CASE-MIX ADJUSTMENT OF ADHERENCE-BASED PHARMACY QUALITY INDICATOR SCORES

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BACKGROUND

- In 2006, the Pharmacy Quality Alliance (PQA) was formed with the mission of "*improving the quality of medication use across health care settings… measuring and reporting performance information related to medications".*
- Detailed specifications were developed for 22 measures in the areas of medication adherence and persistence, efficiency, safety, diabetes, cardiovascular and respiratory care[1].
- Measures related to medication adherence have been previously pilot-tested and concluded to be feasible and sound[2].
- However, an important limitation is the assumption that the measures used were completely at the control of the pharmacist[2].
- Patient characteristics such as comorbidity burden, socio-economic status and medication regimen complexity have been shown to affect medication adherence[3].
- These variables are generally outside the pharmacist's control and should be adjusted for while measuring and comparing pharmacy performance.

OBJECTIVES

- To evaluate three different methods to compute risk-adjusted pharmacy quality scores based on adherence-based pharmacy quality indicators.

METHODS

- This retrospective cohort study used the 2007 Mississippi Medicare administrative claims dataset.
- Patient medication adherence was assessed using the proportion of days covered (PDC) measures proposed by the Pharmacy Quality Alliance for these seven therapeutic classes of medications: Beta Blockers, Angiotensin Converting Enzyme (ACE) Inhibitors / Angiotensin Receptor Blockers, Statins, Calcium Channel Blocker, Thiazolidinediones, Sulfonylureas and Biguanides[4].
- Patients were eligible if they received at least two prescription fills for any medication in the drug class and received at least 75% of their prescription fills from the same pharmacy.
- Pharmacy quality scores were calculated for each therapeutic class as the percentage of adherent (PDC>=0.8) patients in given pharmacy for all pharmacies serving Medicare beneficiaries in the state.
- Risk-adjusted pharmacy performance scores were computed using a classical logistic regression model (Method 1), a hierarchical random-intercept model (Method 2) and the shrinkage estimators of the random-intercept model (Method 3).
- Patient demographics, income subsidy status, and co-morbidity burden were used as variables for risk adjustment.

METHODS

- We used the chronic disease categories of the Rx-Risk instrument, developed by Fishman et al.[5] (2003) to measure co-morbidity burden.
- The agreement in classification of pharmacies based on unadjusted and adjusted scores was measured using Cohen's kappa coefficient.
- We evaluated agreement in identifying outlier pharmacies based on the 95% confidence intervals of the scores and identifying the top 20%

RESULTS

- The logistic regression model and the random-intercept model displayed good predictive ability (c-statistic>0.7) for all therapeutic classes.
- The odds ratio estimates of all patient characteristics were similar in both models. We found that adherence was influenced by low-income subsidy status, race and co-morbidity burden of the beneficiary.
- Presence of chronic conditions such as depression, diabetes, hypertension, hyperlipidemia, pain and inflammatory disorders, were associated with decreased odds of being adherent.
- The residual intraclass correlation coefficient ranged from 0.008 to 0.012 indicating that although pharmacy-level factors may have a significant impact, they are not as important as patient-level factors in determining adherence.
- Higher levels of agreement were observed between pharmacy classifications based on unadjusted scores and risk-adjusted scores obtained from Methods 1 and 2 (0.5<kappa<0.74) with the percentage change in classification ranging from 16.3%-28.4%.
- Scores based on Method 3 produced fewer outliers and showed minimal agreement with unadjusted scores (0.19<kappa<0.35).
- In identifying the top 20% (Table 3), unadjusted scores classified 8-12% of the lower performing pharmacies high performing (top 20%) and classified 29-42% of the high performing pharmacies (top 20%) as lower performers.
- In comparison, almost perfect agreement was observed between pharmacy classification based on Method 1 and Method 2 with Kappa values ranging from 0.97-1.00.
- Pharmacy classification based on Method 3 were in strong agreement with classification based on Method 1 and Method 2 (0.79<κ<0.86).
- 87,220 and 60,913 beneficiaries met our eligibility criteria for the Adherence to ACEI/ARBs and Statins measures respectively. We present the results of our analysis for these two measures here (Tables 1-2).
- We also present a summary of the comparison of risk-adjusted and unadjusted measures in identifying the top 20% of pharmacies.

RESULTS

Table 1. Agreement in identifying Pharmacy Quality Outliers: Comparison of unadjusted and risk adjusted pharmacy quality indicator scores - Statins

Outlier status based on unadjusted score	Outlier Status After Risk Adjustment								
	Method 1[a]			Method 2[b]			Method 3[c]		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Low	81	56	1	81	56	1	37	101	0
Medium	51	295	30	51	297	28	5	360	11
High	2	43	85	3	43	84	1	81	48
Change in classification (%)[d]	39.5%	25.1%	26.7%	40%	25%	25.7%	13.9%	33.6%	18.6%
Cohen's Kappa		0.49			0.50			0.35	

[a]Based on classical logistic regression model,
[b]Based on random-intercept model,
[c]Based on shrinkage estimators of random-intercept model
[d]Calculated for each risk adjustment method using the classification based on the risk adjustment method as the correct classification.

Table 2. Agreement in identifying Pharmacy Quality Outliers: Comparison of unadjusted and risk adjusted pharmacy quality indicator scores – ACEI/ARBs

Outlier status based on unadjusted score	Outlier Status Based on Risk Adjustment								
	Method 1[a]			Method 2[b]			Method 3[c]		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Low	98	61	1	106	53	1	44	115	1
Medium	30	298	26	32	299	23	6	342	6
High	2	54	112	2	54	112	1	97	70
Change in classification (%)[d]	24.6%	27.8%	19.4%	24.3%	26.3%	17.6%	13.7%	38.3%	9.09%
Cohen's Kappa		0.57			0.59			0.38	

[a]Based on classical logistic regression model,
[b]Based on random-intercept model,
[c]Based on shrinkage estimators of random-intercept model
[d]Calculated for each risk adjustment method using the classification based on the risk adjustment method as the correct classification.

RESULTS

Table 3. Agreement between unadjusted and risk adjusted pharmacy quality indicator scores in identifying top 20%

Drug Class	Risk Adjustment Method								
	Method 1[a]			Method 2[b]			Method 3[c]		
	Cohen's Kappa	False (+)ve[d]	False (-)ve[d]	Cohen's Kappa	False (+)ve[d]	False (-)ve[d]	Cohen's Kappa	False (+)ve[d]	False (-)ve[d]
Beta-blocker	0.61	7.86%	30.6%	0.61	7.86%	30.6%	0.63	7.46%	29.03%
CCB	0.52	9.71%	38.5%	0.52	9.71%	38.5%	0.53	9.5%	37.7%
ACEI/ARB	0.56	8.8%	34.8%	0.57	8.64%	34.1%	0.56	8.8%	34.8%
Sulfonyl-urea	0.60	8.18%	30.9%	0.60	8.18%	30.9%	0.58	8.64%	32.7%
Biguanide	0.60	8.06%	31.75%	0.60	8.06%	31.8%	0.62	7.66%	30.2%
TZD[e]	0.47	11%	42.1%	-	-	-	-	-	-
Statin	0.57	8.54%	34.1%	0.57	8.54%	34.1%	0.58	8.35%	33.3%

[a]Based on classical logistic regression model
[b]Based on random-intercept model
[c]Based on shrinkage estimators of random-intercept model
[d]False positive and false negative error rates were calculated for each risk adjustment method assuming the classification based on the risk adjustment method to be the correct classification
[e]Due to sample size restrictions, we were not able risk-adjust performance scores using the random-intercept model for this measure

CONCLUSIONS

- Risk-adjusted scores produced more robust indicators of pharmacy quality than unadjusted scores.
- Not adequately addressing the effects of patient case-mix while measuring quality can have severe implications if these measures are used to generate quality report cards or pay-for-performance.

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