Predictors of Early Treatment Modifications for Uncontrolled Type 2 Diabetic Medicare Advantage Prescription Drug Plan Members

Poster# SAT 654

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*Potential conflict of interest may exist. Please refer to disclaimers

Abstract

Background: Treatment modification of antidiabetic medication regimens (AMR) for Medicare Advantage Prescription Drug (MAPD) members with type-2 diabetes mellitus (T2DM) within 90 days of an HbA1c reading ≥9% has been shown to have positive impact on subsequent HbA1c levels and Diabetes Complications Severity Index (DCSI) score.

Objective: To examine factors predicting early treatment modification among patients with uncontrolled T2DM defined as HbA1c ≥ 9%.

Methods: This was a retrospective administrative claims-based study of T2DM patients continuously enrolled between 07/01/2012 – 9/30/2014 in a Humana MAPD insurance plan. Multivariate logistic regression (MLR) was used to predict likelihood of timely treatment modification within 90 days post HbA1c ≥9%. The final analytic file was split into training/testing datasets for validation. Candidate factors included, but were not limited to, provider/patient demographics, baseline clinical conditions, and utilization metrics, and baseline antidiabetic medication regimens in the pre-index period.

Outcome Measures: Timely treatment modification was defined as any addition, discontinuation, switch, or dose change for AMR post-index regimen occurring within 90 days after an HbA1c reading ≥9%. Dose change was not considered for insulin.

Results: Of the 25,170 patients qualified for the study, 13,268 (53%) received timely treatment modification (TT), while 11,902 (47%) received no timely (NT) treatment modification. Demographic characteristics were similar across the two groups. The NT group more frequently received low income subsidy (33.3% vs %31.0%, p < 0.001, NT vs. TT, respectively) and experienced a higher number of unique chronic co-morbid conditions [mean (s.d.), 13.2 (5.9) vs 12.2 (5.5), p< 0.001, NT vs. TT]. The TT group on average utilized more unique classes of AMR compared to NT cohort [mean (s.d.), 2.1 (0.9) vs 1.7 (0.8), p <0.001]. However, the NT group had higher observed insulin utilization than the TT group (76 % vs 51%, p < 0.001). NT and TT cohorts had significantly different average pre-index Deyo-Charlson index [mean (s.d.), 3.3 (2.3) vs 3.8 (2.4), p<0.001, NT vs. TT] and DCSI [mean (s.d.), 2.1 (2.1) vs 2.6 (2.4), p<0.001, NT vs. TT] scores. In the MLR, baseline drug therapy regimen was predictive of treatment modification. Patients on monotherapy or dual therapy were less likely to experience treatment modification than patients on multi-therapy [≥3 drugs, OR, (95 % CI): 0.44 (0.37, 0.53) vs 0.78 (0.70, 0.88), respectively]. A one unit increase in Deyo-Charlson score was associated with reduced odds of subsequent modification [OR, 95% CI; 0.97 (0.94, 0.99)]. The final model exhibited good discriminant ability (C-statistic = 0.72).

Conclusions: More than half the patients received treatment modification within 90 days of an HbA1c ≥ 9%. However, providers seemed to delay treatment modification for patients with less complicated AMR and clinical complexity.

Results

Figure 1. Patient Selection

Patients with ≥ 2 outpatient, or 1 in patient, claims for Diabetes
N = 614,232

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Patients with ≥ 1 claim for HbA1c between July 1, 2013 and June 30, 2014
n = 284,115

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Diabetic patients with HbA1c ≥ 9 between July 1, 2013 and June 30, 2014
n = 39,986

↓

Exclusion of patients with long term institutional care
n = 39,843

↓

Patients with ≥ 12-months continuous pre-index enrollment and ≥ 3 months post index
N=34,205

↓

Age 18-89 as of index date
n = 33,893

↓

Patients with valid providers' data (excluding duplicate providers)
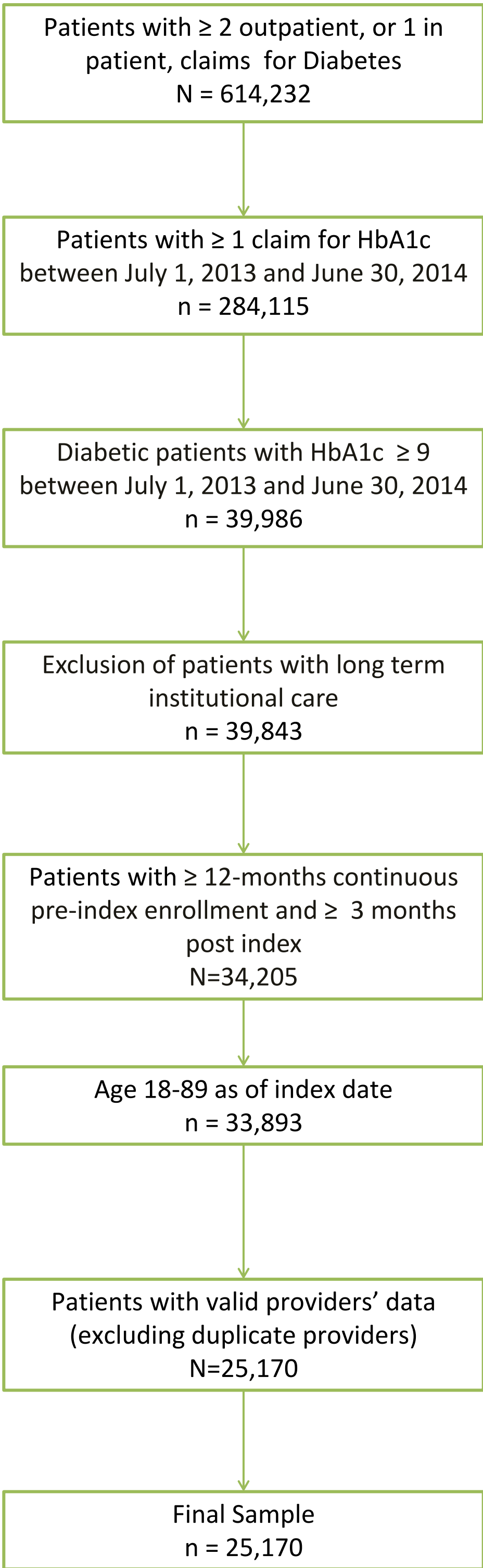N=25,170

↓

Final Sample
n = 25,170

Table 1. Key Baseline Demographic and Clinical Characteristics

Baseline Characteristic	Non-timely Treatment n = 11,902	Timely Treatment n = 13,268	P value [a]
Baseline clinical characteristics, mean [SD]			
Deyo-Charlson score	3.8 [2.4]	3.3 [2.3]	<0.001
DCSI Score	2.6 [2.4]	2.1 [2.1]	<0.001
Average number of chronic conditions	13.2 [5.9]	12.2 [5.5]	<0.001
Social determinants of health, n (%)			
Urban	8347 (70.1)	9442 (71.2)	0.072
Low Income Subsidy	3,962 (33.3)	4,115 (31.0)	<0.001

[a] P values were calculated based on Chi-square and Wilcoxon Rank tests

Table 2. Key Provider Characteristics and Baseline Use of Medical Services

Baseline Characteristics and Utilization	Non-timely Treatment n = 11,902	Timely Treatment n = 13,268	P value [a]
Provider Characteristics, n (%)			
Specialty			
General Practitioner	197 (1.7)	244 (1.8)	0.267
Family/Internal Medicine	9,448 (79.4)	10,819 (81.5)	<0.001
Endocrinology	931 (7.8)	725 (5.5)	<0.001
Cardiologists	67 (0.6)	106 (0.8)	0.024
Others	1,259 (10.6)	1,374 (10.4)	0.565
Type of Practice			
Solo Practice	2,850 (23.9)	3,099 (23.4)	0.273
Group Practice	8,437 (70.9)	9,583 (72.2)	0.019
Unknown Practice	615 (5.2)	583 (4.4)	0.004
Baseline use of medical services, n (%)			
Hospitalization	0.4 (0.9)	0.3 (0.8)	<0.001
ER visits	1.2 (2.4)	0.9 (2.2)	<0.001
Outpatient visits	10.9 (7.6)	9.9 (6.9)	<0.001

ER = emergency room
[a] P values were calculated based on Chi-square, Wilcoxon Rank tests and t-test

Table 3. Significant Baseline Medication Utilization

Baseline Medication Utilization	Non-timely Treatment n = 11,902	Timely Treatment n = 13,268	P value [a]
Diabetic Regimen, n (%)			
Mono-therapy	5,333 (44.8)	2,810 (21.2)	<0.001
Dual-therapy	4,340 (36.5)	6,129 (46.2)	<0.001
Multiple therapy	2,229 (18.7)	4,329 (32.6)	<0.001
Class of Anti-diabetic Medication, n (%)			
Biguanides	5,169 (43.4)	9,233 (69.6)	<0.001
Dipeptidyl Peptidase-4 Inhibitors (DPP-4)	981 (8.2)	2,125 (16.0)	<0.001
Glucagon-like peptide-1 (GLP-1) receptor agonists	229 (1.9)	563 (4.2)	<0.001
Thiazolidinediones (TZDs)	387 (3.3)	785 (5.9)	<0.001
Insulin	9,099 (76.4)	6,746 (50.8)	<0.001
Meglitnide	90 (0.8)	242 (1.8)	<0.001
Sulfonylureas	4,567 (38.4)	8,473 (63.9)	<0.001
Average # of Antidiabetic Groups Per Patient, mean [SD]	1.74 [0.8]	2.14 [0.9]	<0.001
Average # of Medications Per Patient, mean [SD]	15.5 [6.8]	14.6 [6.5]	<0.001

[a] P values were calculated based on Chi-square, Wilcoxon Rank tests and t-test

Table 4. Coefficient Estimates of the Final Predictive Model (n=12,585 for training dataset)

Baseline Medication Utilization and Characteristics	Odds Ratio	95% Confidence Interval		P value
		Lower Limit	Upper Limit	
Diabetic Regimen				
Mono-therapy vs. Multiple therapy	0.444	0.37	0..533	<0.001
Dual Therapy vs. Multiple therapy	0.783	0.696	0.881	<0.001
Class of Anti-diabetic Medications				
Biguanides	1.65	1.48	1.839	<0.001
Dipeptidyl peptidyl-4 inhibitor	1.17	1.02	1.35	0.027
Insulin	0.37	0.33	0.412	<0.001
Sulfonylurea	1.45	1.30	1.62	<0.001
Baseline clinical characteristics				
Pre-index Deyo-Charlson score	0.97	0.94	0.99	0.015
Number of chronic conditions	1.01	1.00	1.02	0.02
Urban vs. Rural	1.11	1.02	1..21	0.008

Table 5. Performance of the Predictive Model

Measure	In-Sample Diagnostic Measure (test dataset)	Out-of-Sample Diagnostic Measures (training dataset)
C-statistic	0.72	0.71
Sensitivity	70.9	69.7
Specificity	62.4	62.4
False Positive Rate	31.9	32.9
False Negative Rate	34.6	34.8

Discussion

HbA1c is the standard biomarker used by physicians to assess diabetes control, evaluate the efficacy of antidiabetic medication regimens and adjust treatment if needed. HbA1c ≥9% is indicative of poor glycemic control and warrants clinical evaluation for treatment modification. In this study, we found that only 53% of the HbA1c ≥9% cohort had a timely treatment modification while a large proportion of patients did not receive any type of treatment modification in the same timeframe.

Factors associated with timely treatment modification were related to the current antidiabetic medication regimens (both the number AND type of AMR) and the overall complexity of clinical conditions as measured by Deyo-Charlson Comorbidity Index. Patients on monotherapy or dual therapy with an HbA1c value of at least nine percent were less likely to have a treatment modification within 90-days than members on multiple therapy. Biguanides, Dipeptidyl peptidase-4 inhibitor and Sulfonylureas were all associated with higher likelihood of treatment modification compared to members not taking these medications. Patients on insulin had less likelihood of treatment modification (switch, discontinuation or new addition) compared to those without insulin. Nevertheless, those patients could have had dose up titration but were not captured through medical/pharmacy claims. As the Deyo-Charlson score decreases, patients were less likely to have their baseline diabetic medication regimen modified within 90-days post HbA1c of at least nine percent.

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