Evaluation of Association Between Diabetes-Related Quality Measure Achievement and Diabetes Complications in a Medicare Advantage Population

Jeffrey J. Ellis,[1] Jon R. Bouchard,[2] Vishal Saundankar,[1] Keran Moll,[1] Jean Baltz,[3] Yunus Meah,[3] Chad Moretz[1]

1. Comprehensive Health Insights, Louisville, KY, USA
2. Novo Nordisk Inc., Plainsboro, NJ, USA
3. Humana Inc., Louisville, KY, USA

Background

- Individuals with Type 1 diabetes mellitus (T1DM) or Type 2 diabetes mellitus (T2DM) may be at risk for a range of complications including retinopathy, nephropathy, limb amputation, and the development of cardiovascular complications.
- Centers for Medicare and Medicaid Services (CMS) rates Medicare Part C and D plans on several quality measures for the purpose of educating consumers on the quality of Medicare plans in the marketplace including increasing the transparency of health plan performance and comparison.[1]
- Specific quality measures for Medicare Part C and D focus on indicators that track quality of medical care and medication management, in diabetic patients.[1,2]
- It remains unclear if attaining these CMS diabetes quality indicators improves outcomes.

Objective

Assess the achievement of eight diabetes-related quality measures, at the patient level, and examine whether achievement was associated with fewer complications.

Methods

- **Study Design:** Retrospective cohort study
- **Data Source:** Humana administrative database, which contains integrated medical, pharmacy, and lab-related claims, and member-level achievement indicators for Medicare Part C quality measures. Medicare Part D measures were provided to Humana by Accumen, LLC, a third party vendor.
- **Patient Selection:**
  - Medicare Advantage plan with Prescription Drug coverage (MAPD) patients, aged 18 to 75 years as of December 31, 2011, continuously enrolled from January 1, 2010 to December 31, 2011, with a diagnosis of diabetes during the pre-index period, defined by at least one of the following:
    - ≥1 prescription claims for insulin or oral hypoglycemics/antihyperglycemics.
    - ≥2 two face-to-face encounters, in an outpatient setting or nonacute inpatient setting, on different dates of service, with a diagnosis of diabetes (250.x).
    - ≥1 face-to-face encounter in an acute inpatient or ED setting, with a diagnosis of diabetes.
  - Exclusions included:
    - Diagnosis of gestational diabetes (648.8) or pregnancy (630.xx-679.xx or v22.x-v24.x) at any position during the study period.
    - Diagnosis of both T1DM (250.x1 or 250.x3) and T2DM (all other 250.x ICD-9 CM codes) AND the presence of ≥1 prescription claims for oral hypoglycemics/antihyperglycemics.
    - Long-term care facility stay >30 days at any point during the study period.
  - Quality Measure-Specific Exclusion Criteria:
    - Each quality measure has its own CMS-defined exclusion criteria[1] and sample size.
- **Baseline Characteristics:** Pre-index demographic and clinical characteristics were assessed.
- **Quality Measures:** Eight DM-related quality measures[1] studied and clinical desirability of measure achievement listed below:
  - HbA1c Poor Control >9%: Not clinically desirable
    - measure achieved if the most recent HbA1c level is >9.0%, missing, or was not done during the measurement year.
  - Eye Exam: Clinically desirable
    - measure achieved if ≥1 of the following exams is completed by an eye care professional: a retinal or dilated eye exam in the measurement year, OR a negative retinal or dilated eye exam (negative for retinopathy) in the year prior to the measurement year.
  - LDL-C Screening: Clinically desirable
    - measure achieved if an LDL-C test was performed during the measurement year, as identified by claim/encounter or automated laboratory data.
  - LDL-C Control <100 mg/dL: Clinically desirable
    - measure achieved if the most recent LDL-C level is <100 mg/dL.
  - Medical Attention for Nephropathy: Clinically desirable
    - measure achieved if a nephropathy screening test or evidence of nephropathy, as documented through administrative data, is present during the measurement year.
  - Medication Adherence to Oral Diabetes Medications: Clinically desirable
    - measure achieved if proportion of days covered (PDC) was greater than or equal to 80% across biguanides, sulfonylureas, and thiazolidinediones, or combinations thereof.
  - Diabetes Medication Dosing (DMD): Not clinically desirable
    - measure achieved if patient dispensed a dose higher than the daily recommended dose for the following diabetes treatment therapeutic categories of oral hypoglycemic: biguanides, sulfonylureas, and thiazolidinediones (TZDs).
    - DMD quality measure was analyzed separately across the three classes.
    - Due to data availability, 1 of 62 MAPD was not available for this measure.
  - Diabetes Treatment (DT): Not clinically desirable
    - measure achieved if patient had a day's supply of renin angiotensin system (RAS) antagonist less than the largest days' supply of a different antihypertensive agent.
    - Due to data availability, 38 of the 62 MAPD plans were available for this measure.
- **Outcome: New or Worsening Diabetic Complications**
  - Diabetes Complications Severity Index (DCSI) score has been shown to predict adverse outcomes including hospitalization and mortality based on number and severity of complications associated with diabetes.[3]
  - Patients were assessed for an increase in diabetes-related complications that occurred during the measurement year.
    - Baseline DCSI was scored for the pre-index period (2010).
    - Measurement year DCSI was scored across both the pre-index (2010) AND the post-index (measurement year; 2011) periods.
    - A member with a measurement year DCSI greater than the baseline DCSI was categorized as having "New or Worsening Complications."
- **Statistical Analyses**
  - Unadjusted association between quality measure achievement and new or worsening diabetes complications was assessed using χ^2 tests or the Fisher exact test, as appropriate.
    - Analyses were conducted for all Part D measures (Adherence, DMD, DT) and for two of the Part C Measures (HbA1c Poor Control >9% and LDL-C Screening).
  - Adjusted impact of quality measure achievement on new or worsening diabetes complications was assessed by a stepwise logistic regression model, adjusted for all pre-index (baseline) demographic characteristics and the baseline DCSI score.
    - Models prepared for all Part D measures (Adherence, DMD, DT) and for two of the Part C Measures (HbA1c Poor Control >9% and LDL-C Screening).
    - Odds Ratios and 95% confidence intervals (CI) reported.
  - A priori alpha level for all inferential analyses was set at 0.05, and all statistical tests were two-tailed.

Results

Table 1. Baseline Demographic and Clinical Characteristics by Quality Measure(s)

Characteristic	General Population (n=164,238)	Part C Measure* Qualifiers (n=159,454)	Adherence Measure Qualifiers (n=95,978)	DMD – Biguanides Measure Qualifiers (n=83,759)	DMD – Sulfonylureas Measure Qualifiers (n=52,541)	DMD – Thiazolidinediones Measure Qualifiers (n=14,323)	Diabetes Treatment Measure Qualifiers (n=4,464)
Age, years , mean (SD)	68.0 (±6.4)	67.9 (±6.5)	67.9 (±6.3)	67.7 (±6.5)	68.2 (±6.1)	67.9 (±6.4)	67.7 (±6.3)
Age Category							
18-29	44 (0.03%)	45 (0.03%)	23 (0.02%)	23 (0.03%)	<10 (0.01%)	<10 (0.03%)	<10 (0.0%)
30-39	578 (0.4%)	580 (0.4%)	303 (0.3%)	307 (0.4%)	108 (0.2%)	44 (0.3%)	15 (0.3%)
40-49	3,274 (2.0%)	3,399 (2.1%)	1,892 (1.9%)	1,769 (2.1%)	881 (1.7%)	282 (1.9%)	77 (1.7%)
50-59	13,336 (8.1%)	13,266 (8.3%)	8,006 (8.3%)	7,320 (8.7%)	4,108 (7.8%)	1,215 (8.5%)	418 (9.4%)
60-69	62,541 (38.1%)	60,476 (37.9%)	37,222 (38.8%)	32,974 (39.4%)	20,170 (38.4%)	5,444 (38.0%)	1,837 (41.2%)
70-79	84,465 (51.4%)	81,688 (51.2%)	48,532 (50.6%)	41,366 (49.4%)	27,270 (51.9%)	7,334 (51.2%)	2,117 (47.4%)
Gender							
Female	82,447 (50.2%)	80,148 (50.3%)	48,020 (50.0%)	42,432 (50.6%)	24,725 (47.1%)	6,474 (45.2%)	2,274 (50.9%)
Male	81,791 (49.8%)	79,306 (49.7%)	47,958 (50.0%)	41,327 (49.4%)	27,816 (52.9%)	7,849 (54.8%)	2,190 (49.1%)
Race/Ethnicity							
White	131,073 (79.8%)	125,554 (78.7%)	75,960 (79.1%)	66,582 (79.5%)	40,936 (77.9%)	11,220 (78.3%)	3,710 (83.1%)
Black	25,357 (15.4%)	25,715 (16.1%)	14,985 (15.6%)	12,678 (15.1%)	8,753 (16.7%)	2,220 (15.5%)	367 (8.2%)
Hispanic	2,677 (1.6%)	3,099 (1.9%)	1,721 (1.8%)	1,553 (1.9%)	975 (1.9%)	320 (2.2%)	72 (1.6%)
Other/Unknown	5,131 (3.1%)	5,086 (3.2%)	3,312 (3.5%)	2,946 (3.5%)	1,877 (3.6%)	563 (3.9%)	315 (7.1%)
Geographic Region							
Midwest	44,954 (27.4%)	42,381 (26.6%)	21,931 (22.8%)	19,234 (22.9%)	12,053 (22.9%)	3,509 (24.5%)	619 (13.9%)
Northeast	2,925 (1.8%)	2,711 (1.7%)	1,803 (1.9%)	1,591 (1.9%)	998 (1.9%)	275 (1.9%)	489 (10.9%)
South	104,073 (63.4%)	102,770 (64.4%)	64,109 (66.8%)	55,581 (66.4%)	35,487 (67.5%)	9,276 (64.7%)	1,917 (42.9%)
West	12,286 (7.5%)	11,592 (7.3%)	8,135 (8.5%)	7,353 (8.8%)	4,003 (7.6%)	1,263 (8.8%)	1,439 (32.2%)
Population Density							
Urban	100,672 (61.3%)	98,931 (62.0%)	58,306 (60.7%)	50,946 (60.8%)	32,095 (61.1%)	8,500 (59.3%)	2,838 (63.6%)
Suburban	42,885 (26.1%)	40,963 (25.7%)	25,138 (26.2%)	21,900 (26.2%)	13,540 (25.8%)	3,882 (27.1%)	1,127 (25.3%)
Rural	19,550 (11.9%)	18,484 (11.6%)	11,847 (12.3%)	10,313 (12.3%)	6,521 (12.4%)	1,842 (12.9%)	458 (10.3%)
Unknown	1,131 (0.7%)	1,076 (0.7%)	687 (0.7%)	600 (0.7%)	385 (0.7%)	99 (0.7%)	41 (0.9%)
Low Income Subsidy							
Yes	30,788 (18.8%)	34,513 (21.6%)	20,632 (21.5%)	17,595 (21.0%)	11,124 (21.2%)	4,020 (28.1%)	994 (22.3%)
Dual Eligibility Status							
Yes	3,688 (2.3%)	4,532 (2.8%)	2,509 (2.6%)	2,177 (2.6%)	1,344 (2.56%)	534 (3.7%)	113 (2.5%)
Diabetes Type							
Type 1	5,194 (3.2%)	4,923 (3.1%)	310 (0.3%)	317 (0.4%)	242 (0.5%)	68 (0.5%)	12 (0.3%)
Type 2	153,736 (93.6%)	152,663 (95.7%)	93,447 (97.4%)	81,332 (97.1%)	51,687 (98.4%)	14,086 (98.3%)	4,321 (96.8%)
Unknown	5,308 (3.2%)	1,868 (1.2%)	2,221 (2.3%)	2,110 (2.5%)	612 (1.2%)	169 (1.2%)	131 (2.9%)
Comorbidity Measures							
DCCI Score, mean (SD)	2.2 (±1.9)	2.3 (±1.9)	2.2 (±1.8)	2.0 (±1.7)	2.4 (±1.9)	2.1 (±1.7)	1.9 (±1.6)
DCSI Score, mean (SD)	1.8 (±1.9)	1.8 (±1.9)	1.7 (±1.8)	1.6 (±1.7)	1.9 (±1.9)	1.6 (±1.8)	1.5 (±1.7)

*Part C measures include: HbA1c Poor Control >9%, Eye Exam, LDL-C Screening, LDL-C Control <100 mg/dL, Medical Attention for Nephropathy; Sample sizes depending on the quality measure's CMS-defined exclusion criteria and patient-level data availability; SD, Standard Deviation; DCCI, Deyo-Charlson Comorbidity Index

Figure 1. Quality Measure Achievement Rates

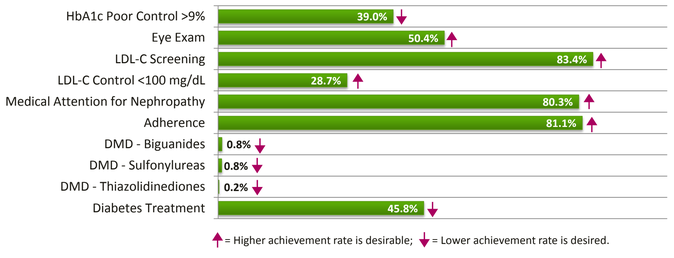

Table 2. Unadjusted Associations of New or Worsening Diabetes Complications and Quality Measure Achievement

Quality Measure	Quality Measure Achieved?	Definition	% of Patients Experiencing New or Worsening Diabetes Complications	p-value
HbA1c Poor Control >9%	Yes	HbA1c Poor Control >9%	39.7%	***<0.0001***
	No	HbA1c Control ≤9%*	36.0%	
LDL-C Screening	Yes	At least 1 LDL Screen in Year*	38.3%	***<0.0001***
	No	No LDL Screens in Year	31.9%	
Adherence	Yes	PDC ≥ 80%*	37.8%	***0.0003***
	No	PDC < 80%	36.4%	
DMD - Biguanides	Yes	Dosing EXCEEDS Recommended	41.2%	***0.0296***
	No	Within Recommended Dosing*	37.1%	
DMD - Sulfonylureas	Yes	Dosing EXCEEDS Recommended	43.6%	0.1354
	No	Within Recommended Dosing*	39.9%	
DMD - Thiazolidinediones	Yes	Dosing EXCEEDS Recommended	44.0%	0.5425
	No	Within Recommended Dosing*	38.1%	
Diabetes Treatment	Yes	Suboptimal Antihypertensive Therapy	42.3%	***<0.0001***
	No	RAS Antagonist Overlap 100%*	34.1%	

*Clinically-desirable outcome

Table 3. Adjusted* Odds of New or Worsening Diabetes Complications by Quality Measure Achievement

Quality Measure	Quality Measure Achieved?	Definition	Odds of New or Worsening Diabetes Complications OR (95% CI)	p-value
HbA1c Poor Control >9%	Yes	HbA1c Poor Control >9%	1.12 (1.10 - 1.15)	***<0.0001***
	No	HbA1c Control ≤9%**	reference	
LDL-C Screening	Yes	At least 1 LDL Screen in Year**	1.32 (1.28 - 1.36)	***<0.0001***
	No	No LDL Screens in Year	reference	
Adherence	Yes	PDC ≥ 80%**	reference	***0.0005***
	No	PDC < 80%	0.94 (0.91 - 0.97)	
DMD - Biguanides	Yes	Dosing EXCEEDS Recommended	1.15 (0.99 - 1.35)	0.0733
	No	Within Recommended Dosing**	reference	
DMD - Sulfonylureas	Yes	Dosing EXCEEDS Recommended	1.15 (0.94 - 1.40)	0.1826
	No	Within Recommended Dosing**	reference	
DMD - Thiazolidinediones	Yes	Dosing EXCEEDS Recommended	1.37 (0.61 - 3.07)	0.4466
	No	Within Recommended Dosing**	reference	
Diabetes Treatment	Yes	Suboptimal Antihypertensive Therapy	1.40 (1.24 - 1.59)	***<0.0001***
	No	RAS Antagonist Overlap 100%**	reference	

*Adjusted for all pre-index (baseline) demographic characteristics and the baseline DCSI score; **Clinically-desirable outcome; OR, odds ratio; CI, confidence interval.

Results Summary

- Cohort size ranged from 4,464 to 159,454, depending on the quality measure and patient-level data availability (Table 1).
- Most patients (>80%) achieved LDL-C screening, nephropathy, and adherence standards (Figure 1).
- <1% of patients exceeded dosing standards for biguanides, sulfonylureas, and TZDs (Figure 1).
- Eye screening and use of appropriate anti-hypertensive treatments had low achievement levels (50.3% and 54.2%, respectively; Figure 1).
- A majority (61%) of patients achieved HbA1c<9% while 29% achieved LDL-C control <100mg/dl (Figure 1).
- Statistically significant univariate associations were identified for new or worsening diabetes complications and achievement of: HbA1c Poor Control >9%, LDL-C Screening, Adherence, DMD-Biguanides, Diabetes Treatment (Table 2).
- Logistic regression estimates showed that the odds of developing new or worsening diabetes complications (Table 3) statistically significantly increased with:
  - Failure to reduce HbA1c below 9% [(OR, 1.12 (95% CI, 1.10-1.15); p<0.0001)].
  - Failure to use RAS Antagonist anti-hypertensive treatment [(OR, 1.40, (95% CI, 1.24-1.59); p<0.0001].
- Counter-intuitively, the odds of developing new or worsening diabetes complications (Table 3):
  - Statistically significantly increased in patients with at least 1 LDL-screen [(OR, 1.32 (95% CI, 1.28-1.36); p<0.0001)].
  - Statistically significantly decreased in patients with a PDC < 80% [(OR, 0.94 (95% CI, 0.91-0.97); p=0.0005)].

Conclusion

The assessment of a 1-year measurement period suggests that attainment of several CMS diabetes quality measures may be associated with lower new or worsening complication risk. Follow-up longitudinal studies may provide clarity on the long-term impact of achieving quality measures.

Limitations

- This study utilized data from Humana MAPD health plans only and may not be generalizable.
- Due to limitations of data provided by Humana's quality data third party vendor, a number of plans were excluded due to incomplete data.
- Causal inference cannot be directly determined as relationships between quality measure achievement and outcomes were based on statistical associations and temporal relationships.

References

1. Centers for Medicare and Medicaid Services. Medicare Health & Drug Plan Quality and Performance Ratings 2012 Part C & Part D Technical Notes. Updated January 18, 2012.
2. Pharmacy Quality Alliance. PQA Measures Used by CMS in the Star Ratings. http://pqaalliance.org/measures/cms.asp. Accessed March 13, 2013.
3. Chang H-Y, Weiner JP, Richards TM, Bleich SN, Segal JB. Predicting costs with diabetes complications severity index in claims data. The American Journal Of Managed Care 2012;18:213-9.

Presented at the 19th Annual Meeting of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) | Montreal, Quebec, Canada
May 31 – June 4, 2014