Insurance Continuity and Receipt of Diabetes Preventive Care in a Network of Federally Qualified Health Centers

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Background and Objectives: Having health insurance is usually associated with better access to care and better health outcomes. For patients receiving care at Federally Qualified Health Centers (FQHCs), where care is provided regardless of insurance status, the role health insurance status plays in affecting receipt of services is less well understood.

Research Design: We used practice management data from a coalition of FQHCs in Oregon, and linked to Oregon's electronic insurance data, to examine whether receipt of diabetes preventive care services was associated with continuity of insurance coverage among adult FQHC patients receiving diabetes care in 2005.

Results: About one-third (32%) of patients with diabetes received a flu vaccination in 2005, 36% an LDL screening, 54% at least 1 HbA1c screening, and 21% a nephropathy screening. Compared with the continuously insured, the continuously uninsured were less likely to receive an LDL screening, a flu vaccination, and/or a nephropathy screening; those with partial coverage were less likely than the continuously insured to receive a flu shot, at least 1 HbA1c screening, or an LDL screening.

Conclusions: Our results suggest that FQHCs do an excellent job in delivering most services to their uninsured and partially insured patients, but also underscore that for diabetic patients from underserved communities, having both an FQHC medical home and continuous health insurance plays a critical role in receiving optimal chronic disease management. Our study is one of the first to demonstrate how electronic administrative data from a network of FQHCs can be successfully used to gauge the state of healthcare delivery.

Key Words: diabetes care, safety net, health insurance

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Vulnerable patients seeking medical care in the complex US healthcare system are increasingly reliant on Federally Qualified Health Centers (FQHCs).[1] These FQHCs provide crucial services for more than 15 million patients, many of whom are uninsured or underinsured; FQHCs have thus been targeted for expansion by federal and state policymakers.[1–5] Concurrent with calls to deliver care to more patients, FQHCs are charged with serving racially and ethnically diverse populations, predominantly from the lowest socioeconomic classes. These populations experience significant disparities in access to healthcare, quality of care received, and health outcomes.[4–8] Chronic diseases are prevalent among FQHC patients, with diabetes being one of the most common.[9–16]

Many FQHCs are developing strategies to reduce health disparities among the sickest and poorest populations through innovations in chronic disease management. For example, the Health Disparities Collaboratives, sponsored by the Health Resources and Services Administration, share ideas developed by the Institute for Healthcare Improvement across national groups of FQHCs.[17,18] Diabetes care management is targeted in these improvement efforts because of the increasing prevalence of diabetes and strong evidence supporting diabetes screening, monitoring, and treatment.[11,19–21]

However, information on ambulatory care delivered to uninsured patients is limited, so quality-improvement processes targeting these populations must rely on novel research methods. Until recently, the utility of such methods and systems has been limited by their reliance on labor-intensive review of paper medical records, self-reported survey data, and lack of information about uninsured patients.[22–29]

In Oregon, a consortium of safety net organizations (Our Community Health Information Network [OCHIN]) has developed a unique Practice Management (PM) database linking administrative and insurance data on patients receiving care at member FQHCs. (OCHIN members are FQHCs–public health care organizations that meet certain Medicare/

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Medicaid Program criteria and receive funds under the Health Center Program (Section 330 of the Public Health Service Act)–and FQHC look-alikes, which are similar to FQHCs but do not receive funding under Section 330. For brevity, we refer to the OCHIN member agencies as FQHCs throughout this article.)

Previous research has shown that reviewing FQHCs' medical records can be an effective means to gauge the current delivery of care and to measure improvements after interventions.[22,23,29–32] Less is known about how to accurately account for factors influencing receipt of services and outcomes in these evaluations. One such factor is health insurance status. In the overall population, having health insurance is associated with better access to care and better outcomes.[24,25,28,33–35] For patients at FQHCs, where care is provided regardless of insurance status, the role of health insurance is less well understood.[24,25,29,31,36] Thus, we sought to determine whether continuity of insurance coverage was associated with varying rates of diabetes preventive care in FQHCs.

Further clouding our understanding of the role insurance status plays in outcomes and treatment of patients at FQHCs is the fact that most previous research has treated insurance status as a static variable, despite evidence that coverage of underinsured persons is often quite fluid, changing frequently.[37–41] OCHIN′s sophisticated data systems present a unique tool to further our understanding of how health insurance status may affect diabetes care in FQHCs, and allow us to examine continuity of insurance coverage over time.

We hypothesized that receipt of preventive services among OCHIN patients with diabetes would be affected by insurance coverage status, with lower rates of preventive services among uninsured and partially insured patients, compared with those continuously insured. In testing this hypothesis, our study had 2 aims: (1) to determine how the PM database of an FQHC network (linked to public insurance data) could be used to assess associations between insurance status and diabetes care, and (2) to examine whether receipt of preventive services differed among diabetic patients receiving care at OCHIN′s member FQHCs, with 3 distinct insurance patterns during 2005 (continuous coverage, partial coverage, no coverage).

METHODS

Data Sources

In 2005, OCHIN members included over 100 clinics operated by its member FQHCs, serving more than 300,000 clients with about 800,000 annual visits. OCHIN manages appointment, claims, and billing data for its member FQHCs through its common PM data system. Each patient is given a unique identifier throughout the OCHIN dataset, so records are linked and can be tracked across clinic sites.

These analyses used the 2004–2005 OCHIN PM data linked to Oregon's electronic public insurance data. To focus on the experience of adults with diabetes, we limited our analyses to persons aged 19 and older as of December 31, 2004. We identified persons with diabetes mellitus as those who had at least 2 separate visits associated with an ICD-9 code for diabetes over a 2-year period (2004–2005) (including ICD9 codes 250.x, 253.5, 357.2, 362.01–2, 366.41, 790.21–2, 790.29, 791.5–6, and V65.46), to minimize the potential for error in classification of a "rule out" visit or due to one erroneous billing code. The 2004 data were used only in the identification of patients with diabetes; full analyses were conducted in the 2005 data.

Variables

We focused on whether diabetic patients at OCHIN clinics received 4 evidence-based preventive care services in 2005: assessment of glycosylated hemoglobin (HbA1c), lipid (LDL) screening, influenza vaccination, and nephropathy screening (urine microalbumin). It is recommended that diabetic patients receive these services at least annually.[16,19,42] We assessed whether each of these services had been provided at least once by searching the database for procedure codes and CPT codes commonly associated with each preventive care service.

We were primarily interested in the predictive value of health insurance continuity. OCHIN receives "real time" reports from the State of Oregon about patients' public insurance enrollment status. This data is linked directly with the PM data. To determine an insurance coverage pattern for each OCHIN patient in 2005, we queried these combined data sources on January 1, April 1, July 1, and October 1, 2005. Health insurance status on each date was considered to represent a patient's coverage for the subsequent 3-month period. We considered patients to be (1) "continuously uninsured" if they had no coverage on any of the days listed above; (2) "continuously insured" if they had some type of coverage at all 4 points in time; or (3) "partially insured" if enrolled in some type of coverage for at least 1 point but not all 4 points in time. Those partially insured were further categorized by number of quarters of coverage. Worker's compensation was not counted because it does not pay for diabetes preventive care.

The other independent variables in our analyses included age (19–44, 45–64, and >65 years on December 31, 2004), gender, race/ethnicity, and household income as a percentage of the federal poverty level (FPL). Household income and FPL are collected at every visit, so we determined them according to the highest income reported in 2005. These covariates were selected from information available in the database with conceptual guidance from common models describing factors influencing utilization of health care.[25,43,44]

Analysis

We described demographics of the patient population with and without diabetes, and by insurance coverage in 2005 (Tables 1, 2). We assessed how frequently the diabetes care services of interest were received by each insurance group. We conducted bivariate logistic regression to determine separate associations between preventive care services and each of the independent variables (insurance coverage, age, gender, race/ethnicity, and poverty level). In multivariate logistic regression models, we examined independent associations

TABLE 1. Demographic Characteristics of the OCHIN Study Population

Demographic Subgroups	Percent in Each Demographic Group: OCHIN Study Population for 2005 Total N = 116,859	Not Diabetic N = 110,732; 94.8% of Total Population Are Not Diabetic	Diabetic N = 6,127; 5.2% of Total Population Are Diabetic
Age, yrs			
19–44	70.1	72.3	29.6
45–64	23.0	21.4	51.5
65 and over	6.9	6.3	18.9
Gender			
Female	63.0	63.1	60.5
Male	37.0	36.9	39.5
Other/unknown		0.0	0.0
Race/ethnicity			
Hispanic	23.3	23.0	29.1
NH AIAN	0.9	0.9	0.9
NH API	3.3	3.2	4.7
NH black	5.3	5.2	6.8
NH white	59.1	59.5	52.3
Missing/unknown	8.2	8.3	6.3
Poverty level			
<50% FPL	15.4	15.6	11.9
50%–100% FPL	21.6	21.3	26.8
100%–150% FPL	37.4	37.4	37.4
150%–200% FPL	6.5	6.5	7.0
200% FPL and up	7.3	7.4	5.7
Missing/unknown	11.9	11.9	11.2
Insurance coverage, 2005			
Continuously insured	35.4	34.4	53.5
Partial coverage	18.3	18.5	16.2
Continuously uninsured	46.3	47.2	30.2

between insurance continuity and the odds of receiving preventive care services adjusted for the other independent variables (Table 3). Finally, we repeated the above regressions limited to those diabetic patients with partial coverage, to determine if having only one quarter of coverage was significantly different from being covered for 2 or 3 quarters. Conducting all analyses including age as a linear variable had no impact on the results. All analyses were conducted in SAS version 9.0[45] and were approved by the Kaiser Permanente Northwest Human Subjects Research Office.

RESULTS

OCHIN Patient Demographics

Among the 116,859 OCHIN patients studied, most (70%) were between age 19 and 44; 7% were over 65. More women were seen than men (63% vs. 37%). Although the majority of patients were non-Hispanic (NH) white (59%), Hispanics also represented a large subset of the FQHC network population (23%), followed by NH blacks (5%). Nearly 37% of the OCHIN population was from households below the FPL, and almost all were from households below 200% of the FPL (>90% of those with known FPL). Nearly half (46%) had no insurance coverage in 2005, 18% had partial coverage, and 35% had continuous coverage (Table 1). Among those with continuous coverage all year, approximately 70% had Medicaid, 10% Medicare, and 20% other (mostly private). More than three-quarters of the partially covered had Medicaid at some point in time, while less than one-quarter had another plan (usually private); results not shown.

The prevalence of diabetes among OCHIN patients was 5.2%, comparable with an estimated 6.0% across the state of Oregon; this difference is likely because FQHC populations are younger than the general population, as persons over 65 often seek care outside of the FQHC system.[21] If OCHIN′s diabetes prevalence rates were adjusted for the statewide population age distribution, OCHIN and state rates would likely be more similar. As expected, older patients were disproportionately represented among OCHIN patients with diabetes. More patients with diabetes were Hispanic, NH Asian/Pacific Islander, and NH black, compared with nondiabetic patients. Patients with diabetes were also more likely to come from households at 50% to 100% of the FPL than nondiabetic patients. A higher percentage of diabetic patients had continuous insurance coverage, and a lower

TABLE 2. Demographic Characteristics of 3 Insurance Groups Among the Overall OCHIN Study Population and Just OCHIN Diabetic Patients

	Percent in Each Demographic Group					
	Continuous Insurance (All 4 Quarters)		Partial Insurance (Coverage Gap)		Uninsured (All 4 Quarters)	
Independent Covariables	OCHIN Study Population N = 41,372 (35.4% of Total Population Continuously Insured)	OCHIN Diabetics N = 3281 (53.6% of Diabetic Population Continuously Insured)	OCHIN Study Population N = 21,430 (18.3% of Total Population Partially Insured)	OCHIN Diabetics N = 995 (16.4% of Diabetics Partially Insured)	OCHIN Study Population N = 54,057 (46.3% of Total Population Uninsured)	OCHIN Diabetics N = 1851 (30.2% of Diabetics Uninsured)
Age, yrs						
19–44	61.6	24.0	77.6	38.3	73.7	34.8
45–64	24.4	47.0	19.0	53.9	23.4	58.3
65 and over	14.0	29.0	3.4	7.8	2.9	6.8
Gender						
Female	69.7	63.1	75.9	62.2	52.7	54.8
Male	30.3	36.9	24.0	37.8	47.3	45.2
Other/unknown	0.0		0.0		0.0	
Race/ethnicity						
Hispanic	16.3	16.5	21.2	25.3	29.5	53.2
NH AIAN	1.0	0.9	0.9	0.7	0.8	0.9
NH API	3.9	6.4	2.6	2.5	3.1	2.8
NH black	6.5	8.2	4.4	7.3	4.6	3.9
NH white	64.9	60.2	63.4	56.5	52.9	36.1
Missing	7.4	7.8	7.5	7.6	9.0	3.0
Household income as a percent of federal poverty level (FPL)						
<50% FPL	16.2	12.9	14.2	10.4	15.3	11.0
50%–100% FPL	21.0	26.3	22.3	23.0	21.7	29.9
100%–150% FPL	33.7	35.7	36.9	37.8	40.4	40.2
150%–200% FPL	6.4	5.7	7.0	7.1	6.4	9.2
≥200% FPL	9.0	6.5	7.1	6.4	6.0	3.9
Missing	13.7	13.0	12.6	15.3	10.2	5.8

TABLE 3. Adjusted* Odds of Receipt of Diabetic Preventive Services Among OCHIN Patients With Diabetes in 2005: Multivariate Analysis

	HgA1c Screening†		LDL Screening‡		Flu Vaccination§		Nephropathy Screening¶	
Independent Variables	**Percent Receiving Screening**	**Adjusted OR (95% CI)**	**Percent Receiving Screening**	**Adjusted OR (95% CI)**	**Percent Receiving Screening**	**Adjusted OR (95% CI)**	**Percent Receiving Screening**	**Adjusted OR (95% CI)**
Total	53.9		36.0		31.9		20.9	
Health insurance status								
Continuously insured	53.4	1.00	37.5	1.00	34.9	1.00	23.3	1.00
Partial insurance	50.8	0.75 (0.64–0.88)	34.0	0.77 (0.65–0.90)	31.8	0.79 (0.67–0.92)	20.8	0.84 (0.70–1.01)
Uninsured	56.5	0.98 (0.85–1.13)	34.5	0.81 (0.70–0.93)	26.6	0.63 (0.54–0.72)	16.7	0.68 (0.58–0.80)
Age, yrs								
≥65	50.1	1.00	34.5	1.00	33.3	1.00	20.1	1.00
45–64	55.3	1.16 (1.00–1.35)	36.3	1.09 (0.93–1.27)	34.1	1.18 (1.01–1.38)	22.0	1.17 (0.97–1.40)
18–44	53.8	1.07 (0.90–1.27)	36.5	1.14 (0.96–1.35)	27.2	0.83 (0.67–0.99)	19.5	1.08 (0.89–1.33)
Race/ethnicity								
Non-Hispanic white	49.3	1.00	33.1	1.00	28.5	1.00	20.5	1.00
Hispanic	61.1	1.81 (1.57–2.08)	37.8	1.31 (1.14–1.50)	34.3	1.62 (1.41–1.86)	16.7	0.85 (0.72–1.00)
Non-Hispanic AI/AN	44.2	0.89 (0.48–1.65)	17.3	0.44 (0.21–0.92)	26.9	1.06 (0.55–2.02)	17.3	0.90 (0.42–1.90)
Non-Hispanic API	61.0	1.54 (1.17–2.03)	46.0	1.63 (1.26–2.12)	42.9	1.74 (1.34–2.25)	31.7	1.67 (1.26–2.21)
Non-Hispanic black	66.5	1.75 (1.38–2.23)	50.6	1.74 (1.40–2.17)	38.3	1.44 (1.15–1.80)	34.7	1.65 (1.31–2.08)
Missing	40.7	0.85 (0.67–1.07)	31.4	1.12 (0.87–1.42)	34.8	1.25 (0.99–1.58)	21.4	1.40 (1.06–1.85)
Household income as a percent of federal poverty level (FPL)								
>200% FPL	44.3	1.00	25.9	1.00	24.7	1.00	11.8	1.00
150%–<200% FPL	57.9	1.55 (1.14–2.09)	36.3	1.56 (1.14–2.15)	27.4	1.13 (0.81–1.57)	17.2	1.63 (1.07–2.47)
100%–<150% FPL	63.5	2.10 (1.65–2.68)	44.9	2.24 (1.73–2.91)	34.3	1.51 (1.15–1.97)	27.9	2.89 (2.05–4.08)
50%–<100% FPL	53.0	1.34 (1.04–1.71)	34.4	1.45 (1.12–1.92)	31.2	1.36 (1.04–1.79)	21.2	2.13 (1.50–3.03)
<50% FPL	53.2	1.63 (1.24–2.15)	36.2	1.72 (1.28–2.31)	30.4	1.42 (1.05–1.91)	22.1	2.20 (1.51–3.20)
Missing	27.1	0.43 (0.33–0.58)	14.9	0.47 (0.34–0.65)	33.5	1.43 (1.06–1.93)	2.5	0.18 (0.10–0.32)

*All results adjusted for all other variables in the model, and gender.
†Documented receipt of glycated hemoglobin level (HgA1c) >1 time in 2005, based on CPT code 83036, procedure code 001453, and/or diagnosis code "Hemoglobin A1C."
‡Documented receipt of LDL screening >1 time in 2005, based on CPT codes 80061, 83716, 83721, procedure codes 303756, 120295, diagnosis name "LDL measured," and/or procedure name "Lipid panel."
§Documented receipt of influenza vaccination in 2005, based on CPT codes 90658 or 90660, procedure name "Administration of influenza virus vaccine," and/or procedure name "Influenza virus vaccine 3+ years."
¶Documented random urine microalbumin and/or urine microalbumin/creatinine ratio >1 time in 2005, based on CPT codes 90658, 90660, and/or procedure codes 82043, 82570.

percentage had partial or no coverage, compared with nondiabetics (Table 1).

Insurance Coverage Patterns

Compared with continuously insured patients in the overall OCHIN population, the uninsured had a higher proportion of patients aged 19 to 44, male, Hispanic, and in households at 100% to 150% FPL (Table 2). The partially insured were more likely to be younger, women, and/or Hispanic, compared with those insured all year.

Among OCHIN patients with diabetes, similar demographic patterns were seen among the 3 insurance groups, with a few exceptions (Table 2). As in the general population, a higher percentage of uninsured diabetic patients were under 65, male, Hispanic, and/or from the poorest households. A higher percentage of partially insured patients with diabetes were aged <45, and/or Hispanic. The continuously insured were more likely to be NH white or NH black, compared with the uninsured.

Receipt of Diabetes Preventive Care

Overall, 32% of OCHIN patients with diabetes received a flu vaccination in 2005, 36% an LDL screening, 54% at least 1 HbA1c screening, and 21% a nephropathy screening (Table 3). Those continuously covered had the highest percentages for flu vaccinations, LDL screening, and nephropathy screening, but the uninsured had the highest percentage of at least 1 HbA1c screening. The partially insured had the lowest percentage of HbA1c screening, while the uninsured were the lowest for flu shot and nephropathy screening.

Insurance Coverage Patterns and Receipt of Diabetes Preventive Care

The associations between continuous coverage and higher rates of receipt of the preventive care services were significant in most multivariate analyses adjusting for age, gender, race/ethnicity, and household income. Compared with the continuously insured (reference group OR = 1.00), those uninsured in all 4 quarters were less likely to have received an LDL screening (OR = 0.81), a flu vaccination (OR = 0.63), and/or a nephropathy screening (OR = 0.68). There was no significant difference between the continuously insured and the uninsured in rates of receipt of HbA1c screening. Those with partial coverage were significantly less likely than the continuously insured to have received a flu shot (OR = 0.79), at least 1 HbA1c screening (OR = 0.75), or an LDL screening (OR = 0.77); the difference in nephropathy screening rates was of borderline significance.

Several other patterns emerged in the multivariable models (Table 3). Hispanic patients were significantly more likely to receive most of the services when compared with NH white patients. NH black and NH API patients were significantly more likely than NH white patients to have received any of the 4 services. For example, NH black patients were more likely than NH whites to have received at least 1 HbA1c screening (OR = 1.75), an LDL screening (OR = 1.74), a flu vaccination (OR = 1.44), and/or a nephrology screening (OR = 1.65). In most cases, patients with household incomes below 200% FPL were more likely to have received the services at a FQHC in the OCHIN network as compared with those above 200% FPL.

Partial Coverage and Receipt of Diabetes Preventive Care

Those with partial coverage appeared similar to the uninsured, and were actually less likely to receive an HbA1c screening or an LDL screening than those uninsured all year (Table 3). We analyzed this subgroup to determine if extent of partial coverage was correlated with preventive service rates. When comparing rates of diabetes preventive services among the subset of OCHIN diabetic patients with partial coverage in 2005—after adjusting for age, gender, race/ethnicity, and poverty level—there were no significant differences in receipt of preventive care measures between having 1 quarter of coverage and having 2 or 3 quarters of coverage (detailed results are available in Table 4, Supplemental Digital Content, http://links.lww.com/A741).

DISCUSSION

In our study population, those with consistent health insurance were more likely to have received diabetes preventive health care in the FQHC network, compared with the uninsured or the partially insured. These results confirm that FQHCs provide crucial health care access for vulnerable patients, and that continuous health insurance makes a difference for this population.[24,25,30,31] Our analyses suggest the need to control for point-in-time health insurance status, and for fluctuations in health insurance over time, in evaluating delivery of care in FQHCs and quality-improvement interventions.

Our findings illustrate that health insurance plays a key role in optimizing care for FQHC patients, and that continuity matters. Compared with uninsured patients, those with partial coverage were worse off in receipt of HbA1c and LDL screening; those covered for 3 quarters had no better rates than those covered for one quarter.

The fact that uninsured patients were not far behind, and sometimes fared better than partially insured patients in receipt of services, deserves further discussion. FQHCs have been able to narrow the access gap in the delivery of most services to their uninsured patients. These are the patients who urgently need a "medical home," a place where patients maintain ongoing relationships with their physician, and with a team of caregivers who work together to provide continuous, comprehensive, coordinated patient care.[46] It is also important to remember that our uninsured subgroup is not necessarily representative of the general uninsured population, but is composed of individuals highly motivated to manage their diabetes and obtain primary care; many are uninsured only because they cannot qualify for public insurance programs. In contrast, the partially insured population is more likely to be people who qualify for full coverage, but have not been able to maintain such coverage due to instability in employment and other aspects of their lives; discontinuous insurance may thus compound their vulnerability.

Despite the unique nature of the uninsured patients in this population and the continuous access to care being

provided by the FQHCs, we found no examples where the uninsured or partially insured fared better than the continuously insured. Although the FQHCs' dedication to providing care for their patients mitigated some of the negative effects of being uninsured, continuous coverage was associated with the best rates of preventive services. It was beyond the scope of these analyses to evaluate why underinsured patients were less likely to receive recommended services in FQHC settings. However, anecdotally, providers and patients report that uninsured patients at the FQHCs often decline diagnostic tests and referrals due to fears about costs. They may go to other sites—an Indian Health Service clinic, a Veterans Administration Hospital, a community health fair—seeking free testing. More often, they delay care hoping to obtain insurance coverage in the future.

In addition to contributing to the existing literature on the importance of insurance continuity for patient care and outcomes, this study highlights the central role played by FQHCs in reducing racial/ethnic disparities.[47] National reports have shown that racial/ethnic minorities receive lower rates of recommended preventive care.[9–16,20,36,48–50] In our comparisons, however, minorities were more likely than whites to receive recommended care. In interpreting this finding, we note that the racial/ethnic groups in our study are heterogeneous; for example, the NH white patients include many recent immigrants from Eastern Europe who have diverse cultural and linguistic backgrounds. Another consideration is that NH whites may be more likely to obtain private insurance over the course of a given year,[37,40,41] and thus may receive preventive services elsewhere. So, although the "reverse disparities" described here account for age, socioeconomic status, and insurance patterns, many other life circumstances likely differ between minority and nonminority patients at these clinics and may have influenced our findings.

The significance of this study goes beyond insurance patterns. Previous work has shown the relevance of reviewing medical records from FQHCs to inform public policy discussions about how to improve healthcare delivery and outcomes for underserved patients.[22,23,29–32] Our study is one of the first to demonstrate how administrative FQHC data can be used to gauge the state of healthcare delivery. The methods used here will help future studies measure the impact of interventions designed to improve care for vulnerable populations.

The National Institutes of Health has stated that translating evidence-based research into practice and policies should be a major focus of efforts to improve health care.[51] Our research models how the OCHIN database—and others like it, when they become available–can be used in translational research, especially when partnered with data from programs such as the HRSA Health Disparities Collaboratives. The evolving OCHIN database is unique in design and in scale, with enormous potential to be a leader in creating information technology networks among safety net providers. This type of network not only serves clinicians and patients by improving day-to-day operations, but also provides a powerful data warehouse for studies on improving care for vulnerable populations on a much larger scale.

Limitations

Although the OCHIN database allows us an unprecedented view into care received by patients with partial or no insurance coverage, limitations are inherent. First, our data are limited to a finite number of FQHCs, and does not include every FQHC in the area. This lack of a population-based denominator meant it was only feasible to conduct a user-rate analysis. Although no comparable national database exists to obtain more generalizable data, further studies should be conducted in other states as databases comparable to OCHIN′s become available. We showed reasonable correlation between rates of receipt of diabetes preventive services compared with available estimates from nationally representative data.[22] However, directly comparing rates of receipt of the care measures with other populations was not feasible, as previous assessments varied from ours in how receipt of care was measured and how populations were defined.[22,24,29–31,36]

We chose to define patients as diabetic if they had 2 or more visits associated with a diabetes diagnostic code. We used this method to avoid incorrectly considering patients as diabetic based on a single visit's "rule-out" diabetes diagnostic code. However, through this method, we likely missed some patients with diabetes who had only 1 or no visits associated with a diabetes diagnosis during the study period; therefore, our results give conservative estimates of the diabetic patient population in these clinics and their receipt of preventive care.

Third, we may have missed the occurrence of screenings if they were billed using procedure codes other than those we used. Also, some of the patients we identified may have received services elsewhere. In this initial study, we had no information about diabetes care received outside of the OCHIN FQHC network. For example, patients aged over 65 probably had low rates of influenza vaccinations because this Medicare-covered group received vaccinations outside the FQHC system. Similarly, NH American Indians may access these services through the Indian Health Service.

It is possible that patients more likely to seek care outside the OCHIN clinic network are disproportionately distributed among our 3 insurance groups, which would explain some of the differences we found. The OCHIN database allows us to track patients across over 100 FQHC clinic sites, and patients utilizing safety set services usually have few other options, making it unlikely that a large number of patients sought care outside of the network. Even if this group does represent a large percentage of our subjects, this finding would be significant in itself and supports the need for policy efforts to focus on designing comprehensive medical homes. If discontinuous insurance or lack of insurance is more likely to force patients to "shop around" to find recommended services, mechanisms must be created within medical homes to minimize this fragmentation of care. Future studies should measure this important issue and its implications, and should take into account community factors such as the availability of other sources of care.

Fourth, we estimated insurance coverage based on each patient's assigned coverage on the first day of the quarter. Although this method created a categorical variable to enable

simpler analyses, we were not able to account for the true fluidity of health insurance coverage. We also determined public insurance coverage based on state administrative files, but do not know whether patients themselves were aware of what coverage they were assigned, or the services to which they may have been entitled. We also estimated household income and FPL percentage, which are recorded at every visit, based on the highest income recorded in 2005; thus, results associated with these variables are conservative.

Finally, although data errors as described above may have occurred, we believe that OCHIN′s dataset far surpasses what has been previously available of a similar nature. The analyses we conducted for this study would not have been possible using older methods of data-sifting and less comprehensive datasets.

Future studies should determine more precise measurements of insurance continuity and type of coverage, control for comorbidities, and assess the impact of churning between coverage types on continuity of care. The ongoing implementation of an electronic medical record system at many OCHIN member FQHCs, linking OCHIN′s PM data with more detailed clinical data including care received outside of the FQHC system, will support future efforts to conduct this important research.

CONCLUSIONS

Our study supports the importance for diabetic patients from underserved communities of having both a FQHC medical home and continuous health insurance in receiving optimal chronic disease management. It also demonstrates how FQHCs can collaborate within information technology networks and effectively partner with researchers to study their own care delivery, to impact the translation of evidence into practice, and to inform policies that will make a difference to their communities.

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REFERENCES

1. NACHC. The safety net on the edge. 2008. Available at: http://www.nachc.com/client/documents/issues-advocacy/policy-library/researchdata/research-reports/SNreport2005.pdf. Accessed May 21, 2008.
2. Dievler A, Giovannini T. Community health centers: promise and performance. *Med Care Res Rev*. 1998;55:405–431.
3. O'Malley AS, Forrest CB, Politzer RM, et al. Health center trends, 1994–2001: what do they portend for the federal growth initiative? *Health Aff (Millwood)*. 2005;24:465–472.
4. US DHHS. National Healthcare Disparities Report, 2005. 2008. Available at: http://www.ahrq.gov/qual/nhdr05/nhdr05.htm. Accessed May 21, 2008.
5. Smedley BD, Stith AY, Nelson AR. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington, DC: National Academy Press; 2005.
6. McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. *N Engl J Med*. 2003;348:2635–2645.
7. US DHHS. National Healthcare Quality Report, 2005. 2008. Available at: http://www.ahrq.gov/qual/nhqr05/nhqr05.htm. Accessed May 21, 2008.
8. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press; 2001.
9. Kirk JK, Bell RA, Bertoni AG, et al. A qualitative review of studies of diabetes preventive care among minority patients in the United States, 1993–2003. *Am J Manage Care*. 2005;11:349–360.
10. Kirk JK, Bell RA, Bertoni AG, et al. Ethnic disparities: control of glycemia, blood pressure, and LDL cholesterol among US adults with type 2 diabetes. *Ann Pharmacother*. 2005;39:1489–1501.
11. Mokdad AH, Ford ES, Bowman BA, et al. Diabetes trends in the U.S.: 1990–1998. *Diabetes Care*. 2000;23:1278–1283.
12. Harris MI. Racial and ethnic differences in health care access and health outcomes for adults with type 2 diabetes. *Diabetes Care*. 2001;24:454–459.
13. Chin MH, Cook S, Drum ML, et al. Improving diabetes care in Midwest community health centers with the health disparities collaborative. *Diabetes Care*. 2004;27:2–8.
14. Chin MH, Zhang JX, Merrell K. Diabetes in the African-American Medicare population. Morbidity, quality of care, and resource utilization. *Diabetes Care*. 1998;21:1090–1095.
15. AHRQ. *Diabetes Disparities Among Racial and Ethnic Minorities*.. Rockville, MD: Agency for Healthcare Research and Quality; 2001. Publication 02-P007.
16. U.S. Dept. of Health and Human Services. *Healthy People 2010*. 2nd ed. Washington, DC: US Government Printing Office; 2000.
17. Berwick DM. Continuous improvement as an ideal in health care. *N Engl J Med*. 1989;320:53–56.
18. Shortell SM, O'Brien JL, Carman JM, et al. Assessing the impact of continuous quality improvement/total quality management: concept versus implementation. *Health Serv Res*. 1995;30:377–401.
19. American Diabetes Association. Standards of Medical Care in Diabetes-2008. *Diabetes Care*. 2008;31:S12–S54.
20. Centers for Disease Control and Prevention (CDC). Preventive-care practices among persons with diabetes–United States, 1995 and 2001. *MMWR*. 2002;51:965–969.
21. CDC. Data and Trends: National Diabetes Surveillance System. 2008. Available at: www.cdc.gov/diabetes/statistics/prev/state/index.htm. Accessed May 20, 2008.
22. Landon BE, Hicks LS, O'Malley AJ. Improving the management of chronic disease at community health centers. *N Engl J Med*. 2007;356:921–934.
23. Maizlish NA, Shaw B, Hendry K. Glycemic control in diabetic patients served by community health centers. *Am J Med Qual*. 2004;19:172–179.
24. Nelson KM, Chapko MK, Reiber G, et al. The association between health insurance coverage and diabetes care; data from the 2000 Behavioral Risk Factor Surveillance System. *Health Serv Res*. 2005;40:361–372.
25. Oladele CRW, Barnett E. Racial/ethnic and social class differences in preventive care practices among persons with diabetes. *BMC Public Health*. 2006;6:259–266.
26. Beckles GLA, Engelgau MM, Narayan KMV, et al. Population-based assessment of the level of care among adults with diabetes in the US. *Diabetes Care*. 1998;21:1432–1438.
27. Harris MI, Cowie CC, Eastman R. Health-insurance coverage for adults with diabetes in the US population. *Diabetes Care*. 1994;17:585–591.
28. Gregg EW, Geiss LS, Saaddine J, et al. Use of diabetes preventive care and complications risk in two African-American communities. *Am J Prev Med*. 2001;21:197–202.
29. Srinivasan M, Przybylski M, Swigonski N. The Oregon Health Plan: predictors of office-based diabetic quality of care. *Diabetes Care*. 2001;24:262–267.
30. Hicks LS, O'Malley AJ, Lieu TA. The quality of chronic disease care in US community health centers. *Health Aff (Millwood)*. 2006;25:1712–1723.
31. Porterfield DS, Kinsinger L. Quality of care for uninsured patients with diabetes in a rural area. *Diabetes Care*. 2002;25:319–323.
32. Fenton JJ, Von Korff M, Lin EH, et al. Quality of preventive care for diabetes: effects of visit frequency and competing demands. *Ann Fam Med*. 2006;4:32–39.
33. McWilliams JM, Meara E, Zaslavsky AM, et al. Use of health services by previously uninsured Medicare beneficiaries. *N Engl J Med*. 2007;357:143–153.

34. Cunningham PJ, Kemper P. Ability to obtain medical care for the uninsured: how much does it vary across communities? *JAMA*. 1998; 280:921–927.
35. Cook NL, Hicks LS, O'Malley AJ, et al. Access to specialty care and medical services in community health centers. *Health Aff (Millwood)*. 2007;26:1459–1468.
36. Saaddine JB, Engelgau MM, Beckles GL. A diabetes report card for the United States: quality of care in the 1990s. *Ann Intern Med*. 2002;136:565–574.
37. Schoen C, DesRoches C. Uninsured and unstably insured: the importance of continuous insurance coverage. *Health Serv Res*. 2000;35:187–206.
38. US Census. Health Insurance Coverage: Who Had A Lapse Between 1990 and 1992? SB/94-6. 1994.
39. Klein K, Glied S, Ferry D. *Entrances and Exits: Health Insurance Churning, 1998–2000*. New York, NY: Commonwealth Fund; 2005. Commonwealth Fund Publication 855.
40. Bennefield RL. *Who Loses Coverage and for How Long?* Washington, DC: U.S. Dept. of Commerce, Census Bureau; 1996. Census Bureau Publication P70-54.
41. Probst JC, Wang J, Moore CG, et al. Continuity of health insurance coverage and perceived health at age 40. *Med Care Res Rev*. 2008;65: 450–477.
42. Fleming BB, Greenfield S, Engelgau MM, et al. The Diabetes Quality Improvement Project: moving science into health policy to gain an edge on the diabetes epidemic. *Diabetes Care*. 2002;24:1815–1820.
43. Aday LA, Andersen R. A framework for the study of access to medical care. *Health Serv Res*. 1974;9:208–220.
44. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund Q Health Soc*. 1973;51:95–124.
45. SAS Institute Inc. What's New in SAS 9.0, 9.1,9.1.2, and 9.1.3. Cary, NC: SAS Institute Inc; 2004.
46. Patient-Centered Primary Care Collaborative. Joint Principles of the Patient Centered Medical Home. 2007. Available at: http://www.pcpcc.net/node/14. Accessed August 26, 2008.
47. Appel A, Everhart R, Mehler PS, et al. Lack of ethnic disparities in adult immunization rates among underserved older patients in an urban public health system. *Med Care*. 2006;44:1054–1058.
48. Heisler M, Smith DM, Hayward RA, et al. Racial disparities in diabetes care processes, outcomes, and treatment intensity. *Med Care*. 2003;41: 1221–1232.
49. Massing MW, Henley NS, Carter-Edwards L, et al. Lipid testing among patients with diabetes who receive diabetes care from primary care physicians. *Diabetes Care*. 2003;26:1369–1373.
50. Egede LE, Zheng D. Racial/ethnic differences in adult vaccination among individuals with diabetes. *Am J Public Health*. 2003;93:324–329.
51. US DHHS. National Institutes of Health. Overview of the NIH Roadmap. 2005. Available at: http://nihroadmap.nih.gov/overview.asp. Accessed May 20, 2008.

