Eye Care Utilization Among Insured People With Diabetes, U.S. 2010–2014

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Stephen R. Benoit,[1] Bonnielin Swenor,[2] Linda S. Geiss,[1] Edward W. Gregg,[1] and Jinan B. Saaddine[1]

EPIDEMIOLOGY/HEALTH SERVICES RESEARCH

OBJECTIVE

Diabetic retinopathy (DR) is the leading cause of blindness among working-age adults, and although screening with eye exams is effective, screening rates are low. We evaluated eye exam visits over a 5-year period in a large population of insured patients 10–64 years of age with diabetes.

RESEARCH DESIGN AND METHODS

We used claims data from IBM Watson Health to identify patients with diabetes and continuous insurance coverage from 2010 to 2014. Diabetes and DR were defined using ICD-9 Clinical Modification codes. We calculated eye exam visit frequency by diabetes type over a 5-year period and estimated period prevalence and cumulative incidence of DR among those receiving an eye exam.

RESULTS

Among the 298,383 insured patients with type 2 and no diagnosed DR, almost half had no eye exam visits over the 5-year period and only 15.3% met the American Diabetes Association (ADA) recommendations for annual or biennial eye exams. For the 2,949 patients with type 1 diabetes, one-third had no eye exam visits and 26.3% met ADA recommendations. The 5-year period prevalence and cumulative incidence of DR was 24.4% and 15.8% for patients with type 2 diabetes, respectively, and 54.0% and 33.4% for patients with type 1 diabetes.

CONCLUSIONS

The frequency of eye exams was alarmingly low, adding to the abundant literature that systemic changes in health care may be needed to detect and prevent vision-threatening eye disease among people with diabetes.

Diabetic retinopathy (DR) is the leading cause of new cases of blindness among working-age adults (1), resulting from microvascular changes in the retina due to the chronic hyperglycemia of diabetes. Control of serum glucose and blood pressure, early detection, and timely treatment of DR are critical in preventing debilitating vision loss (2,3). Monitoring eye exam visits is one way to evaluate prevention opportunities and adherence to current guidelines. Prior studies show that adherence to DR screening guidelines is low, especially among people with limited access to care (4). In this study, we reported the frequency of eye exam visits over a 5-year period in a large population of insured patients 10–64 years of age with type 1 and type 2 diabetes. We also calculated the period prevalence and cumulative incidence of DR among people with diabetes receiving an eye exam.

[1]Division of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA
[2]The Wilmer Eye Institute, Johns Hopkins University, Baltimore, MD

Corresponding author: Stephen R. Benoit, bvy8@cdc.gov

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RESEARCH DESIGN AND METHODS

Data Source

The IBM MarketScan Research Databases were used to identify a longitudinal cohort of patients with diabetes (5). Patient-level identifiers enabled tracking clinical encounters in the inpatient and outpatient setting as well as outpatient pharmacy claims. The population comprised working adults <65 years of age with commercial or employee-sponsored health plans and their dependents. From 2010 to 2014, there were ~4.8 million unique patients captured in the data with diabetes. The insurance companies and employers who were clients of IBM Watson Health contributed the data.

Definitions

We defined a patient with diabetes as a patient meeting one or more of the following criteria: *1*) two or more outpatient claims ≥30 days apart with an ICD-9 Clinical Modification (ICD-9-CM) code for diabetes (250.xx); *2*) one or more inpatient admissions with an ICD-9-CM code for diabetes or a diagnosis-related group code for diabetes (637, 638, or 639); or *3*) one or more claims for an oral diabetes medication or insulin using therapeutic class codes of 172–174 (6). We excluded patients with gestational diabetes (ICD-9-CM 648.8) if there was a code within the 1st year of the initial diabetes diagnosis. Patients with polycystic ovary syndrome (ICD-9-CM 256.4) were excluded if there was a diagnosis code for this syndrome at any point of time.

DR was categorized into four mutually exclusive groups, including nonproliferative DR (NPDR), severe NPDR, proliferative DR (PDR), and macular edema; a patient with one or more diagnosis codes meeting the definition of any DR type in the inpatient or outpatient setting was considered to have DR (7) (Table 1). In addition, a patient with a diagnosis code for severe NPDR, PDR, or macular edema was considered to have vision-threatening DR (VTDR) (Table 1).

We considered a patient to have type 1 diabetes if over 50% of the ICD-9-CM codes for diabetes were type 1 codes, there were at least three diabetes ICD-9-CM codes to evaluate, and there were no prescriptions for a sulfonylurea during the study period (Table 1). Otherwise, the patient was assumed to have type 2 diabetes. We used the Healthcare Effectiveness Data and Information Set measures for eye exam codes, which include codes from ICD-9-CM diagnoses and procedures, Current Procedure Terminology (CPT), and Healthcare Common Procedure Coding System (8). However, CPT codes 99203–99205, 99213–99215, and 99242–99245 are general office visits, not specific to ophthalmology. Those codes were only considered an eye exam if they were paired with a provider type of ophthalmologist or optometrist.

Eye exam visit frequency over the 5-year study period was categorized as zero or one or more visits. For those patients who had one or more eye exam visits, the largest time gap in years was noted between the start of the study and the first visit, between visits, and between the last visit and the end of the study period. The largest gap for these patients was categorized into >4–5 years, >3–4 years, >2–3 years, >1–2 years, or >0–1 year. For multinomial logistic regression models, we collapsed

Table 1—Key definitions

	Definition
DR	
NPDR	ICD-9-CM code 362.01, 362.03, 362.04, or 362.05
Severe NPDR	ICD-9-CM code 362.06
PDR	ICD-9-CM code 362.02, 250.5 + 364.42, 250.5 + 379.23, or 250.5 + 361.81
Macular edema	ICD-9-CM code 362.07, 250.5 + 362.53, or 250.5 + 362.83
VTDR	Severe NPDR, PDR, or macular edema
Type 1 diabetes	All three criterion must be met: *1*) >50% of ICD-9-CM codes for diabetes were 250.x1 or 250.x3, *2*) ≥3 ICD-9-CM codes for diabetes, *3*) no prescriptions for sulfonylurea during study period
Eye exam	Any of the following: *1*) CPT code 67028, 67030, 67031, 67036, 67038, 67039, 67040, 67041, 67042, 67043, 67101, 67105, 67107, 67108, 67110, 67112, 67113, 67121, 67141, 67145, 67208, 67210, 67218, 67220, 67221, 67227, 67228, 92002, 92004, 92012, 92014, 92018, 92019, 92225, 92226, 92230, 92235, 92240, 92250, 92260, 2022F, 2024F, or 2026F *2*) CPT code (99203, 99204, 99205, 99213, 99214, 99215, 99242, 99243, 99244, or 99245) + provider type optometrist or ophthalmologist *3*) HCPCS code S0620, S0621, S0625, or S3000 *4*) ICD-9-CM code V72.0 *5*) ICD-9-CM procedure code 14.1–14.5, 14.9, 95.02–95.04, 95.11, 95.12, or 95.16
Eye exam visit frequency during study period	Low: 0 eye exam visits or ≥1 visits with the largest gap of >4–5 years; medium: ≥1 eye exam visits with the largest gap of >2–4 years; high: ≥1 eye exam visits with the largest gap of >0–2 years
Prevalence	Numerator: patients who had DR at onset or developed DR during study Denominator: patients who had DR at onset or developed DR during study + patients with no DR but had ≥1 eye exam visit with at least one within 2 years of the study end date
Incidence	Numerator: patients who developed DR during study Denominator: patients who developed DR during study + patients with no DR but had ≥1 eye exam visit with at least one within 2 years of the study end date

HCPCS, Healthcare Common Procedure Coding System.

these groups to create low, medium, and high eye exam visit frequency categories (Table 1).

Patient Selection

We identified patients with continuous insurance coverage (including pharmacy coverage) from 1 January 2010 to 31 December 2014 (Supplementary Fig. 1). These patients were required to have a diabetes diagnosis code on or before 1 January 2010 to ensure that they had diabetes throughout the entire study period. Age was recorded at the beginning of the study in 2010. Patients ≥10 years old for type 1 and ≥20 years old for type 2 were included. Patients with capitated health plans were excluded because administrative coding practices for those patients may have been different. We also excluded patients who had no outpatient visits or inpatient admissions during the study period; these patients met the diabetes definition with drug prescriptions alone.

Data Analysis

We described the cohort of patients by diabetes type, DR status, age category, and sex. We assessed the frequency of eye exam visits for patients with no DR and those who had DR at the onset of the study, overall and by age category, sex, and diabetes type. For patients with type 1 diabetes, we only included patients with an initial diabetes diagnosis in 2005 or earlier since annual or biennial screening is recommended after a duration of 5 years of disease (9). A χ^2 test was used to compare differences in eye exam visit frequency among age-groups and sex. We used multinomial logistic regression to assess the association between eye exam visit frequency and the independent factors of age category, sex, diabetes duration, and VTDR. Separate multivariable models were run for patients with no DR and those with DR at the study onset. We used multinomial logistic regression because the models did not satisfy the proportional odds assumptions of ordinal regression.

For 5-year DR prevalence and incidence calculations, we excluded patients from the denominator with no DR and either *1*) no eye exam visits or *2*) one or more eye exam visits but visits were >2 years from the study end date. These patients had either no or insufficient opportunity for a DR diagnosis and would therefore falsely lower rate estimates. We calculated crude rates overall and by age-group and sex, stratified by diabetes type. A χ^2 test was used to compare differences in prevalence and incidence by age-groups and sex.

RESULTS

We identified 355,384 unique patients with diabetes with continuous insurance coverage during the 5-year study period; 6.0% met the definition for type 1 diabetes (Supplementary Table 1). Patients were from all 50 U.S. states, the District of Columbia, and Puerto Rico, and the six states with the most patients represented approximately half of the study population (Supplementary Fig. 2). The majority of the patients with type 2 diabetes were ≥50 years old, whereas the opposite was true for patients with type 1 diabetes (Supplementary Table 1).

For the 298,383 patients with type 2 diabetes and no DR, 48.1% had no eye exam visits over the study period; 15.3% met the American Diabetes Association (ADA) recommendations (9) for annual or biennial eye exam visits (Table 2, sum of last two columns). The frequency of eye exam visits was low in the 20–39-year age-group, with only 5.4% meeting biennial exams and an adjusted odds ratio (aOR) of low eye exam visit frequency 4.5 (95% CI 4.3–4.7) times higher compared with patients 40–64 years of age (Supplementary Table 2). For the 13,215 patients with type 2 diabetes and DR at the onset of the study, 11.2% had no eye exam visits during the study period; 50.9% met the ADA recommendations (9) for annual eye exams (Table 2). Again, eye exam visit frequency was lower in the younger age-group, with an aOR of low eye exam visit frequency 2.6 (95% CI 2.1–3.2) times

Table 2—Eye exam visit frequency among adults with type 2 diabetes and continuous insurance coverage, stratified by DR status, MarketScan Databases 2010–2014

	Number of eye exams during study period						
	0	≥1					
		Largest time gap between eye exams (years)					
		>4–5	>3–4	>2–3	>1–2†	>0–1†	*P* value
No DR, *n* (%)							
Total	143,499 (48.1)	25,785 (8.6)	37,004 (12.4)	46,360 (15.5)	37,594 (12.6)	8,141 (2.7)	
Age (years)							<0.0001
20–39	27,438 (66.9)	3,110 (7.6)	4,159 (10.1)	4,083 (10.0)	1,979 (4.8)	228 (0.6)	
40–64	116,061 (45.1)	22,675 (8.8)	32,845 (12.8)	42,277 (16.4)	35,615 (13.8)	7,913 (3.1)	
Sex							<0.0001
Males	68,080 (48.6)	12,320 (8.8)	17,480 (12.5)	21,623 (15.4)	17,000 (12.1)	3,682 (2.6)	
Females	75,419 (47.7)	13,465 (8.5)	19,524 (12.3)	24,737 (15.6)	20,594 (13.0)	4,459 (2.8)	
DR at onset of study, *n* (%)							
Total	1,474 (11.2)	862 (6.5)	1,498 (11.3)	2,664 (20.2)	4,278 (32.4)	2,439 (18.5)	
Age (years)							<0.0001
20–39	108 (18.3)	56 (9.5)	74 (12.6)	141 (23.9)	149 (25.3)	61 (10.4)	
40–64	1,366 (10.8)	806 (6.4)	1,424 (11.3)	2,523 (20.0)	4,129 (32.7)	2,378 (18.8)	
Sex							0.48
Males	827 (11.6)	464 (6.5)	794 (11.1)	1,465 (20.5)	2,295 (32.1)	1,310 (18.3)	
Females	647 (10.7)	398 (6.6)	704 (11.6)	1,199 (19.8)	1,983 (32.7)	1,129 (18.6)	

†Sum of >0 to 1 year and >1 to 2 year columns were considered to meet American Diabetes Association guidelines (11) for biennial eye exams.

higher compared with patients 40–64 years of age (Supplementary Table 2).

For the 2,949 patients with type 1 diabetes for ≥5 years prior to the study and no DR, 33.6% had no eye exam visits over the study period; 26.3% met the ADA recommendations (9) for annual or biennial eye exams (Table 3). Eye exam visit frequency was lower in the 10–19-year and 20–39-year age-groups, with only 22.6% and 19.8%, respectively, meeting biennial eye exams and an aOR of low eye exam visit frequency 1.7 (95% CI 1.5–1.9) and 1.9 (95% CI 1.7–2.2) times higher, compared with those 40–64 years of age (Supplementary Table 2). For the 1,429 patients with type 1 diabetes and DR at the onset of the study, 8.9% had no eye exam visits during the study period; 63.5% met the ADA recommendations (9) for annual eye exams. Eye exam visit frequency was lowest in the 10–19-year age-group, with an aOR of low eye exam frequency 3.1 (95% CI −1.9 to 5.2) times higher compared with patients 40–64 years of age (Supplementary Table 2).

The overall 5-year period prevalence of DR and VTDR, among those receiving an eye exam, for type 2 diabetes was 24.4% and 8.3%, respectively (Table 4). DR prevalence was higher in the 40–64-year (24.7%) compared with the 20–39-year age-group (20.0%) ($P < 0.0001$), and males had a higher DR prevalence rate than females (27.3% vs. 21.7%) ($P < 0.0001$). The overall 5-year cumulative incidence of DR and VTDR, for those receiving an eye exam, for type 2 diabetes was 15.8% and 4.7%, respectively. Similar to prevalence, the older age category and males had higher incidence rates.

The overall 5-year period prevalence of DR and VTDR, for those receiving an eye exam, for type 1 diabetes was 54.0% and 24.3%, respectively (Table 4). The prevalence was highest in the 40–64-year age-group (62.9%) ($P < 0.0001$) and in males (56.1%) ($P < 0.0001$). The overall 5-year cumulative incidence of DR and VTDR, for those receiving an eye exam, for type 1 diabetes was 33.4% and 11.2%, respectively. DR incidence was highest in the 40–64-year age-group (39.8%) ($P < 0.0001$).

Table 3—Eye exam visit frequency among people with type 1 diabetes and continuous insurance coverage, stratified by DR status, MarketScan Databases 2010–2014

	Number of eye exams during study period						
	0	≥1					
		Largest time gap between eye exams (years)					
		>4–5	>3–4	>2–3	>1–2†	>0–1†	*P* value
	No DR*, *n* (%)						
Total	991 (33.6)	269 (9.1)	348 (11.8)	564 (19.1)	653 (22.1)	124 (4.2)	
Age (years)							<0.0001
10–19	241 (33.4)	81 (11.2)	88 (12.2)	149 (20.6)	148 (20.5)	15 (2.1)	
20–39	201 (34.8)	48 (8.3)	92 (15.9)	118 (20.5)	108 (18.7)	10 (1.7)	
40–64	549 (33.3)	140 (8.5)	168 (10.2)	297 (18.0)	397 (24.1)	99 (6.0)	
Sex							0.23
Males	513 (34.6)	141 (9.5)	175 (11.8)	292 (19.7)	307 (20.7)	54 (3.6)	
Females	478 (32.6)	128 (8.7)	173 (11.8)	272 (18.5)	346 (23.6)	70 (4.8)	
	DR at onset of study*, *n* (%)						
Total	127 (8.9)	52 (3.6)	97 (6.8)	246 (17.2)	536 (37.5)	371 (26.0)	
Age (years)							<0.0001
10–19	8 (25.0)	3 (9.4)	3 (9.4)	7 (21.9)	11 (34.4)	0 (0)	
20–39	26 (12.4)	11 (5.3)	21 (10.1)	47 (22.5)	61 (29.2)	43 (20.6)	
40–64	93 (7.8)	38 (3.2)	73 (6.1)	192 (16.2)	464 (39.1)	328 (27.6)	
Sex							0.18
Males	62 (8.7)	27 (3.8)	53 (7.5)	139 (19.6)	255 (35.9)	175 (24.6)	
Females	65 (9.1)	25 (3.5)	44 (6.1)	107 (14.9)	281 (39.1)	196 (27.3)	

*For patients with type 1 diabetes, only patients with an initial diabetes diagnosis in 2005 or earlier were included since annual or biennial screening is recommended after a duration of 5 years of disease (11). †Sum of >0 to 1 year and >1 to 2 year columns were considered to meet American Diabetes Association guidelines (11) for biennial eye exams.

CONCLUSIONS

Using health care claims data, this study measures eye exam visit frequency over a 5-year study period for a large population of insured patients with diabetes. Only 15.3% and 26.3% of patients with no DR and type 2 and type 1 diabetes, respectively, met the ADA recommendations (9) for annual or biennial eye exams. Although adherence to these guidelines is known to be poor, these eye exam rates are lower than expected and emphasize the need for changes in the health care system to improve eye care utilization among patients with diabetes. We also report the period prevalence and cumulative incidence of DR and VTDR among those receiving an eye exam; recent population-based estimates are limited in the U.S. Although findings were largely in line with studies worldwide, the rates of VTDR among patients with type 2 and type 1 diabetes were higher. Particularly concerning was the 30.6% of patients with type 1 diabetes 40–64 years of age with VTDR.

Detecting DR depends on screening, and despite the fact that screening for DR is cost-effective (3), eye care utilization among patients with diabetes is low. The Centers for Disease Control and Prevention Diabetes Surveillance System, using the 2015 Behavioral Risk Factor Surveillance System, documents that 61.6% of people with diagnosed diabetes self-reported having a dilated eye exam in the past year (10). Eye care utilization in

Table 4—Period prevalence and cumulative incidence of DR and VTDR among people with diabetes and continuous insurance coverage, MarketScan Databases 2010–2014*

	Population with diabetes	No. people with DR	DR percentage	*P* value	No. people with VTDR	VTDR percentage	*P* value
Type 2 diabetes							
Prevalence							
Total	146,151	33,664	24.4		12,082	8.3	
Age (years)				<0.0001			<0.0001
20–39	10,136	2,027	20.0		720	7.1	
40–64	136,015	33,637	24.7		11,362	8.4	
Sex				<0.0001			<0.0001
Males	70,725	19,333	27.3		6,583	9.3	
Females	75,426	16,331	21.7		5,499	7.3	
Incidence							
Total	131,261	20,774	15.8		6,173	4.7	
Age (years)				<0.0001			0.70
20–39	9,457	1,348	14.3		437	4.6	
40–64	121,804	19,426	16.0		5,736	4.7	
Sex				<0.0001			<0.0001
Males	62,574	11,182	17.9		3,340	5.3	
Females	68,687	9,592	14.0		2,833	4.1	
Type 1 diabetes							
Prevalence							
Total	13,882	7,493	54.0		3,371	24.3	
Age (years)				<0.0001			<0.0001
10–19	2,066	374	18.1		55	2.7	
20–39	3,119	1,652	53.0		657	21.1	
40–64	8,697	5,467	62.9		2,659	30.6	
Sex				<0.0001			<0.01
Males	6,980	3,916	56.1		1,771	25.4	
Females	6,902	3,577	51.8		1,600	23.2	
Incidence							
Total	9,593	3,204	33.4		1,078	11.2	
Age (years)				<0.0001			<0.0001
10–19	1,931	239	12.4		38	2.0	
20–39	2,293	826	36.0		250	10.9	
40–64	5,369	2,139	39.8		790	14.7	
Sex				<0.0001			<0.01
Males	4,745	1,681	35.4		580	12.2	
Females	4,848	1,523	31.4		498	10.3	

*Type 2 diabetes: adults ≥20 years of age; type 1 diabetes: adolescents and adults ≥10 years of age.

minority populations is even lower, cited as 29.9% among a predominantly low socioeconomic African American population with diabetes in Alabama (11) and 34.8% in an urban Hispanic population with diabetes in Los Angeles (12). Although our eye care utilization rates include a 5-year period, our rates are alarming. Especially concerning were the half of patients with type 2 diabetes and one-third of patients with type 1 diabetes with no eye exam visits and the ~95% of those 20–39 years of age with type 2 diabetes who did not meet recommended biennial eye exams. For patients with established DR, <20% of patients with type 2 and <30% of patients with type 1 diabetes had annual eye examinations over the study period.

Many factors are associated with poor eye care utilization, most notably behavioral and cultural factors, cost, geographic access, and clinician referral practices (4,13). In this study, since all patients had continuous insurance coverage over the 5-year period, cost was likely less of a barrier. Eye care education is a behavioral and cultural factor associated with eye care utilization. Although eye care education is beneficial in improving eye exam and DR screening rates, one study found rates still <50% after patient receipt of educational materials (14). We were unable to assess clinician referral rates in this study, but previous studies indicate that eye care referrals among patients with diabetes are suboptimal (4). Telemedicine using nonmydriatic fundus cameras has emerged as a viable and effective DR screening option (15–17). These photos can be taken by health care personnel in primary care settings and then transmitted to reading centers for evaluation. Recently, the U.S. Food and Drug Administration approved the marketing of the first medical device to use artificial intelligence to detect moderate to severe DR (18). These innovative approaches may eliminate an additional appointment to an optometrist or ophthalmologist and could improve screening uptake. Although implemented by the Veterans Health Administration (19), the Indian Health Service (20), and some European countries (21), digital screening has had limited penetration in the U.S. (22).

Our DR prevalence findings are similar to another U.S. population-based study. Zhang et al. (23) found prevalence rates of 28.0% and 4.1% of DR overall and VTDR, respectively, for people 40–64 years of age with diabetes using the

National Health and Nutrition Examination Survey 2005–2008. Global prevalence of DR and VTDR was estimated to be 34.6% and 10.2%, respectively, for people 20–79 years of age with diabetes (24). A 10-year study in the U.K. documented a period prevalence of 28.3% for type 2 and 48.4% for type 1 diabetes (25). In Portugal, period prevalence was 16.3% for DR and 3.1% for VTDR in a 5-year retrospective study (26). From 2005 to 2009, the National Diabetic Retinopathy Screening Service in Wales reported the prevalence of DR and VTDR for type 2 diabetes to be 30.3% and 2.9%, respectively, and 56.0% and 11.2% for type 1 diabetes (27). Differences in estimates between this study and others are likely multifactorial, including differences in characteristics of the population with diabetes. Most importantly, however, we defined DR and VTDR using health care claims among those who had the opportunity to have a DR diagnosis as opposed to other studies that used clinical assessment with fundus images. Since these codes are used for billing and not clinical purposes, their accuracy is a limitation.

Although our methodologic differences complicate direct comparison with other studies, we can examine patterns among demographic factors and diabetes type. For example, period prevalence and cumulative incidence were higher for males and increased with age for both type 2 and type 1 diabetes. Prevalence and incidence rates were also more than two times higher in patients with type 1 diabetes. Increasing age and type 1 diabetes may be a proxy for diabetes duration, so these findings are not surprising and some of these patterns were also found in other studies (23,25,27). Of concern, however, is the fact that over one-third of the DR patients with type 2 diabetes and almost half of those with type 1 had VTDR.

This study has a number of limitations. First, as mentioned previously, administrative claims data are not always accurate for clinical diagnoses and lack important clinical data such as laboratory results. Coding practices may also vary by health care provider. Although accurate algorithms have been developed for many health conditions, their performance varies by disease and population (28). Second, although our sample size was large and included patients from all U.S. states, these findings are not representative of the overall U.S. population. These findings, however, may represent insured, working-age adults with diabetes. Third, DR rates and eye care utilization vary by race/ethnicity, and this information was not available. Fourth, we may have underestimated the frequency of eye exams as visits outside of the insurance network would not have been captured. An example is paying cash for an optometry visit. Although ophthalmologic management of DR is likely covered by insurance, screening with eye exams for patients with diabetes may vary by health plan. Fifth, as mentioned above, telemedicine is emerging as a screening option for DR in primary care settings (29), and this practice would not have been considered an eye exam by our definition. However, the adoption of telemedicine for DR screening has not yet been widely implemented in the U.S. (22). Sixth, the accuracy of our definition of type 1 diabetes is unknown. The criteria used were restrictive, however, so it is more likely that patients with type 1 diabetes were misclassified as type 2 rather than the reverse. Finally, the duration of diabetes affects DR rates, and we were not able to accurately assess duration using claims data for all patients.

In summary, in our 5-year study of >300,000 insured patients <65 years of age with diabetes, the frequency of eye exam visits was extremely low. Due to the consistency in suboptimal eye care utilization among people with diabetes, systemic changes in health care may be needed. Telemedicine may be one viable option, but other interventions could also simplify and improve the fractionated health care system so that eye care is a seamless part of diabetes care. Until this happens, DR will likely remain the leading cause of blindness among working-age adults.

Duality of Interest. No potential conflicts of interest relevant to this article were reported.
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