Annual Diabetic Eye Examinations in a Managed Care Medicaid Population

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ABSTRACT

Objectives: To assess how well a managed care organization performed annual diabetic eye screening in a Medicaid population, and to identify barriers to completion.

Study Design: Cross-sectional study.

Methods: Healthcare claims data for all Medicaid patients with diabetes covered by Priority Partners Managed Care Organization in 2010 and 2012 were collected, and the annual rates for diabetic eye exams in those years were reported. Predictors of completion of the diabetic eye exam in primary care clinics in 2010 and 2012 were assessed using a logistic regression model.

Results: We identified 8902 Medicaid patients with a diagnosis of diabetes using the Healthcare Effectiveness Data and Information Set codes: 3838 patients in 2010 and 5064 patients in 2012. In 2010 and 2012, 46% and 64% of patients, respectively, had completed their annual diabetic eye exam. The increase in participation in annual eye exams from 2010 to 2012 was statistically significant (P <.001). Among the factors increasing the likelihood of completion of an annual diabetic eye exam among the Medicaid population were access to a nonmydriatic fundoscopic camera in the primary care clinic, compliance with glycated hemoglobin measurement based on the recommended guidelines, incentives offered to primary care offices, and higher resource utilization band score. Financial incentives to patients, however, lowered the completion rate.

Conclusions: Annual diabetic eye exam completion is low among the Medicaid population. Detecting high-risk patients and adjusting for factors that play a role in nonadherence both increase the rate of annual diabetic eye exams among underserved populations such as Medicaid patients.

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The number of patients with diabetes worldwide is increasing, and is predicted to double from 171 million in 2000 to more than 366 million by 2030[1]—the World Health Organization (WHO) predicts that diabetes will be the seventh-leading cause of death in the world in 2030.[2] In 2012 in the United States, an estimated 29.1 million people, or 9.3% of the population, had diabetes.[3] Diabetic retinopathy (DR) is one of the leading causes of blindness in the United States and other developed countries.[3,4] Annual diabetic eye exams and prompt treatment, if needed, are considered the key strategies to control vision loss due to diabetes; early detection and appropriate timely intervention for DR would result in a greater than 90% reduction in blindness due to diabetes.[5] In the United States, about 50% of people with diabetes do not receive an annual eye exam for early detection and treatment of DR, and many of those with DR who would benefit from laser treatment fail to receive such care.[6-11] Although about 98% of patients with diabetes see their primary care physician or endocrinologist at least once a year, the number is much lower for ophthalmology visits.[12] Risk factors for inadequate eye care include older age, lower socioeconomic status, lower educational attainment, living in a rural area, shortage of eye care specialists, lack of healthcare insurance, and receiving medical care from a family medicine physician or general practitioner.[11,13-15]

Different DR screening programs with various levels of effectiveness have been tested in the United States and around the world, including healthcare services located in shops, workplaces, residences, or schools, as well as the provision of mobile health vans and telemedicine technology. None of these alternative approaches involve experienced physicians or, more specifically, an ophthalmologist or retina specialist on-site.[12]

Johns Hopkins HealthCare (JHHC) was created in 1995 as a partnership between the Johns Hopkins Health System and the Johns Hopkins University School of Medicine to develop and administer contractual healthcare relationships

Take-Away Points

An annual diabetic eye exam is the main strategy to screen for vision-threatening diabetic retinopathy (DR). To improve screening rates of an at-risk population, we recommend the following interventions:

- Application of telemedicine technology, if available.
- Financial incentives for physicians.
- Improvement of diabetes control, including increase in compliance with glycated hemoglobin measurement and better treatment coverage for systemic disease.

To reduce diabetes-related eye disease, we recommend the design of a referral system for patients with positive DR to an ophthalmology service for future follow-up and treatment.

in a managed care organization construct. JHHC boasts a unique care management program to provide support for members with chronic conditions. In 2011, JHHC planned to increase the completion rate for annual diabetic eye exams for Medicaid diabetic patients. To achieve this, JHHC provided nonmydriatic fundoscopic cameras to 3 clinics in the Baltimore area in 2011 and 2012. The camera made it possible to take retinal images of eligible diabetic patients during the time of their primary care visit without the need for pupil dilation. The images were reviewed by retina specialists at Wills Eye Institute in Philadelphia and results were scanned into patients' charts; patients were then informed about the results of the scan by their primary care physicians. Data on the screening for annual diabetic eye exam by using nonmydriatic camera were collected as well, including how many patients took advantage of the opportunity and factors that seemed to influence them in completing the screening. JHHC also offered financial incentives to primary care practices and to patients who completed the annual diabetic eye exam, and expanded its care management program for Medicaid patients.

In this report, we assess the completion rate for annual diabetic eye exam among Medicaid patients as well as barriers to full coverage, comparing data from 2010 and 2012.

METHODS

Healthcare claims data were collected for all Medicaid diabetic patients covered by JHHC in 2010 and 2012—the years before and after 2011, when the JHHC instituted its program to increase the completion rate for annual diabetic eye exams. To define diabetes and annual diabetic eye exam screening, we applied the Healthcare Effectiveness Data and Information Set (HEDIS) codes defined by the National Committee for Quality Assurance.[16]

HEDIS defined diabetic patients in the Medicaid program as "those Medicaid members aged 18 to 75 years with diabetes (type 1 and type 2) and no more than 1 gap in enrollment of up to 45 days during the measurement year. To determine continuous enrollment for a Medicaid beneficiary for whom enrollment is verified monthly, the member may not have more than a 1-month gap in coverage (ie, a member whose coverage lapses for 2 months [60 days] is not considered as continuously enrolled). Two methods identify members with diabetes: pharmacy data and claim/encounter data. The organization must use both to identify the eligible population, but a member only needs to be identified in 1 to be included in the measure. Members may be identified as having diabetes during the measurement year or the year prior to the measurement year."[17]

Procedures and Measures

We assessed the effect of several factors on the rate of diabetic eye exams in the primary care setting. We compared the completion rates for diabetic eye exams in 2010 and 2012, while adjusting for factors such as access to a nonmydriatic camera (based on the clinic to which patients were assigned); gender (as documented in claims data); age (date of birth as documented in claims data); compliance with recommended glycated hemoglobin (A1C) measurements (collected from claims data for this specific measurement); financial incentive offer to primary care physicians; financial incentive offer for patients who completed annual diabetic eye exam; medication possession rate (MPR; collected from pharmacy claims data); and resource utilization band (RUB) score as defined by the Johns Hopkins Adjusted Clinical Group Mix System (the ACG System).[18] The ACG System as a predictor of healthcare utilization has been validated in multiple settings.[19,20] The RUB values are: 0 (no or only invalid diagnosis); 1 (healthy users); 2 (low); 3 (moderate); 4 (high); and 5 (very high users).

The incentive for both providers and patients was $25. Those providers deemed to be eligible to receive the incentive were those who cared for a high volume of JHHC patients; the intent was to phase in incentives to lower-volume providers over time. The patient incentive was available only to those cared for by eligible providers.

Statistical Analysis

We performed descriptive and univariate analysis to assess the completion rate for diabetic eye exams in 2010 and 2012. We also performed multivariate logistic regression

Table 1. Demographic and Baseline Characteristics of Participants in Diabetic Eye Examination in 2010 and 2012

Variable	Number (median or %)		*P*
	2010	2012	
Age (years)	18-64 (47)	18-64 (47)	—
Gender (female)	2674 (70)	3508 (69)	.686
Compliance with A1C	2821 (73)	3876 (77)	.001
Completion of diabetic annual eye exam	1736 (46)	3261 (64)	<.001
Scanned with nonmydriatic camera	0	353 (7)	—

A1C indicates glycated hemoglobin.

analysis to evaluate potential factors that affected compliance with the recommended annual diabetic eye exam.

RESULTS

We identified 8902 Medicaid patients with a diagnosis of diabetes using HEDIS codes: 3838 patients in 2010, and 5064 patients in 2012. Table 1 presents the demographic and baseline characteristics of participants in both years. In 2012, 50% of primary care provider offices and 87% of patients received the opportunity to collect incentives to complete the diabetic eye exam. There were no offers for incentives to physicians and patients in 2010. The MPR scores for diabetic medications in 2010 and 2012 were 0.76 and 0.77, respectively; the difference was not statistically significant ($P = .778$). In 2010, RUB was moderate for 39% of patients, high for 29%, and very high for 26%. In 2012, RUB was moderate for 39%, high for 30%, and very high for 25% of patients.

Table 2 presents the result of a multivariate logistic regression model for compliance with the annual diabetic eye exam, reporting the odds ratio (OR), 95% CI, and *P* value for each of the covariates in the model. The OR for completing the annual diabetic eye exam was 2.49 (95% CI, 2.10-2.95) comparing 2012 with 2010 ($P <.001$). Patients assigned to clinics with access to a nonmydriatic camera had an OR of 1.51 (95% CI, 1.05-2.15) for completing their annual diabetic eye exam compared with those patients in clinics without access to a nonmydriatic camera ($P = .024$). The OR of having an annual diabetic eye exam versus not having an exam was 1.01 (95% CI, 1.01-1.02) with each 1-year increase in age ($P <.001$). Patients with successful A1C control had an OR of 1.52 (95% CI, 1.00-2.31) for completing their annual diabetic eye exam compared with those who were not compliant with A1C measurement ($P = .047$). When an incentive was offered to primary care physicians to complete annual diabetic eye exams for their eligible patients, the OR of having the exam was 1.82 (95% CI, 1.55-2.14) compared with those patients whose primary care physicians did not get an offer of an incentive ($P <.001$).

When incentives were offered to eligible patients to complete their annual diabetic eye exam, the OR of completing the exam was 0.27 (95% CI, 0.19-0.37) compared with those eligible patients who did not get an offer of an incentive ($P <.001$). Comparing low, moderate, high, and very high RUB patients with healthy users, the OR for completing the annual diabetic eye exam was 1.05 (95% CI, 0.59-1.85), 4.29 (95% CI, 2.80-6.58), 6.80 (95% CI, 4.41-10.50), and 5.16 (95% CI, 3.34-7.97), respectively ($P = .857$, <.001, <.001, and <.001, respectively).

DISCUSSION

There are expected to be 30.3 million adults with diabetes in the United States by 2030,[1] with the cost of their care predicted to outpace the rate of population growth.[21] DR is one of the leading causes of blindness in the United States; between 2005 and 2008, the estimated prevalence of DR and vision-threatening DR among US adults with diabetes was 28.5% and 4.4%, respectively.[4] The key strategies to control vision loss due to diabetes include annual diabetic eye exam screening and prompt treatment if needed. Screening for DR is among several cost-saving preventive measures for diabetic patients,[22] so annual diabetic eye exams have been implemented in national health systems in numerous European countries. The British National Health System (NHS) incorporated the screening for diabetic retinopathy in 2008 and used it as a performance measure of overall quality of care.[23,24] As part of its "quality assurance standards," the NHS aimed for the following key performance indicators; equal or more than 70% of screening uptake; equal or more than 70% of issuing results within 3 weeks of screening; and equal or more than 80% specialist consultation for screen positive tests.[25] Studies have shown a decline in sight-threatening DR at second or subsequent screening.[26]

In the United States, the annual diabetic eye exam is

Table 2. Multivariant Logistic Regression for Annual Diabetic Eye Examination and Risk Factors for Noncompliance With the Exam

Variable	Odds Ratio	95% CI	*P*
Year (2012 vs 2010)	2.49	2.10-2.95	.000
Nonmydriatic camera (available vs unavailable)	1.51	1.05-2.15	.024
Gender (female vs male)	1.00	0.89-1.13	.941
Age (years)	1.01	1.01-1.02	.000
A1C (compliant vs noncompliant)	1.52	1.00-2.31	.047
Primary care physician incentive (offered vs not offered)	1.82	1.55-2.14	.000
Patient incentive (offered vs not offered)	0.27	0.19-0.37	.000
Medication possession ratio (MPR)	1.03	0.61-1.74	.900
Resource Utilization Band (RUB) 2 vs 1	1.05	0.59-1.85	.857
RUB 3 vs 1	4.29	2.80-6.58	.000
RUB 4 vs 1	6.80	4.41-10.50	.000
RUB 5 vs 1	5.16	3.34-7.97	.000
A1C & MPR	1.54	0.87-2.71	.136

A1C indicates glycated hemoglobin.

not available for almost one-third of patients with diabetes at high risk for vision loss, and treatment is available for less than 40% of those at high risk for vision loss.[11,14] The low rate of DR screening and treatment is not limited to the United States, however. Based on a WHO report in 2006, only an estimated 20% of diabetic patients with sight-threating proliferative DR had 4 ophthalmology visits (with fundus exam) in a 5-year period.[12] In the current study in 2010, 46% of Medicaid population had the recommended annual diabetic eye exam, and it increased to 64% across our Medicaid population in 2012.

In 2004, the American Academy of Ophthalmology recommended single-field photography of the retina as a sufficient screening method for the presence of DR, but insufficient in the management of this condition in the United States.[27] With the development of telemedicine technology for DR screening, various DR screening programs have been tested in the United States and around the world. The new telemedicine technology has made it possible for diabetic patients to get their annual diabetic eye exam without an ophthalmology visit. With this technology, healthcare service located in shops, workplaces, residences, schools, and primary care physician offices could obtain retinal images without the need for pupil dilation or the presence of an ophthalmologist or retina specialist.[12] These healthcare services, in connection with an ophthalmology center, would complete the annual eye exam, review the scanned images, and contact patients regarding the result and necessity for further medical diagnostic or treatment intervention. Telemedicine technology has shown promising results for screening and detecting DR.[28]

Studies have shown high specificity for telemedical digital imaging in detecting different diabetic retinopathy severity levels. Telemedical digital imaging also compares favorably to the "gold standard" technology in detecting different diabetic retinopathy severity levels and diabetic retinopathy-related lesions (meaning that there is consistent detection of diabetic retinopathy severity level or diabetic retinopathy-related lesions through review of the same images by different image graders). Studies have reported high inter-grader reliability for telemedicine technology.[28] Inter-grader agreement for diabetic retinopathy levels was better for 3-field nonmydriatic digital imaging compared with mydriatic Early Treatment Diabetic Retinopathy Study (ETDRS) images of retina (kappa = 0.86 vs 0.76), and it was equal for 1-field nonmydriatic digital imaging compared with mydriatic ETDRS images of retina (kappa = 0.75 vs 0.76).[29] The telemedical strategies have been reported as convenient by many patients, reflected in high patient satisfaction and their increased adherence to annual screenings.[28]

Telemedical digital imaging is also a cost-effective method for reducing disparities in diabetic retinopathy screening services for underserved areas.[15] In our study, those clinics with access to a nonmydriatic camera showed about a 50% increase in the completion of annual diabetic eye screening among members of the Medicaid population.

The effect of financial incentives for primary care physicians and pay-for-performance on quality of care has been tested in different studies. Chen and colleagues[26]

detected a significant increase in the quality of care and decrease in hospitalization rates among patients with diabetes in a pay-for-performance program. In the current study, we observed an increase in the rate of annual diabetic eye exams among patients whose primary care physicians were offered a financial incentive for completion of such an exam. In contrast, financial incentives for patients appeared to discourage them from completing their annual diabetic eye exam.

Among factors playing a role in patients' compliance with annual diabetic eye exams, A1C measurement and higher MPR were associated with a higher rate of compliance. Those patients who were compliant with the A1C measurement showed an almost 50% increase in their annual diabetic eye exam rates; those with higher MPR had a slightly higher rate of annual diabetic eye exams. We believe these 2 indices are representative of general patient attitudes toward their diabetes. Those who are more active in self-management—namely, those compliant with reaching recommended A1C levels and higher MPR—are in better control of their disease and most probably would be more compliant with their annual eye exam. To test this hypothesis, we defined an interaction term between A1C compliance and MPR in our model. The term reflected the combined effect of these 2 indices in the model and resulted in about a 50% increase in the rate of annual diabetic eye exam (while the interaction term in the model was not statistically significant, we left the term in the model since it affected the OR and *P* of other model factors).

A major issue in DR control is providing resources for those in whom any sign of DR is detected in their annual visit. WHO strongly recommended concurrent resource allocation for ophthalmology referral and potential treatment when screening and detection programs were implemented, and called the detection of disease without treatment a poor use of resources from a public health perspective.[12] Lee and colleagues[30] assessed the chronic care of patients with a diagnosis of proliferative DR over 5 years using Medicare administrative claims. They reported at least 1 comprehensive eye examination every 15 months over those 5 years among fewer than 50% of patients. This report highlighted the problems and obstacles, longitudinally, with DR care patterns. In the current study, we did not have data on long-term follow-up for DR patients. We also did not have access to the results of prior annual eye exams for all of those who completed them. We calculated an estimate of referral rate in our population using the 28% DR prevalence in the United States between 2005 and 2008.[4] We limited the estimate to those 40 years or older, since the estimate of DR prevalence was for people in that age bracket.[4] In our study population in 2010, 2740 patients 40 years or older had diabetes and an estimated 767 patients had DR (2740 × 0.28 = 767). Of those 767 patients, 85 had a healthcare claim from an ophthalmology office, resulting in an estimated 11% (85/767) referral rate for those with DR. In 2012, 3584 patients 40 years or older had diabetes, and an estimated 1003 patients had DR (3584 × 0.28 = 1003). Of those 1003, 194 had a healthcare claim from an ophthalmology office, resulting in an estimated 19% (194/1003) referral rate for those with DR.

The rate might be underestimated since the annual diabetic eye exam was performed by an ophthalmologist for some patients and no further workup or treatment was needed at the time of DR diagnosis. The claims data also do not reflect those ophthalmology visits in which the patient did not use their insurance plan or in which coding errors may have been made by ophthalmology office staff, such as failure to reflect diagnosis or treatment of DR.

Limitations

This study has some limitations. Applications of healthcare claim data rely on the quality of reported claims and coding of services, which might not be complete. This method also misses those patients who seek services outside their insurance network. Further, the study reflects the behaviors of patients and providers in 1 geographic region—urban mid-Atlantic—which may limit its generalizability. Additionally, the population was selected based on HEDIS code set, which is fairly rigorous. Thus, some patients with diabetes may have been excluded from the analysis; however, the large sample size and highly significant findings reduce the likelihood of significant impact from this possibility. Another limitation of the study could be the size of incentive offered to eligible patients. While $25 is not insubstantial, focus groups determined that up to 5 times that sum would be needed to induce the desired behavior. The incentive was also limited to providers with whom JHHC had high patient volumes, so those with minimal patients likely did not report theirs. Obviously this limited the incentive to their patients, too. The limitation was due to administrative reasons—JHHC needed to develop the ability to pay the incentives, and started with a limited group of providers.

CONCLUSIONS

DR screening, followed by consultation with a specialist for those with positive screenings, should be considered an important part of diabetes management. Application

of telemedicine technology, detection of high-risk populations, and programs focused on provider engagement can potentially increase the rate of annual diabetic eye exams among underserved populations such as Medicaid patients.

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