Do Experiences Consistent With a Medical-Home Model Improve Diabetes Care Measures Reported by Adult Medicaid Patients?

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OBJECTIVE

The patient-centered medical home has gained much traction. Little is known about the relationship between the model and specific health care processes for chronic diseases such as diabetes. This study assesses the impact of features of a medical home on diabetes care.

RESEARCH DESIGN AND METHODS

A cross-sectional survey of 540 patients with Medicaid (Medi-Cal) health insurance and type 2 diabetes in Los Angeles County was performed. The Primary Care Assessment Tools was used to measure seven features of medical-home performance.

RESULTS

The response rate of the patient survey was 68.9%. Patient-reported medical-home performance averaged a score of 2.85 ± 0.29 (on a 1–4 scale, with 4 equaling the best care). Patients who received more timely and thorough diabetes care reported higher medical-home performance in every feature except for the comprehensiveness-services available. For example, the first-contact access feature score was higher among patients who had an HbA_{1c} test in the past 6 months versus those who did not (2.38 vs. 2.25; $P < 0.05$). Before and after adjusting for sociodemographics and health status, total medical-home performance was positively associated with each diabetes care measure. A 1-point increase in total medical-home score was associated with 4.53 higher odds of an HbA_{1c} test in the past 6 months and 1.88 higher odds of an eye exam in the past year.

CONCLUSIONS

Features consistent with higher medical-home performance are associated with improvements in patient-reported diabetes care process measures, even in this low socioeconomic status setting. The patient-centered medical-home model may help in caring for people with type 2 diabetes.

Diabetes is the seventh leading cause of death in the U.S. and is widely considered a forthcoming global epidemic (1). It is more prevalent in certain vulnerable subgroups, particularly in African Americans and Latinos and those of lower socioeconomic status (SES). Additionally, there are significant racial/ethnic and SES disparities in diabetes care, management, and health outcomes (2). African Americans and Latinos, for example, have two to four times the rate of related renal

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disease, blindness, amputation, and amputation-related mortality compared with non-Hispanic whites (3).

Disparities in diabetes outcomes are the product of multiple interacting factors, including individual, family, neighborhood, and community factors. Disparities in outcomes are also likely due to poorer-quality diabetes care received by vulnerable populations. As evidence of this, the Agency for Healthcare Research and Quality has reported disparities of up to 20% in the receipt of preventive services for diabetes across race/ethnicity, income, and education groups (4). Other studies have found that differences in diabetes care vary according to characteristics of primary care practices (5,6).

Individuals with diabetes receive the majority of their care in a primary care setting (7). Thus it is imperative to understand health care factors that influence care in this setting, especially with the advent of changes to the primary care environment. Most notably, this involves the concept of the patient-centered medical home. A medical home reflects an accessible, ongoing source of primary care that delivers or coordinates the majority of a patient's care. Medical-home definitions vary considerably across organizations, but there is consensus on at least four key features: first-contact care, continuity, comprehensiveness, and coordination (8,9). Other features sometimes include aspects of community-oriented care, family-centered care, and cultural competence.

The evidence cited to promote the medical home is derived almost wholly from the literature on primary care delivery (10). There is a substantive literature demonstrating the benefits of primary care to equity and efficiency and in health care (11), and primary care is a cornerstone of health system efforts to reduce disparities (12). Most of these studies assess the general population in need of preventive care, not those from vulnerable populations who have chronic conditions, such as diabetes.

Thus we undertook this study to evaluate whether patient-reported indicators of care that are consistent with the medical-home model are associated with patient-reported receipt of recommended preventive diabetes services for adults considered vulnerable. We hypothesized that patients with physicians who are reported to function more like a medical home will be more likely to report better preventive diabetes care (including both recommended screening and patient education).

RESEARCH DESIGN AND METHODS

Study Sample

The data for this analysis are from a cross-sectional survey of patients aged 19–63 years with type 2 diabetes and Medicaid (Medi-Cal) health insurance in Los Angeles County. Sampling was conducted in two stages. First, primary care physicians (i.e., family medicine, internal medicine, and general practice) were identified through publicly available network data for one of the largest Medicaid plans in the county. From a list of 471 eligible physicians, they were randomly drawn and recruited until we reached our target sample size of 100 (n = 104; 75% response rate). Random selection of physicians was accomplished on a rolling basis through a random cell selection algorithm in our spreadsheet software.

Second, all physicians were asked to refer a minimum of 10 patients with type 2 diabetes who met the study criteria—aged 18 to 63 years and having Medi-Cal health insurance—using one of two methods: retrospective or prospective referrals. The retrospective referral method involved referring all eligible patients who had visited the physician, working from most recent up to the past 6 months. Before referral, the offices called the patients using a study-provided script that offered a chance to opt out of being referred. The prospective method was similar. Physicians referred all eligible patients visiting the office for up to the next 6 months or until a minimum of 10 referrals were made. In this case, a flier was provided to each patient about the study by the office staff, allowing the patient an opportunity to opt out of being referred.

Both methods received an institutional review board–approved waiver of Health Insurance Portability and Accountability Act authorization by the University of Southern California Office for the Protection of Research Subjects. In both approaches, the potential for physicians to hand-select patients is reduced by the requirement that *all* patients meeting the criteria be referred. A total of 1.8% of patients opted out of being referred, accounted for in the study response rate. From the referrals, we then randomly selected patients (again on a rolling basis using a random cell selection algorithm in our spreadsheet software) until we reached a goal of ~5 patients per physician. There were no significant differences in opt-out rates, response rates, or demographics between referral methods.

Measures

Medical-Home Total Score and Its Features

We used the Primary Care Assessment Tools (PCAT) Adult Expanded to assess patient-reported indicators of medical-home quality (13,14). The PCAT has good reliability and validity and consists of 96 questions that evaluate 7 features: *1*) first-contact care, *2*) continuity of care, *3*) comprehensiveness, *4*) coordination, *5*) community-oriented care, *6*) family-centered care, and *7*) cultural competence. Each question is scored using a Likert-type response scale as follows: "definitely not" (1 point), "probably not" (2 points), "probably" (3 points), and "definitely" (4 points). Missing values in any of the PCAT items were assigned the average score of 2.5. A total medical-home score averages the responses across all of the features.

The first four features have two subcomponents each: one based on the structure indicating the capacity to practice as a medical home and one based on the process indicating actual care delivery. First-contact care refers to the concept that care is available and first sought from the medical home when a new health or medical need arises, reflecting that services are accessible (structure) and utilization occurs when a need arises (process). Continuity of care refers to the use of a regular source of care over time, including tracking a defined population (structure) and the perceived ongoing patient-provider relationship (process). Comprehensiveness refers to the range of services offered (structure) and the recognition of problems and their appropriate delivery (process). Coordination refers to arranging for and following up on specialist health services, including effective information systems (structure) and use of that information as it bears on current needs for integration of all patient care (process).

Three other features have only a process component. These include community-oriented care that refers to the concept

that all primary care is delivered in the context of the community, such that providers recognize the common health needs of the community and strive to be aware of, and oriented to, providing services to address those needs. Family-centered care refers to the recognition of the family as a major participant in the diagnosis, treatment, and recovery of patients. Providers must be aware of the family context, learn about the family history of illness and health risks, and work to incorporate the family as needed into care. Cultural competence refers to provision of care that respects the language, beliefs, and attitudes of people as they influence health. Providers should be prepared to address language barriers and account for cultural beliefs and practices in working to promote health.

Diabetes Care Received

We asked patients when they had their last HbA_{1c} test ("When was your last HbA_{1c} test? This is a test that measures your average blood sugar level over the past 2 or 3 months.") and dilated eye exam ("When was the last time that you had an eye exam during which the doctor put drops in your eyes that made your pupils large? You may have been unable to see enough to drive or had to wear dark glasses afterward."). Responses were dichotomized at 6 months for last HbA_{1c} test and at 1 year for last eye exam. Patients were asked if their physician gave them a plan to manage their own care at home, if they have had diabetes education outside of their usual doctor or nurse visits, and whether they had met with a dietitian (defined for them as "a person who teaches others what foods to eat to help you manage diabetes").

Diabetes Education Received

Patients were asked if in the past 6 months their physician had discussed any of nine topics with them: when and how to take insulin or diabetes pills, when and how to check blood glucose, how to time their meals, what to eat, how to check and care for their feet, how to increase their physical activity, how to make changes in medications, how to deal with the emotional demands of diabetes, and where to find community resources to help with diabetes. Responses to each item were dichotomous (yes/no) and are reported in this study as the total number of items discussed (0 to 9).

Analysis

Descriptive statistics were first obtained for demographic characteristics, including race, education, employment, marital status, self-reported health status, medical-home scores for each feature and total score, as well as diabetes care and diabetes education received. Next, bivariate analysis was conducted to examine the differences in medical-home scores and demographics among different diabetes care and diabetes education received. To test the significance of differences, *t* tests or ANOVA were performed for medical-home scores and χ^2 tests for demographics. Finally, logistic regression of total medical-home score on diabetes care and linear regression of total medical-home score on diabetes education received were conducted, controlling for demographics. Seven people had one or more missing values in the study covariates and were dropped in the regression analyses. Data were analyzed using STATA 11.

RESULTS

Data collection was completed between June 2012 and May 2013. A total of 540 patient interviews were completed by telephone in Spanish (55.3%), English (43.7%), and Mandarin or Armenian (1%). The most conservative response rate (56.9%) is calculated as the total completed patient interviews (n = 540) out of all patients sampled (n = 949). Approximately one-fifth of all patients sampled had an incorrect phone number and address (n = 165) and were not considered usable. The response rate among just the usable listings (n = 784) was 68.9%. Among patients that we reached and spoke with (n = 635), the response rate was 85.0%.

Table 1 provides a listing of the descriptive details of the 540 patients surveyed. Of note, 77% were Hispanic, 56% had less than a high school education, and 72% were unemployed. Medical-home performance measurements yielded an average score of 2.85 $\pm$ 0.29 (based on a 1–4 scale, with 4 representing the highest level of care). The lowest score was for community orientation (2.10 $\pm$ 0.61) and the highest for first-contact utilization (3.81 $\pm$ 0.40). With regards to diabetes care, a majority (83%) reported having their HbA_{1c} level measured within the past 6 months, while only 58% recollected having had a dilated ophthalmologic examination within the past year. Other measures regarding education and self-management are provided in Table 1.

Table 2 provides a bivariate comparison between measures of diabetes care and medical-home performance. Higher medical-home performance was reported among patients who had received more timely and thorough diabetes care. For example, the first-contact access feature score was higher among patients who had an HbA_{1c} test in the past 6 months compared with those who had the test longer ago (2.38 vs. 2.25; $P < 0.05$) and an eye exam in the past year compared with an eye exam longer ago (2.39 vs. 2.31; $P < 0.05$). Similar patterns were found for all measures of medical-home performance except the comprehensiveness-services available feature. Interestingly, none of the sociodemographic variables, except health status, were found to be associated with any of the diabetes care measures.

Table 3 shows the relationship between overall medical-home performance and the diabetes care measures after adjustment for sociodemographics and health status. We show the total medical-home performance score that summarizes all of the features here (rather than the individual features) because they were nearly all associated with the diabetes care measures in Table 2. This table shows that total medical-home score (on a scale from 1 to 4) is associated with improvements in each of the diabetes care measures. For example, a 1-point increase in total medical-home performance is associated with 4.53 higher odds of reporting they had an HbA_{1c} test in the past 6 months and 1.88 higher odds of having an eye exam in the past year. Also, a 1-point increase in total medical-home performance was associated with a 5.66-point increase in our tally of diabetes education items received (on a scale of 1–9 items).

CONCLUSIONS

The concept of a patient-centered medical home is becoming an accepted model for the delivery and coordination

Table 1—Descriptive statistics (*N* = 540)

	No.	Mean ± SD/%
Demographics		
Race		
Hispanic	417	77.22
Non-Hispanic black	72	13.33
Other	51	9.44
Education		
Less than high school	305	56.48
High school graduate or equivalent	116	21.48
College or higher	114	21.11
Employment		
Unemployed	388	71.85
Employed	151	27.96
Marital status		
Single	250	46.30
Married	289	53.52
Health status		
E/VG/G	244	45.19
Fair/poor	296	54.81
Medical-home performance (range 1–4; 4 = best)		
First contact		
Utilization	540	3.81 ± 0.40
Access	540	2.36 ± 0.44
Longitudinality	540	3.35 ± 0.43
Coordination		
Processes	540	2.79 ± 0.60
Information systems	540	2.89 ± 0.63
Comprehensiveness		
Services available	540	2.94 ± 0.37
Services received	540	2.53 ± 0.77
Family-centered care	540	2.91 ± 0.94
Community orientation	540	2.10 ± 0.61
Cultural competence	540	3.33 ± 0.80
Total score	540	2.85 ± 0.29
Diabetes care		
Last HbA_{1c} test		
<6 months	450	83.33
≥6 months	90	16.67
Last eye exam		
<1 year	312	57.78
≥1 year	228	42.22
Plan to manage care at home	306	56.67
Had diabetes education outside	257	47.59
Visited a dietitian	252	46.67
Diabetes education (no. and % saying yes)		
Insulin or diabetes pills	405	75.00
Check blood glucose	446	82.59
Time your meals	375	69.44
What to eat	421	77.96
Check and care for your feet	358	66.30
Increase physical activity	424	78.52
Make changes in medications	287	53.15
Emotional demands	243	45.00
Community resources	235	43.52
Total score (mean)	540	5.91 ± 2.76
Poor (0–4)	165	30.56
Fair (5–7)	169	31.30
Good (8–9)	206	38.15

For medical-home measures, all 88, 99, and missing values were coded as 2.5. For last HbA_{1c} test, 31 observations of "don't know" were coded as ≥6 months. For last eye exam, 14 observations of "don't know" were coded as ≥1 year. For diabetes education, "don't know" was coded as 0. Education score equals the number saying "yes" to the nine education items with minimum of 0 and maximum of 9. E/VG/G, excellent/very good/good.

of care for patients in primary care settings. This study is one of the first to specifically target diabetes in relationship to medical-home performance. Diabetes is one of our greatest emerging health care problems, and it is particularly suited for this sort of analysis given the availability of clearly defined preventive care guidelines. In addition, the treatment of diabetes involves engagement of patients regarding lifestyle behaviors, which may benefit from the ongoing patient-provider relationship and other features in the primary care medical home.

Indeed, this study found that among individuals with Medicaid insurance, there was a relationship between patient-reported indicators of the medical-home model and better patient-reported diabetes care. In bivariate analysis, medical-home features nearly across the board were associated with better diabetes care. When summarized as a total score in multivariate analysis, medical-home performance was more predictive of diabetes care than any sociodemographic measures in our analysis. This is somewhat expected given that the study is limited to Medicaid patients (limiting heterogeneity), but this also provides evidence that medical-home performance may lead to improvements in patient-reported diabetes care, even in this lower SES population.

The overall PCAT score reported by this population was slightly lower than generally found for privately insured patients in HMO settings (15). This suggests some room for improvement. Many projects have been developed to enhance primary care practices, and some may be adaptable to practices predominantly serving Medicaid or otherwise low-SES patients. One review identified more than 40 medical-home transformation projects nationwide, with 8 reporting measures of diabetes care or outcomes (16). Absent randomized controlled trials, before and after data in these pilots suggested the potential for improvements in diabetes care, outcomes, and costs. If medical-home performance as shown in this study is indeed important for patients with diabetes, then the challenge will be to enable more practices to adopt at least some of these features (17,18). For those practices serving predominantly Medicaid patients, the challenge is likely greater.

Table 2—Bivariate analysis of medical-home measures, covariates, and diabetes care

	Last HbA_{1c} test		Last eye exam		Plan to manage care at home		Had diabetes education outside		Visited a dietitian		Diabetes education		
	<6 months *n* = 450	≥6 months *n* = 90	<1 year *n* = 312	≥1 year *n* = 228	Yes *n* = 306	No *n* = 234	Yes *n* = 257	No *n* = 283	Yes *n* = 252	No *n* = 288	Poor (0–4 items) *n* = 165	Fair (5–7 items) *n* = 169	Good (8–9 items) *n* = 206
Mean medical-home score													
First contact													
Utilization	3.82	3.78	3.80	3.84	3.83	3.79	3.82	3.81	3.82	3.81	3.76	3.85	3.83
Access	2.38*	2.25*	2.39*	2.31*	2.41*	2.28*	2.36	2.35	2.36	2.35	2.24*	2.37*	2.44*
Longitudinality	3.38*	3.19*	3.37	3.33	3.46*	3.21*	3.38	3.33	3.39*	3.31*	3.10*	3.39*	3.52*
Coordination													
Processes	2.82*	2.67*	2.87*	2.69*	2.92*	2.62*	2.84	2.75	2.87*	2.73*	2.56*	2.76*	3.01*
Information system	2.92*	2.69*	2.91	2.85	2.99*	2.74*	2.96*	2.82*	2.96*	2.82*	2.71*	2.84*	3.07*
Comprehensiveness													
Services available	2.93	2.98	2.94	2.95	2.95	2.94	2.96	2.93	2.94	2.95	2.90	2.97	2.96
Services received	2.60*	2.21*	2.59*	2.45*	2.83*	2.14*	2.66*	2.42*	2.68*	2.40*	1.93*	2.48*	3.05*
Family-centered care	2.97*	2.61*	2.93	2.88	3.29*	2.42*	3.07*	2.77*	3.08*	2.76*	2.29*	2.96*	3.37*
Community orientation	2.13*	1.97*	2.09	2.12	2.25*	1.91*	2.19*	2.02*	2.16*	2.05*	1.83*	2.07*	2.34*
Cultural competence	3.37*	3.16*	3.38	3.27	3.54*	3.07*	3.40	3.27	3.37	3.30	3.02*	3.39*	3.54*
Total score	2.87*	2.73*	2.87*	2.81*	2.96*	2.70*	2.89*	2.80*	2.89*	2.81*	2.62*	2.85*	3.02*
Race													
Hispanic	84.89	15.11	59.95	40.05	54.92	45.08	49.16	50.84	45.80	54.20	30.46	32.13	37.41
Non-Hispanic black	73.61	26.39	55.56	44.44	69.44	30.56	45.83	54.17	54.17	45.83	31.94	26.39	41.67
Other	84.31	15.69	43.14	56.86	52.94	47.06	37.25	62.75	43.14	56.86	29.41	31.37	39.22
Education													
Less than high school	84.26	15.74	60.66	39.34	53.44	46.56	46.23	53.77	42.62	57.38	30.49	32.13	37.38
High school	81.90	18.10	50.86	49.14	57.76	42.24	46.55	53.45	51.72	48.28	29.31	25.00	45.69
College or higher	81.58	18.42	57.89	42.11	64.04	35.96	52.63	47.37	52.63	47.37	32.46	35.96	31.58
Employment													
Unemployed	82.47	17.53	57.99	42.01	59.28	40.72	48.71	51.29	48.45	51.55	29.90	31.96	38.14
Employed	85.43	14.57	56.95	43.05	50.33	49.67	44.37	55.63	41.72	58.28	31.79	29.80	38.41
Marital status													
Single	80.80	19.20	54.40	45.60	53.60	46.40	45.60	54.40	47.60	52.40	33.20	33.20	33.60
Married	85.47	14.53	60.90	39.10	59.52	40.48	49.48	50.52	46.02	53.98	28.03	29.76	42.21
Health status													
Fair/poor	80.41*	19.59*	56.76	43.24	56.08	43.92	48.31	51.69	49.32	50.68	32.77	29.05	38.18
E/VG/G	86.89*	13.11*	59.02	40.98	57.38	42.62	46.72	53.28	43.44	56.56	27.87	34.02	38.11

Mean medical-home score ranges from 1–4, with 4 = best. E/VG/G, excellent/very good/good. *$P < 0.05$.

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Table 3—Regressions of diabetes care on medical-home total score controlling for demographics

	Last HbA_{1c} test <6 months (logistic) (*n* = 534)	Last eye exam <1 year (logistic) (*n* = 534)	Plan to manage care at home (logistic) (*n* = 534)	Had diabetes education outside (logistic) (*n* = 534)	Visited a dietitian (logistic) (*n* = 534)	Diabetes education score (linear) (*n* = 534)
Total medical-home score	4.53* (2.053–9.998)	1.88* (1.031–3.427)	44.12* (19.96–97.51)	2.97* (1.614–5.451)	3.16* (1.715–5.838)	5.66* (5.016–6.299)
Race						
Hispanic	1	1	1	1	1	1
Non-Hispanic black	0.55 (0.284–1.057)	0.93 (0.539–1.607)	2.08* (1.085–3.975)	0.78 (0.453–1.359)	1.16 (0.670–2.010)	0.27 (−0.326 to 0.858)
Other	0.98 (0.425–2.270)	0.53* (0.289–0.984)	0.73 (0.371–1.428)	0.53* (0.282–0.995)	0.73 (0.392–1.354)	−0.11 (−0.770 to 0.553)
Education						
Less than high school	1	1	1	1	1	1
High school graduate or equivalent (GED)	0.91 (0.500–1.651)	0.71 (0.453–1.113)	1.17 (0.703–1.937)	1.09 (0.691–1.706)	1.42 (0.906–2.235)	0.09 (−0.400 to 0.573)
College or higher	0.96 (0.513–1.792)	1.01 (0.631–1.619)	1.78* (1.037–3.043)	1.56 (0.974–2.496)	1.59 (0.995–2.546)	−0.41 (−0.915 to 0.093)
Employment						
Unemployed	1	1	1	1	1	1
Employed	1.08 (0.620–1.869)	0.91 (0.606–1.354)	0.56* (0.361–0.883)	0.76 (0.508–1.135)	0.74 (0.495–1.111)	−0.27 (−0.706 to 0.156)
Marital status						
Single	1	1	1	1	1	1
Married	1.08 (0.667–1.763)	1.24 (0.860–1.784)	1.28 (0.852–1.927)	1.11 (0.769–1.592)	0.95 (0.656–1.363)	0.12 (−0.273 to 0.511)
Health status						
Fair/poor	1	1	1	1	1	1
E/VG/G	1.46 (0.897–2.371)	1.02 (0.711–1.452)	0.90 (0.603–1.337)	0.86 (0.605–1.232)	0.74 (0.518–1.058)	0.04 (−0.345 to 0.420)

Data are odds ratio/coefficient (95% CI). E/VG/G, excellent/very good/good. $^*P < 0.05$.

There are several limitations to the study. First, the data are cross-sectional, suggesting only association not causation. Second, the data were collected from an important and growing, but unique, population (mostly Hispanic Medicaid-insured patients in Los Angeles), and so the results may not be fully generalized to other vulnerable groups. Third, features in the PCAT to assess medical-home quality align closely, but not perfectly, with the other measures of medical home (such as those by the National Committee for Quality Assurance). As such they may not reflect a complete measure of medical-home quality. The National Committee for Quality Assurance measures are different in that they are reported by physicians and include elements of reimbursement not included in the PCAT. It may be important for readers to note these differences.

Fourth, an element of endogeneity may exist in the results because the independent and dependent measures were reported by the same individual. For example, an individual who has a positive outlook on their medical care in general may report positive responses on both medical-home quality and diabetes care. While we cannot rule out this potential endogeneity, it is reduced by the use of more reporting measures (e.g., Do you have to wait more than 30 min before you are seen by a doctor or nurse?) rather than rating measures that tend to be based on more evaluative or subjective satisfaction measures (e.g., How satisfied are you with the wait time to be seen?).

Lastly, the diabetes quality measures were obtained by patient self-report and thus may be neither accurate measures of either medical-home performance nor complete and objective measures of clinical care. Previous work suggests the level of concordance between patient self-report and medical record or administrative data are only fair (55–65%), with patients tending to overreport (rather than underreport) diabetes services (19–21). Patient-reported data are nonetheless very important. These data reflect the patient's understanding of their condition and their perceived health care needs and thus likely influence care-seeking behaviors (22). The findings should, however, be confirmed with medical record

or administrative data, but even those sources are not considered fully accurate and unbiased (20,23).

Despite these limitations, this study adds important evidence to the value of the primary care medical home for patients with chronic disease. The study also adds to the literature on how patients perceive the medical-home model and its impact on perceptions of chronic disease care. In our analysis, features consistent with higher medical-home performance were related to improvements in patient-reported diabetes care measures. This adds to the literature on how patients perceive the medical-home model and suggest that the results may be particularly important, given that this study was conducted among a Medicaid (low-SES) population where the prevalence of diabetes is higher, the potential for poor outcomes is greater, and resources dedicated to primary care tend to be fewer.

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