

# Quality of Care for Uninsured Patients With Diabetes in a Rural Area

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**OBJECTIVE** — We compared quality of care for uninsured patients with diabetes in private physician offices and community/migrant health centers (C/MHCs).

**RESEARCH DESIGN AND METHODS** — We conducted a cross-sectional medical record review in a convenience sample of eight physician offices and three C/MHC sites in rural North Carolina. Billing systems generated lists of self-pay patients with diabetes. Abstraction of the medical records ( $n = 142$ ) yielded data on process and intermediate outcome measures of diabetes care, which were derived from the Diabetes Quality Improvement Project.

**RESULTS** — Medical records of patients in C/MHCs demonstrated higher rates on four of six process measures of quality of care, including measurement of HbA<sub>1c</sub> (98 vs. 75%;  $P < 0.001$ ), cholesterol (82 vs. 51%;  $P < 0.001$ ), and urine protein (90 vs. 25%;  $P < 0.001$ ). Nonsignificant trends in documented eye examinations and the intermediate outcome of blood pressure control were found in medical records of C/MHC patients. No differences were seen in the intermediate outcomes of glucose or lipid control. Notable differences in provider type, time since training, and use of flow sheets were found.

**CONCLUSIONS** — In our sample, uninsured patients with diabetes in C/MHCs had higher quality of care as suggested by higher rates of processes of care. Outcomes were similar in the two settings and well below targets. Further work is required to replicate these findings and to understand which features of C/MHCs may facilitate quality care for the uninsured and are replicable in other settings.

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According to data from the 1989 National Health Interview Survey (NHIS), an estimated 600,000 patients in the U.S. have diabetes and no insurance (1). Although studies comparing clinical outcomes between insured and uninsured patients with diabetes are few (2,3), comparisons of process measures of quality of care in patients with diabetes support the hypothesis that uninsured patients receive lower quality care. In national surveys such as the NHIS and the Behavioral Risk Factor Surveil-

lance System (BRFSS), care measures of number of visits (1), diabetes education sessions (1), foot examinations (1,4), dilated eye examinations (1,4,5), and cholesterol measurement (4) were higher in insured patients. In the most recent study (4), this effect persisted after controlling for sociodemographic factors.

The Institute of Medicine has defined quality of care as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with

current professional knowledge” (6). Lack of insurance may compromise either the technical or interpersonal aspects of care in a variety of ways: through insufficient resources of either the patient or provider, physicians’ biases regarding uninsured patients’ behavior (7), physicians’ frustrations with past experiences taking care of uninsured patients (8), or physicians’ fear of malpractice (7,8).

The factors that can compromise quality of care for uninsured individuals may vary by source of care. Outpatient care for uninsured individuals takes place in diverse settings: hospital clinics, fee-for-service settings, and government subsidized sites such as community health centers, health departments, and free clinics. Data from the 1993 NHIS indicate that three-quarters of uninsured patients with a usual source of care report a traditional fee-for-service setting as that source (9), and a similar percentage of primary care visits of uninsured individuals in 1994 were to physician offices (10). In contrast, community and migrant health centers (C/MHCs), which are federally funded clinics that target health care delivery for underserved populations, provide care for <10% of the nation’s uninsured patients (11), and in 1994, only 10% of primary care visits of uninsured individuals were to C/MHCs (10).

No study has examined the quality of care for the uninsured in private physician offices. Limited research is available from community health centers (12–14) but none specifically in uninsured populations. In this study, we compare quality of care for uninsured patients with diabetes in two types of settings in a rural area of North Carolina: C/MHCs and physician offices. We hypothesized that C/MHCs, with a mission to care for the underserved and specific features designed to facilitate care for these patients, would have higher quality care for uninsured individuals with diabetes.

## RESEARCH DESIGN AND METHODS

### Sample

We conducted a cross-sectional medical record review of a sample of uninsured

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**Abbreviations:** C/MHC, community and migrant health center; DQIP, Diabetes Quality Improvement Project; IRB, North Carolina Chapel Hill School of Medicine Committee on the Protection of the Rights of Human Subjects; NHIS, National Health Interview Survey.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

patients with diabetes seen during 1999 in a seven-county rural area in North Carolina. We initially recruited the three sites of the only federally funded C/MHC in the region. To identify eligible private physician offices, we used the Yellow Pages of local telephone directories, which listed 155 physicians as general practice, internal medicine, family practice, or not specified but whose staff identified them as providing "primary care." Letters of introduction were followed up by a phone call from the primary investigator to the physician or office manager. Multiple phone contacts were often required to recruit practices. Those who were willing to participate estimated the number of patients eligible (see below), and recruitment was continued until a target number of medical records was achieved (at least 100 in each setting).

Practices generated from their billing systems a list of patients who had at least one visit coded as uninsured or self-pay during the calendar year 1999 and a diagnosis code of diabetes (250.00–250.99). Further inclusion criteria, determined at the time of data collection, were as follows: age between 18 and 64 years, at least two visits to the practice during 1999, first visit to the practice before January 1999, and first diagnosis of diabetes before January 1999. We included medical records of patients with a diagnosis of type 1 or type 2 diabetes, including diet-controlled diabetes. We excluded residents of nursing homes and patients whose medical record explicitly stated that diabetes care was obtained elsewhere.

### Data collection

The data collection form was reviewed by two diabetes researchers not otherwise associated with the project and pilot tested in two sites (a community health center and a physician office). We conducted a 1-day training session for two medical record reviewers, including practice on actual medical records and reliability checks. Reliability checks consisted of the two reviewers abstracting the same medical record; differences were resolved through discussion, and a single form for that record was completed. The reviewers conducted similar reliability checks 11 times throughout the data collection period.

### Patient and provider confidentiality

Approval for the study was granted from the University of North Carolina at Chapel Hill School of Medicine Committee on the Protection of the Rights of Human Subjects (IRB). Subsequently, three clinics requested that we obtain patients' consent to review their records. IRB approval was granted for a cover letter and consent form, which was sent to 33 patients from the three clinics. In follow-up phone calls, we reached 21 patients and obtained consent from 19.

### Patient and provider characteristics

We abstracted data on the demographic characteristics of age, sex, and race and clinical variables, such as smoking status, duration of diabetes, and presence of provider-reported diabetic complications and other comorbid conditions. Patients were assigned a primary provider if a majority of visits in 1999 were to a single person, occurring in 140 of 142 cases. Provider name and specialty obtained from the clinical sites was successfully matched to data on provider age and training obtained from the North Carolina Medical Board website for 64 of 65 providers (15).

### Measurement of quality of care

The measures of quality of care include process measures as well as intermediate outcomes. We based our measures on the Diabetes Quality Improvement Project (DQIP) (16), a collaboration of the American Diabetes Association, the Foundation for Accountability, the National Committee for Quality Assurance, and the Health Care Financing Administration. Detailed descriptions of each measure are publicly available through the Internet (17). Process measures derived from DQIP were as follows: medical record documentation of an eye examination by an eye care professional in 1999 (or 1998 if two of three criteria were met: not on insulin,  $HbA_{1c} < 8.0$ , examination in 1998 showed no retinopathy), foot examination in 1999, blood pressure measured in 1999, laboratory examination for  $HbA_{1c}$  in 1999, lipid panel in 1998–1999, and urine microalbumin screen in 1999 (or 1998 if two of three criteria were met: not on insulin,  $HbA_{1c} < 8.0$ , result of screen in 1998 showed no microalbuminuria). Included in the numerator of this last measure are patients with known nephropathy. Intermediate outcome mea-

asures were attainment of target values of blood pressure ( $< 140/90$  mmHg),  $HbA_{1c}$  ( $\leq 9.5\%$ ), and LDL cholesterol ( $< 130$  mg/dl).

In addition to the DQIP measures, we included additional process measures of quality (influenza vaccination in 1999 and dietitian or diabetes education referral within the last 3 years). We also report measures of utilization (number of visits to a provider during 1999), of continuity (using a method that adjusts for the number of total providers seen as well as total number of visits) (18,19), and of quality of the medical record (the presence of problem lists, medication lists, and diabetes flow sheets).

We hypothesize several potential confounders of the relationship between site of care and quality, some of which we were able to measure. These include sociodemographic and clinical patient characteristics; type of provider (physician, nurse practitioner, or physician assistant); specialty of physician (internal medicine, family practice, or general practitioner); time since training; chart features, such as a problem list and diabetes flow sheet; and presence of sliding scale fees, transportation services, and other services on site, such as dietitians, pharmacy, case managers, social workers, and translation services.

### Data analysis

Data were analyzed using STATA (Version 6.0; Stata, College Station, TX) statistical software. We compared means, medians, and proportions of sociodemographic and clinical variables between patients seen in C/MHCs and private physician offices using two sample *t* tests, Wilcoxon's rank-sum tests, and Pearson's  $\chi^2$  analyses. A summary measure of number of comorbidities, including hypertension, hypercholesterolemia, and diabetes micro- and macrovascular complications, was calculated for each patient. Proportions of patients in the two settings who had received a process of care or who had achieved a target value of an outcome variable were compared using the Pearson's  $\chi^2$  test. Other utilization and quality measures, such as mean number of visits and presence of diabetes flow sheets, were also compared.

Although not a part of DQIP methods, we also created an index consisting of the number of DQIP measures achieved and compared the means between the two

groups, unadjusted and adjusted for confounders in a multiple linear regression model. We investigated the following potential confounders: patient age, sex, race, number of comorbidities, number of visits during 1999, type of provider (MD or not), time since provider finished training, and presence of a flow sheet. Only the final three characteristics were associated with both setting type and the index, and of these, only presence of a flow sheet was a significant confounder in adjusted analyses. Finally, we assessed whether there was any intraclass correlation due to clustering of patients by providers and adjusted the estimated standard errors whenever necessary (20,21).

## RESULTS

### Provider recruitment

Of 85 unique phone numbers obtained from the Yellow Pages, 17 were excluded because they were not working, or the physician had retired or was not a primary care physician. Of the remaining 68, we contacted 56, of whom 12 agreed to participate, 24 refused, and 20 did not give a response. Based on the number of providers listed under each telephone number, practices that agreed to participate were larger (mean of 4.9) than those that refused (mean 2.3) or the overall average (1.8). Four practices willing to participate either had fewer than four patients or were unable to generate a list of patients and were not included. Ultimately, the community health center (with three sites and 13 providers) and eight physician offices (with 52 providers) participated.

### Medical record eligibility

Overall, 62% of C/MHC medical records (81 of 131) and 45% of those from the physician offices (61 of 135) were eligible. A total of 15% of the sample C/MHC medical records and 27% of those from physician offices had fewer than two visits. Also, 20% of C/MHC records and 34% from physician offices were ineligible because the patient either was diagnosed with diabetes or had initiated care in that clinic during or after January 1999. Only 16 patients were excluded because of age, and one each due to resident status in a nursing home or reporting primary care obtained elsewhere. The percentages reported do not total 100% because the categories are not exclusive.

**Table 1—Patient demographic and clinical characteristics**

	Entire sample	C/MHC	Physician office	P*
n	142	81	61	—
Age (years)	48.1 (41.5–56.1)	47.3 (42–55.1)	50.5 (41.2–57.9)	0.46
Sex				
M	67 (47.2)	42 (51.9)	25 (41.0)	0.20
F	75 (52.8)	39 (48.2)	36 (59.0)	
Race				
White	94 (66.2)	50 (61.7)	44 (72.1)	<0.001
Black	10 (7.0)	7 (8.6)	3 (4.9)	
Hispanic	23 (16.2)	23 (28.4)	0 (0.0)	
Other	3 (2.1)	1 (1.2)	2 (3.3)	
Not recorded	12 (8.5)	0 (0.0)	12 (19.7)	
Duration of diabetes (years)	3.6 (2.1–7.7)	2.9 (1.9–7)	4.3 (2.2–10)	0.071
Current smoker	36 (25.4)	24 (29.6)	12 (19.7)	0.18
Diagnosis of				
Hypertension	80 (56.3)	39 (48.1)	41 (67.2)	0.023
Hyperlipidemia	60 (42.3)	39 (48.1)	21 (34.4)	0.10
Retinopathy	11 (7.8)	7 (8.6)	4 (6.6)	0.65
Nephropathy/microalbuminuria	37 (26.1)	28 (34.6)	9 (14.8)	0.008
Moderate/severe renal disease	5 (3.5)	3 (3.7)	2 (3.3)	0.89
Neuropathy/ulcer	22 (15.5)	10 (12.4)	12 (19.7)	0.23
Peripheral vascular disease	2 (1.4)	0	2 (3.3)	0.10
Congestive heart failure	6 (4.2)	1 (1.2)	5 (8.2)	0.041
Stroke or transient ischemic attack	3 (2.1)	1 (1.2)	2 (3.3)	0.40
Coronary artery disease	15 (10.6)	7 (8.8)	8 (13.1)	0.41
Number of comorbid conditions	2 (2–3)	2 (2–3)	2 (2–3)	0.87

Data are medians (interquartile range) or n (%) unless otherwise indicated. \*Comparison of C/MHC to physician offices: Pearson's  $\chi^2$  or multiple degrees of freedom Pearson's  $\chi^2$  was used to compare percentages of categorical variables. Wilcoxon's rank-sum test was used to compare medians of continuous variables.

### Provider and patient characteristics

The community health center sites ranged in size from 3 to 8 providers, with a median of 3, and the physician offices ranged from 2 to 12 providers, with a median of 6. The overall proportion of physicians (69% in C/MHCs and 87% in physician offices) and the distribution of types of physicians were similar between settings (data not shown). However, significantly more patient records from C/MHCs had nonphysicians as the primary provider (55.6 vs. 9.8%;  $P < 0.001$ ) and of those patients with physicians, more had a family practitioner (rather than an internist) (96.2 vs. 60.0%;  $P = 0.003$ ). Health center providers represented in the sample were more recently trained than physician office providers; the median number of years since graduation from professional school was 13.9 versus 6.2 years ( $P < 0.001$ ).

Patient populations were similar between the two settings, with the exception of race/ethnicity (Table 1). Overall, the

mean age of patients was 48 years, approximately half were male, and two-thirds were white. The racial distribution differed between settings: C/MHCs had 28.4% Hispanic patients versus none in physician offices, and C/MHCs had no records with this information missing versus 19.7% in physician offices. The prevalence of comorbid conditions, as recorded by physicians in the medical records, was generally similar in the two groups.

Measures of utilization and continuity were similar between settings. The median number of visits for all patients was four, with no difference between settings. Patients from physician offices had been seen in the practice longer (median 5.3 years) than those from the C/MHCs (3.7 years;  $P = 0.003$ ). Of all patients, 56% had the same provider for all visits. The range of number of providers was greater among C/MHC patients (one to eight for C/MHC vs. one to four for physician offices); although the mean (1.9) and median (1) number of providers was the

**Table 2—Process and intermediate outcome quality measures among uninsured patients with diabetes**

	Entire sample	C/MHC	Physician office	P*
n	142	81	61	—
Foot examination	114 (80.3)	74 (91.4)	40 (65.6)	<0.001
HbA <sub>1c</sub> measured	125 (88.0)	79 (97.5)	46 (75.4)	<0.001
Urine microalbumin screen†	88 (62.0)	73 (90.1)	15 (24.6)	<0.001
Lipid panel measured‡	97 (68.3)	66 (81.5)	31 (50.8)	<0.001
Documented eye examination†	29 (20.4)	21 (25.9)	8 (13.1)	0.06
Blood pressure measured	140 (98.6)	81 (100)	59 (96.7)	0.10
HbA <sub>1c</sub> ≤9.5%	89 (62.7)	53 (65.4)	36 (59.0)	0.43
LDL <130 mg/dl‡	57 (40.1)	35 (43.2)	22 (36.1)	0.39
Blood pressure <140/90 mmHg	73 (51.4)	47 (58.0)	26 (42.6)	0.069
9-point index, unadjusted		5.5	3.7	<0.001
9-point index, adjusted§		5.2	4.1	0.012

Data are n (%) unless otherwise indicated. All measures are for the prior year unless otherwise noted. \*Comparison of C/MHC to physician offices: Pearson's  $\chi^2$  was used to compare percentages of categorical variables. A two-sample *t* test was used to compare unadjusted means of index. †In a prior year or prior 2 years if low risk (see text). ‡In prior 2 years. §Adjusted for presence of a flow sheet and effect of clustering by provider.

same in both settings, a comparison of rank sums was significant ( $P = 0.028$ ). We used a published measure of continuity of care (the Modified Continuity Index) (18) and found no difference between the settings (data not shown).

### DQIP quality of care measures

Table 2 shows the results of DQIP process and outcome measures. C/MHCs had higher rates of four of six indicators: foot exam, HbA<sub>1c</sub> measurement, urine microalbumin screening, and lipid screening. A nonsignificant trend toward higher rates of a fifth indicator, documentation of an eye examination by an eye care professional, in C/MHCs was noted. No significant differences were seen in the three intermediate outcome measures, although a trend toward better blood pressure control in C/MHCs was noted ( $P = 0.069$ ).

We created a 9-point index, with each of the measures worth 1 point, for each patient and compared means for patients in the two settings (unadjusted and adjusted for significant confounders). Only the presence of a flow sheet was found to confound the relationship between setting and index. The mean unadjusted index value was 5.5 for C/MHCs and 3.7 for physician offices ( $P < 0.001$ ). Adjusted for presence of a flow sheet and for clustering at the level of the provider, the mean value for C/MHCs was 5.2 and for physician offices 4.1 ( $P = 0.012$ ).

### Other quality of care measures

Other process measures tended to occur more frequently in C/MHCs: influenza vaccination (35.8% in C/MHCs vs. 21.3% in physician offices;  $P = 0.061$ ), referral to nutrition or diabetes education in the last 3 years (72.8 vs. 52.5%;  $P = 0.012$ ), and evidence of a monofilament neurological examination (42.0 vs. 6.6%;  $P < 0.001$ ). Two medical record quality measures were similar between settings: presence of a problem list (found in 99.3% of records) and medication list (found in 97.9% of records). Presence of a diabetes flow sheet was found more often in records from C/MHCs (95.1 vs. 14.8%;  $P < 0.001$ ).

**CONCLUSIONS**— In our sample of 11 provider sites in a rural area of North Carolina, community health center sites had higher rates of processes of care for uninsured patients with diabetes than physician offices. Intermediate outcomes of glycemic, lipid, and blood pressure control, unadjusted for patient or clinic characteristics, were similar between groups. No differences in number of visits or continuity of care were found. We identified at least one potential confounder of the relationship between quality of care and setting. Patient charts from C/MHCs were more likely to have a diabetes flow sheet. Patients in C/MHCs were also more likely to have been cared for by a nonphysician provider who was more recently trained.

Overall, the rates of processes of care were high, especially in comparison with other published rates of care in underserved settings. For example, a recent study, conducted in 55 Midwest community health centers, demonstrated the following rates of processes: measurement of HbA<sub>1c</sub> 70%, dilated eye examination 26%, and foot care 51% (22). A second study, conducted in a sample of 11 agencies serving low-income patients in North Carolina, found lower rates of the same nine indicators we examined (23). Despite the encouraging rates of processes of care in this sample, still only 51% had blood pressure below the target of 140/90 mmHg, only 40% had reached the LDL target of 130 mg/dl, and only 63% were at or below the HbA<sub>1c</sub> target of 9.5%.

Our findings are limited by the sample size, and our sample included only one C/MHC system. Thus, we cannot generalize to the entire population of these types of clinics, especially to settings in urban areas. Our sample of physicians was limited to those listed in the Yellow Pages, and larger physician offices were more likely to participate, which may have introduced a selection bias.

Although we found few differences between patients in C/MHCs and physician offices, we cannot exclude the possibility that differences in care may be related to differences in the patient populations. For example, income and educational status of patients are potential confounders that we were not able to measure. Also, our inclusion and exclusion criteria make several assumptions about the participants. First of all, our population of uninsured patients includes patients who had at least one visit as “self-pay”; however, self-pay status may also indicate a patient whose insurance is not accepted by the clinic. Also, patients may have more than one source of care, and unless this was explicitly stated in the medical record, we had no way to exclude these patients.

To our knowledge, this is one of the first studies of quality of care for uninsured patients comparing sources of care and one of the first to examine quality for the uninsured using medical record review as opposed to population-based patient survey (4,24,25) or emergency room or hospital records (26). Barriers to studying care for the uninsured include the relative lack of secondary data and lack of

community-based longitudinal samples (27).

This study is also to our knowledge one of the first to describe care for the uninsured in physician offices, which constitute the largest regular source of care for uninsured patients. Charity care is difficult to quantify (11), and although current foundation (28) and federal grants (29) are targeting this important source of care for the uninsured, recent work suggests that the provision of charity care is threatened by the penetration of managed care (30).

Community health centers were created over 30 years ago to care for underserved populations, including the uninsured, but we know little about their effectiveness (13,14). One of the few studies that directly compared quality in health centers with other sources used medical record data from 2,024 Medicaid patients in Maryland. In this study, community health centers ranked equal or better to physician offices for quality of care for both preventive and chronic disease care (12). Although C/MHC funding mandates certain ancillary services, such as transportation and case management, the variation in what is provided is large, and no work has examined which features are successful in facilitating quality care for these populations.

This study addresses the overall effectiveness of community health centers in providing quality care for uninsured patients but needs replication in a larger sample. Also, this study cannot distinguish what features of C/MHCs (whether differing characteristics of providers, more systematic documentation of services, lower out-of-pocket costs, or ancillary services) may be responsible. Further work can test these hypotheses directly and also control for these factors in a multivariate analysis.

This study also addresses the challenges that private practitioners face in caring for uninsured patients with a chronic disease. The complex needs of these patients are not easily addressed by the average private practitioner in the office setting. Efforts to structure and subsidize care for uninsured patients need to go beyond ensuring access to a provider visit. Further research, such as a survey of uninsured patients who seek care in different practice settings, would highlight which features of community health cen-

ters facilitate quality care and are replicable in other settings (for example, access to low-cost or free pharmacy). A more refined understanding of the needs of these patients will enhance current efforts to improve chronic disease care for the uninsured in all types of practice settings.

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