducted using Statistical Analysis Soft-
ware (SAS), version 9.1.

**RESULTS**

A total of 22,917 patients satisfied
study inclusion criteria; 16,352 patients
received metformin as their index
OAD regimen and 6,565 patients re-
ceived sulfonylurea. Overall, 27% of
patients (n=6,191) had a second OAD
added to their initial OAD during the
study; 73% of patients (n=16,726) up-
titrated their initial OAD regimen. Of
those patients with OAD additions,
12.6% (n=780) added a branded OAD
and 87.4% (n=5,411) added a generic
OAD.

**Sociodemographic and health
care profiles**

There were significant differences
between index event groups with re-
gard to gender, age, geographic re-
igion, health insurance type, copay-
ment, days from index OAD to index
event, and health care costs during
the pre-index-event year (all p <0.05)
(Table 1).

**Total health care costs**

**Descriptive costs analyses**

During the post-index-event pe-
riod, total median unadjusted health
care costs for the addition cohort
($4,264 vs. $4,764, p<0.0001) (see
Table 2) were significantly lower than
for the up-titration cohort. Further
breakdown of total costs into various
cost components indicated signifi-
cantly higher all-cause medication
costs for the addition cohort (medi-
ans = $2,871 vs. $2,188, p<0.0001)
as compared to the up-titration cohort
but significantly lower costs for in-
patient admissions (medians = $802
vs. $1,902, p<0.0001). The observed
cost patterns were similar in the two
OAD regimens (Table 2). The most
common primary diagnoses asso-
ciated with inpatient admissions
were for T2DM and coronary ather-
sclerosis for both the study cohorts.

**Multivariable regression models**

The GLM comparison of total
health care costs in the post-index-
event period (adjusting for selected
factors, including type of index medi-
cation, prior health care expendi-
tures, and demographic and clinical
variables) found no statistically sig-
nificant difference in risk-adjusted
total annual health care costs between
the addition and up-titration cohorts
(ratio of costs = 0.99; p=0.052). Vari-
ables significantly associated with
higher total health care costs included
having initiated sulfonylurea monother-
apy (vs. metformin monotherapy), older age (aged 45–64
years vs. 18–34 years), enrollment in
a non-HMO plan, and higher pre-
index-event total health care costs (all \( p < 0.05 \)). Finally, total costs were 22% higher for each 1-point increment in modified CCI scores \( (p < 0.0001) \) (Table 3).

Separate multivariable GLM models were run to examine the differences in all-cause medication costs and inpatient costs across the cohorts, after adjusting for selected factors. The risk-adjusted all-cause medication costs remained significantly higher for the addition cohort as compared to the up-titration cohort (ratio of costs = 1.09; \( p < 0.0001 \)), while the risk-adjusted inpatient costs were 14% lower for the addition group as compared to the up-titration group (ratio of costs = 0.86; \( p = 0.008 \)).

**Subgroup analyses**

Among patients who were up-titrated, 48% (n=8,057) received intermediate doses or below (subgroup 1), while 52% (n=8,669) up-titrated beyond the intermediate dose (subgroup 2). Total health care costs remained lower for the addition cohort (median = $4,264) as compared to both up-titration subgroups (medians = $4,724; \( p < 0.0001 \) for subgroup 1; and $4,811, \( p < 0.0001 \) for subgroup 2), with highest costs in subgroup 2. Similar to the overall cohort, subgroup regression analyses demonstrated that total costs for new OAD addition were slightly lower than for both up-titration subgroups, but these differences were not statistically significant (both \( p > 0.05 \); Table 5). The risk-adjusted all-cause medication costs were significantly higher for the addition cohort as compared to both up-titration subgroups (sub-

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**TABLE 1**

**Patient sociodemographics and health care profiles**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>All n = 22,917</th>
<th>Addition n = 6,191</th>
<th>Up-titration n = 16,726</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, %</td>
<td>50.4</td>
<td>47.9</td>
<td>51.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Age (years), mean (Std Dev)</strong></td>
<td>50.62 (9.62)</td>
<td>51.87 (9.52)</td>
<td>50.16 (9.75)</td>
<td>0.0001</td>
</tr>
<tr>
<td><strong>Region, %</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>20.2</td>
<td>22.1</td>
<td>19.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Midwest</td>
<td>46.5</td>
<td>43.9</td>
<td>47.5</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>25.8</td>
<td>28.0</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>7.5</td>
<td>6.0</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td><strong>Plan type, %</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer-directed health care product</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0001</td>
</tr>
<tr>
<td>Health maintenance organization (HMO)</td>
<td>40.2</td>
<td>37.6</td>
<td>41.2</td>
<td></td>
</tr>
<tr>
<td>Indemnity plan</td>
<td>4.2</td>
<td>4.3</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Point of service (POS)</td>
<td>13.2</td>
<td>13.3</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Preferred provider organization (PPO)</td>
<td>39.2</td>
<td>42.0</td>
<td>38.1</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>2.2</td>
<td>1.9</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td><strong>Copayment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$0–$5</td>
<td>33.9</td>
<td>33.1</td>
<td>34.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>$6–$10</td>
<td>33.3</td>
<td>30.5</td>
<td>34.3</td>
<td></td>
</tr>
<tr>
<td>$11–$15</td>
<td>12.0</td>
<td>12.1</td>
<td>11.9</td>
<td></td>
</tr>
<tr>
<td>$16–$20</td>
<td>7.0</td>
<td>8.7</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>$21–$35</td>
<td>9.4</td>
<td>10.9</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>$36 +</td>
<td>4.5</td>
<td>4.7</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td><strong>Charlson comorbidity index in pre-index–event period</strong></td>
<td>1.09 (0.71)</td>
<td>1.06 (0.76)</td>
<td>1.11 (0.69)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Time from first OAD to treatment modification</strong></td>
<td>183.74 (224.85)</td>
<td>215.23 (269.62)</td>
<td>172.09 (204.60)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Labs/claims (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥1 claim for HbA1c test</td>
<td>81.4</td>
<td>81.9</td>
<td>81.2</td>
<td>0.2235</td>
</tr>
<tr>
<td>≥1 claim for FBG test</td>
<td>60.2</td>
<td>58.1</td>
<td>61.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Total health care expenditures in pre-index–event period</strong></td>
<td>$3,384.85</td>
<td>$3,309.24</td>
<td>$3,412.84</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Mean</td>
<td>$14,339.94</td>
<td>$9,160.77</td>
<td>$15,833.20</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>$1,169.20</td>
<td>$1,114.00</td>
<td>$1,191.32</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>$1,607,747.44</td>
<td>$185,053.95</td>
<td>$1,607,747.44</td>
<td></td>
</tr>
</tbody>
</table>
The results of this study indicate that despite the higher all-medication costs for the addition cohort than for the up-titration cohort, total health care costs remained similar — largely due to lower costs for inpatient admissions.

Previous studies have shown that addition of a second OAD with a complimentary mechanism of action to the initial monotherapy may result in improved glycemic control compared to up-titrating the initial monotherapy (Baksi 2004, Kerenyi 2004, Chacra 2009). In our study, it is possible that better clinical outcomes, such as improvement in HbA1c level and/or fewer diabetes-related complications with the addition of a second OAD may have lowered the non-medication-related costs, leading to similar total health care costs in the addition cohort. However, this study was not able to examine clinical outcomes after addition or up-titration of an initial OAD. Further studies are warranted to understand the differences in clinical outcomes and their association with costs among patients who added a second OAD vs. those who up-titrated their initial OAD regimen.

Multivariable regression analysis indicated slightly lower total annual health care costs among the addition cohort as compared to the up-titration cohort, although this difference was not statistically significant, apparently because their significantly lower inpatient costs were offset by increased medication costs in the addition cohort. Further studies with longer follow-up periods are needed to assess whether these differences persist over time, and whether they eventually lead to savings in overall costs with addition of another OAD.

**TABLE 2**
Total health care expenditure during the 360-day follow-up period (unadjusted)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type of index treatment modification</th>
<th>Addition</th>
<th>Up-titration</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total health care expenditure ($)</td>
<td></td>
<td>$8,157.41</td>
<td>$8,447.33</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($8313.00)</td>
<td>($8158.37)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>$2,870.73</td>
<td>$2,188.35</td>
<td></td>
</tr>
<tr>
<td>Medication costs</td>
<td></td>
<td>$4618.67</td>
<td>$4004.19</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($8313.00)</td>
<td>($8158.37)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>$2,870.73</td>
<td>$2,188.35</td>
<td></td>
</tr>
<tr>
<td>Office costs</td>
<td></td>
<td>$143.55</td>
<td>$137.08</td>
<td>0.072</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($93.99)</td>
<td>($109.04)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>$120.00</td>
<td>$124.00</td>
<td></td>
</tr>
<tr>
<td>Hospital inpatient costs</td>
<td></td>
<td>$1641.76</td>
<td>$2458.03</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($10124.90)</td>
<td>($13478.95)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>$802.45</td>
<td>$1,902.10</td>
<td></td>
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<tr>
<td>Hospital outpatient costs</td>
<td></td>
<td>$264.00</td>
<td>$263.70</td>
<td>0.5143</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($1190.92)</td>
<td>($1234.51)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>$108.00</td>
<td>$101.40</td>
<td></td>
</tr>
<tr>
<td>ER costs</td>
<td></td>
<td>$315.03</td>
<td>$337.44</td>
<td>0.8379</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($1773.09)</td>
<td>($1827.51)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>$242.60</td>
<td>$257.56</td>
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<tr>
<td>Home health care costs</td>
<td></td>
<td>$195.89</td>
<td>212.18</td>
<td>0.631</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($547.77)</td>
<td>($1012.69)</td>
<td></td>
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<tr>
<td></td>
<td>Median</td>
<td>$93.82</td>
<td>$107.85</td>
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<tr>
<td>Independent lab costs</td>
<td></td>
<td>$49.06</td>
<td>$44.52</td>
<td>0.0035</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>($347.38)</td>
<td>($167.38)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>$23.40</td>
<td>$21.70</td>
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</table>
to the initial OAD treatment as compared with up-titration.

A previous prospective economic study of older T2DM patients (aged ≥60 years) showed that addition of rosiglitazone to sulfonylurea therapy was associated with lower direct health care costs and decreased use of health care resources, in particular hospitalizations and ER visits, compared with progressive up-titration of sulfonylurea (Herman 2005). Lower health care services utilization and decreased costs of care have been reported to be associated with improved glycemic control (Wagner 2001, Gilmer 2001). The difference in total costs was slightly higher for patients who were up-titrated beyond the intermediate dose as compared to those who were up-titrated up to the intermediate dose, perhaps because of limited incremental efficacy when up-titrating beyond intermediate doses for these OADs. Although progressive up-titration of initial OAD therapy is often the first choice in treatment modification, it may not always be beneficial, especially when the medication is titrated beyond the intermediate dose. In previous studies, adding a TZD to sulfonylurea was shown to be clinically effective in improving glycemic control as compared to up-titrating a sulfonylurea to its maximum dose. In one study of 471 patients with T2DM who were inadequately controlled on a half-maximal dose of glinazide (fasting plasma glucose ≥7.0 and ≤15.0 mmol/l), adding rosiglitazone to glinazide resulted in a significant reduction in HbA1c level (p<0.0001) as compared to up-titrating glinazide to a maximum of 320 mg/day (Baksi 2004). Similarly, addition of rosiglitazone to glibenclamide achieved significantly improved glycemic control as compared with up-titration of glibenclamide (maximum dose = 15 mg/day) among 340 patients with T2DM inadequately controlled on glibenclamide 7.5 mg/day (Kerenyi 2004). Better efficacy and safety was also observed with the combination treatment of saxagliptin and glyburide, with statistically significant reductions in HbA1c, fasting plasma glucose (FPG), and postprandial glucose from baseline to week 24, as compared with up-titration of glyburide monotherapy (Chacra 2009).

**Limitations**

This claims study has several limitations. First, the observational nature of this study does not permit causal inferences from these results.
The nature of the data used for this study limited our capacity to analyze patients’ laboratory data, such as glycemic levels; thus, the potential association between glycemic control and economic outcomes was not analyzed. This study did not examine or control for any medication compliance measure such as medication possession ratio.

The current study required that patients be eligible for continuous enrollment within their health plans for the length of the observation period. These data also do not include uninsured or non-continuously eligible patients, so these results should only be generalized to the insured population.

This study evaluated costs through only 12 months following the initial therapy change. Our study looked back only 6 months and assumed that patients were OAD therapy-naïve if no claims for any OAD therapy were found during this period.

Finally, this study is also subject to several limitations that are inherent in investigations that rely on the use of administrative claims data. For example, lack of laboratory data (e.g., HbA1c levels) limits our ability to evaluate treatment goals. Further, the time from first OAD to treatment modifications was significantly different between the two cohorts, which could represent differences between the populations that cannot be captured through administrative claims data. Because administrative claims data were used to determine cost estimates, errors due to billing and coding cannot be ruled out, which may lead to biased cost estimates.

CONCLUSIONS

Addition of a second OAD to the initial OAD treatment in a population of patients with T2DM was associated with higher all-cause medication costs as compared to up-titration of an initial OAD treatment, but with lower inpatient costs. Overall, risk-adjusted total annual health care costs were slightly lower but statistically non-significant for addition than for up-titration; perhaps indicating offsets in total costs for the addition cohort due to lower treatment-related complications and associated outcomes. OAD addition may be an appropriate option to consider when contemplating progressive up-titration of initial OAD therapy, particularly beyond intermediate dose levels.

REFERENCES


