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Abstract

The Medical Services Initiative program—a safety net–based system of care—in Orange County included assignment of uninsured, low-income residents to a patient-centered medical home. The medical home provided case management, a team-based approach for treating disease, and increased access to primary and specialty care among other elements of a patient-centered medical home. Providers were paid an enhanced fee and pay-for-performance incentives to ensure delivery of comprehensive treatment. Medical Services Initiative enrollees who were assigned to a medical home for longer time periods were less likely to have any emergency room (ER) visits or multiple ER visits. Switching medical homes three or more times was associated with enrollees being more likely to have any ER visits or multiple ER visits. The findings provide evidence that successful implementation of the patient-centered medical home model in a county-based safety net system is possible and can reduce unnecessary ER use.

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Introduction

Having an established primary care medical home may be an important component in improving access to and quality of care for health care consumers (Paulus, Davis, & Steele, 2008). The uninsured represent 15% of the U.S. population (46 million) and are less likely to have a medical home or a usual source of care when compared with those with insurance (DeNavas-Walt, Proctor, & Smith, 2008). In addition, the uninsured are more likely to experience poor outcomes because of a disease than an insured person with the same condition (Institute of Medicine, 2008). This study explores the use of medical home assignment in an uninsured, low-income population and attempts to estimate the impact of having a medical home on emergency room use.

The concept of the medical home was first introduced in 1967 and has been further enhanced and revised in subsequent years. The concept was most recently renamed and refined in 2007 as the Patient-Centered Medical Home (PCMH). The PCMH specifically calls for the following elements: (a) a personal physician for each patient; (b) a physician-directed, multidisciplinary team–based medical practice; (c) whole person orientation for care processes such as case management; (d) coordination and integration of care; (e) improved quality and safety through evidence-based medicine and information systems; (f) enhanced access to care; and (g) adequate reimbursement to support the components of the medical home (American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, & American Osteopathic Association, 2007). Attempts at further delineation of specifics of medical home implementation have been made, but consensus on what such specifics should entail has not been reached (National Committee for Quality Assurance, 2009; Pourat et al., 2009).

The implementation of the medical home concept is an ideal that has not yet been attained for the majority of the population of the United States. According to a recent study, only 27% of nonelderly adults in the United States reported having the four main indicators of a medical home (Beal, Doty, Hernandez, Shea, & Davis, 2007). Existing models are frequently pilot projects that have implemented some aspects of the medical home concept in limited populations within existing health systems or settings (Paulus et al., 2008; Steiner, Denham, Newton, Wroth, & Dobson, 2008). The information on success of these programs in improving patient outcomes is gradually forthcoming but currently limited and not clearly duplicable in other settings.

Under an 1115 Medicaid waiver from the Centers for Medicare and Medicaid Services, California has established the Health Care Coverage Initiative (HCCI) demonstration program within 10 participating counties.[1] The duration of the demonstration is 3 years from September 1, 2007, through August 31, 2010. The main goal of HCCI is to improve access to high-quality health care for the low-income uninsured individuals. This

goal is to be achieved through implementing the medical home concept and assigning the enrollees to a medical home (Pourat et al., 2009). HCCI requires delivery of services within the existing safety net systems of the participating counties, through strengthening the system, expanding the scope of services, and expansion of provider participation.

The medical home under HCCI is defined as "a single provider or facility that maintains all of an eligible person's medical information and that is a licensed provider of health care services, and that provides primary medical care and prevention services."[2] This definition of a medical home is broad and fairly flexible, allowing a more patient-centered approach than defined in the statute (Pourat et al., 2009). This program serves as a model for implementing the PCMH concept within the safety net system for low-income uninsured populations. These types of interventions could be effective in reducing disparities in access to care and patient outcomes between insured and uninsured populations.

Orange County's HCCI Program: The Medical Services Initiative

One of the HCCI participants, Orange County, implemented the medical home concept in a unique environment. Prior to September 2007 and implementation of HCCI, Orange County primarily provided episodic health care to the uninsured population through their Medical Services for the Indigent program. The County does not have any public hospitals and the County's HCCI program (Medical Services Initiative [MSI]) contracts out for services with 23 area hospitals (nonprofit, for-profit, and academic) and a combination of primary care physicians in 14 safety net clinics and 166 private offices that serve as medical homes as of September 2009.[3] The implementation of the PCMH in Orange County is an innovative approach for delivery of care to low-income uninsured populations. It could serve as a model for other counties and localities that do not have a traditional public safety net hospital, which are often the main access point to the health care system for many uninsured individuals (Zaman, Cummings, & Spieler, 2009). These types of counties could develop a provider network based in private clinic and physician providers and private hospital facilities that can deliver care through a medical home model for the uninsured (Roby et al., 2009).

Approximately 90,000 to 100,000 residents of Orange County are potentially eligible for the MSI program based on the following criteria: (a) currently uninsured, (b) earning 200% of federal poverty level or less, (c) aged 21 to 64 years, (d) legal immigrants who have lived in the United States for 5 years or more, and (e) U.S. citizens residing in the county. The entire county is home to 3.05 million people, with 387,000 being uninsured.[4] Nearly 26,769 Orange County residents have been enrolled in MSI between September 2007 and September 2009.[5] Most of the enrollment in MSI has occurred when a user sought services through an area hospital or clinic provider. The hospital or clinic then assesses the qualification of the individual for MSI based on the aforementioned eligibility criteria. Therefore, residents of the county that do not seek out health care services and/or do not apply for eligibility for MSI at the point of service are often not represented in the MSI population. In addition, MSI enrollees are

charged enrollment fees and pay for a share of their own care via copayments collected at the point of service. These fees, although nominal, could provide barriers to some low-income individuals in enrolling and maintaining enrollment in the MSI program.

Out of the 27,000 MSI enrollees since September 2007, only 3,700 were not previous users of the county health system. These 3,700 enrollees were part of a separate outreach strategy to recruit new county residents who use other social services into the county system's MSI program and medical home model. However, that group is not included in the population for this study. Instead, this study focuses on current users of the MSI program who were uninsured and used county services over the past 2 years or more.

Under MSI, each uninsured enrollee chooses or is assigned to a medical home, which is a clinic or a private physician in the community. Within clinic-based medical homes, the enrollee chooses or is assigned to a specific physician to serve as their personal provider. This decision may be based on personal relationships, recommendation, language spoken by the provider, or proximity to the enrollee's home. This medical home is intended as the source for all primary care visits, as well as the place where medical record data for the patient are stored.

Nearly all MSI enrollees were assigned to clinic medical homes by January 2009, and 29% of enrollees were assigned to a private practice medical home by March 2009. All new enrollees are contacted by MSI on enrollment and are informed and educated about the use of the medical home. Members are allowed to change medical homes once a month and are encouraged to visit their assigned medical homes. Clinic medical homes receive a monthly incentive for providing at least one visit per enrollee during their eligibility period (usually 1 year from enrollment date). Patients with a chronic condition such as diabetes, congestive heart failure, hypertension, or asthma are required to be seen at least twice at their medical home during their annual eligibility period. Providers who do not meet these requirements will still be reimbursed a fee-for-service rate based on 70% of the Medicare fee schedule but will not receive any incentive payments for those patients. Private providers received incentives to join the network and pay-for-performance payments for primary and preventive services. In addition, private MSI medical home providers could determine how many MSI enrollees they were willing to accept as new or existing patients to their practice.

The clinic medical home providers direct a multidisciplinary team of health professionals consisting of PCPs, nurses, nurse practitioners, case managers/social service personnel, and support staff. Private physician medical homes typically consist of more limited staff. The medical home is responsible for coordinating all aspects of patients' health care needs, including specialist referrals, case management of complex diseases through an outside county vendor or in a clinic setting, and regular follow-up care.

Coordination of care is facilitated through the *ER Connect* information system, which links the 23 contracted hospital emergency rooms (ERs) with the 14 contracted community clinics. This system enables emergency physicians to view comprehensive patient medical histories (e.g., pharmacy, lab, claims data, and physician notes) and to electronically refer patients with nonemergent conditions back to their personal physician

at the clinic medical homes. MSI also uses *Clinic Connect*, a web-based application that enables community clinics to receive referrals from ERs. This allows clinic providers to access critical patient information, including ER physicians' recommended treatment plans, claims history, and physician notes. It also notifies the medical home that the patient had an ER visit, so that the physician can follow-up with the patient and the specialists and ER providers that their patient may have seen during the emergent episode.

Case and disease management services are provided to approximately 1,000 high-risk MSI patients diagnosed with diabetes, asthma, hypertension, and congestive heart failure and patients who frequently use ERs. MSI case managers facilitate communication between the patient, medical home providers, the MSI medical director, the utilization management department, hospital administration, DME companies, and home health care. Case managers also help secure patient access to services such as specialty consults, diagnostic testing, and the creation of individualized care plans that target self-management of chronic illness. Case managers reinforce the importance of proactive care at the medical home level to avoid complications resulting in ED or inpatient stays. An emergency phone line staffed with registered nurses is available 24 hours a day, 7 days per week, and provides members with advice on medical issues and redirects them to the appropriate level of care. In cases where medical complaints are for nonemergent issues, nurses divert patients to their assigned medical home.

MSI has a significant quality improvement and assurance component and monitors the quality of medical care provided. The adoption of evidence-based practice guidelines by medical home providers is encouraged and the extent to which these guidelines are followed is continuously monitored. Utilization review, formulary development and adherence, and patient and provider satisfaction are monitored by MSI staff and the medical director. Medical home providers can also earn incentives for meeting specific goals—such as seeing a chronic illness patient twice per year. A pay-for-performance program was instituted to improve utilization of preventive services. Incentives were also provided, such as $15 to ER physicians to enter clinical notes into the *ER Connect* system and $100 to community clinics to successfully receive patient referrals directly from ERs.

Prior to implementing the medical home model described above, the MSI program had high rates of ER utilization, inpatient visits and days of hospitalization, and high per member costs because of their receipt of episodic, limited, and uncoordinated care. Following the implementation of MSI, reductions in ER visits and hospitalizations were observed. This study examines the potential role of the PCMH in ER utilization under the MSI program.

New Contribution

This study provides five major contributions to the existing literature on the PCMH. The MSI program provides a unique example of implementation of the medical home concept within a county system of care that uses a private network of safety net

providers. Other existing models of medical home implementation have occurred in large safety net clinics for the uninsured through initiatives such as the Health Disparities Collaboratives (Chin et al., 2007) and the Safety Net Medical Home Initiative[6] or in relatively large medical groups that provide care to insured populations (Rittenhouse, Casalino, Gillies, Shortell, & Lau, 2008).

The MSI program is implemented through a combination of contracts with private clinics and their physicians, private physicians with their own practice or belonging to a medical group, or private hospitals. Other than the clinics, the other providers are not traditional safety net providers. Instead, Orange County has been able to create a network of physicians that looks similar to a closed panel insurance network.

Furthermore, the county has been able to implement Medicare-based fee schedules, pay-for-performance incentives, evidence-based guidelines for the various providers, and the involvement of a medical director in utilization review and formulary guidance and monitoring that resemble services usually available only in managed care plans or private insurance companies. In addition, the current study assesses the role of medical home assignment on ER utilization over time for a broad population of uninsured enrollees. Evidence on impact of the medical home on utilization of services and patient outcomes are still limited and often include specific population subsets.

Finally, the study measures the impact of assignment to a medical home without the confounding impact of such assignments in the past. The subset of enrollees in the MSI program described in this study were uninsured for at least 1 year prior to Orange County's adoption of the medical home model. Because of the episodic nature of MSI before September 2007, it was highly unlikely that study participants had a medical home prior to the intervention described here.

Method

Conceptual Framework

The Andersen (Andersen & Davidson, 2007) framework for health care access and utilization was used to conceptualize the relationship between medical home assignment and ER use. The model allowed the authors to develop hypotheses regarding the presence of a medical home, the time enrolled in a medical home, and the number of medical home changes (i.e., continuity breaks) and the potential impact on ER use and number of visits. According to the model, utilization of services is determined by predisposing and enabling characteristics of the patients as well as their level of need for health care. Predisposing characteristics identified in this study include age, race/ethnicity, and gender. Enabling characteristics include income (percentage of poverty level), the length of assignment to a medical home, and number of changes in assigned medical home (which is a proxy for continuity of care). In the context of this study, need is measured through the presence of chronic conditions including asthma, diabetes, congestive heart failure, musculoskeletal disorders, and mental health disorders. Although there is no other severity or need-based measure available, we feel that the

presence of chronic illness, chronic pain, or mental health problems serve as effective proxy measures.

Using the Andersen model and other literature on access to primary care and the medical home, we arrived at the following hypotheses. Below each set of hypotheses are the rationale used to support each one.

Research Questions and Hypotheses

Research Question 1: Is improved access to a patient-centered medical home in Orange County associated with the likelihood of experiencing an ER visit?

Hypothesis 1: Being assigned to a medical home for a longer period of time reduces the likelihood of any ER visits.

Research Question 2: Is improved access to a patient-centered medical home in Orange County associated with lower numbers of ER visits?

Hypothesis 2: Being assigned to a medical home for a longer period of time reduces the likelihood of having multiple ER visits.

Based on the model, we hypothesized that longer assignment a medical home will reduce rates of ER visits in the study population. This hypothesis is based on the argument that the longer a patient is assigned to a medical home, the more likely that she/he would use appropriate and needed primary care services and not obtain care in the ER except in an emergency. Access to appropriate primary care for the uninsured should reduce avoidable ER use (Kaiser Family Foundation, 2006). Patients with shorter times assigned to a medical home are more likely to visit an ER since they have not established a solid relationship with their medical homes (Fredrickson, Molgaard, Dismuke, Schukman, & Walling, 2004). Availability and access to a patient-centered primary care medical home is likely to lead to improved health status and outcomes as well as reduced unnecessary or avoidable ER visits (Begley, Vojvodic, Seo, & Burau, 2006). In this case, we are assuming that assignment to a medical home reflects access to the medical home. Based on preliminary analysis of the data set, this was determined to be a valid assumption. Every member of the study population used the medical home at least once, and over time, the average enrollee used the medical home once per month.

Research Question 3: Does lack of continuity or continuous primary care through a medical home increase the likelihood of experiencing an ER visit?

Hypothesis 3: Frequent changes to one's medical home (i.e., breaks in continuity) will result in a higher likelihood of any ER visit.

Research Question 4: Do frequent changes of medical home assignment (i.e., breaks in continuity) increase the likelihood of multiple ER visits?

Hypothesis 4: Frequent changes to one's medical home will result in a higher likelihood of multiple ER visits.

In this second set of hypotheses, we posit that fewer changes in a medical home will reduce rates of ER visit in the study population. This hypothesis is based on the argument that the longer a patient is assigned to a medical home and the less disruption in continuity of care occurs because of staying with that medical home, the more likely that she/he would use appropriate and needed primary care services. Patients with disruptions in insurance coverage and continuity of care are more likely to visit an ER since they have not established a solid relationship with their medical homes and lack care coordination or access to routine care from their primary care provider (Federico, Steiner, Beaty, Crane, & Kempe, 2007; Fredrickson et al., 2004). Other research has found that individuals with chronic illnesses, such as asthma, are likely to experience exacerbations of their condition because of inadequate access to insurance coverage (Markovitz & Andresen, 2006).

Research Question 5: Do the interaction of race/ethnicity, chronic disease and time in medical home affect use of ER services?

Hypothesis 5: Race/ethnicity and chronic illness mitigates the impact of time assigned to a medical home in predicting use of ER services.

The aforementioned hypotheses are based on the potential for interaction between race/ethnicity and chronic disease in the uninsured, low-income population enrolled in MSI. The existing literature on disparities in health outcomes focuses on lack of access to health care for minority groups (Brown, Ojeda, Wyn, & Levan, 2000; Escarce, 2007). Diabetics from minority groups are more likely to experience complications, have worse diabetes control, and suffer from lack of access to care than their White counterparts (Peek, Cargill, & Huang, 2007). Because of the potential relationship between racial/ethnic groups, access to care, and chronic illness, it is likely that these systematic differences could mitigate the relationship of medical home assignment on the outcome, use of ER services.

Data Source

Eligibility and claims data from the population enrolled in the MSI program in Orange County, California, between September 2006 and March 2009 were used for this study. The sample included individuals who had used services in the last 4 months of this time period and who had MSI claims as far back as September 2006. The sample consisted of 2,708 individuals who fit these criteria. Although the MSI program as a whole has had 26,769 enrollees as of September 2009, the characteristics of the selected 2,708 enrollee subset appear to be representative of the MSI population overall. These individuals were actively enrolled from September 1, 2006, to March 20, 2009 (see Table 1). The majority of the sample was 55 to 64 years of age (66.7%), female (68.9%), and had incomes below 100% of federal poverty level (FPL; 68.3%). The largest racial/ethnic group was Vietnamese (41.0%), followed by Latino (24.3%) and White (18.3%).

Table 1. Sample Characteristics (*N* = 2,708): Dependent and Independent Variables

	Estimate	Standard Error
Predisposing		
Age (years)		
22-44	10%	0.6%
45-54	23%	0.8%
55 or older	67%	0.9%
Female gender	69%	0.9%
Race/ethnicity		
White	18%	0.7%
Latino	24%	0.8%
Vietnamese	41%	0.9%
Other	6%	0.5%
Missing/unknown	10%	0.6%
Enabling		
Federal poverty level		
≤100%	68%	0.9%
Medical home		
1-2 medical home changes	72%	0.9%
3 or more medical home changes	28%	0.9%
Average time with medical home (months)	16	0.04
Need		
Chronic conditions		
Diabetes	28%	0.9%
Asthma	4%	0.4%
Congestive heart failure	5%	0.4%
Hypertension	78%	0.8%
Mental illness diagnosis	14%	0.7%
Musculoskeletal conditions	54%	1.0%
Use (dependent variables)		
Emergency room (ER) visits		
Any ER visit	48%	1.0%
Average number of ER visits (among those with any visits)	4	0.29

In the overall MSI population to date, 39% are Vietnamese, 25% are Latino, and 22% are White. While women were more likely to be in the study population (69%) than the overall MSI population (55%), it is also possible that women are more likely to maintain enrollment and seek out a medical home when compared with males in the overall population. Therefore, women may be more likely to meet the criteria for inclusion in the study. Last, there were no income differences between the overall MSI population and the study population.

The most prevalent disease conditions in the study population were hypertension (78%), musculoskeletal conditions (54%), diabetes (28%), mental illness (14%), congestive

heart failure (5%), and asthma (4%). Individuals may have had one or more of these conditions, which is reflected in the data. In addition, this group of subjects may be more likely than the average uninsured individual in Orange County or in the state of California to need and use health care (because of the high rates of chronic illness). Although the individuals in this study did not have access to a medical home prior to enrollment in MSI, they were receiving episodic, acute care through the previous indigent care program operated in Orange County.

The dependent variables are using the ER in the past 31 months and the number of ER visits, measured by counting the number of claims for such visits delivered by all hospitals in Orange County. One independent variable of interest, length of time with a medical home (enabling) was measured in number of months an individual patient was assigned to a medical home. The second independent variable of interest is the continuity of enrollment with a medical home (enabling), which was measured by the number of times an individual had changed their medical home. This variable was dichotomized into those with one or two changes versus those with three or more changes.

A minimum of 6 months of enrollment in the MSI program and 6 months of use of county services prior to implementation of the MSI program was required for inclusion in the enrollee sample. The maximum length of enrollment in MSI was 19 months, and the maximum length of service use prior to implementation of the medical home was 12 months.

Variables that could change over time (i.e., poverty level, age) were indicated by selecting the value at the time of the most recent enrollment. Those with incomes at 100% or below FPL (enabling) were distinguished from those between 101% and 200% of FPL. Age (predisposing) was categorized into enrollees aged 21 to 44, 45 to 54, and 55 years and older. Race/ethnicity (predisposing) was categorized as White, Latino, Vietnamese, and others. Those with missing or unknown race/ethnicity were included in the analysis to avoid loss of data. In addition, gender (predisposing) was used as a demographic variable in the analysis.

Four specific chronic conditions (need) were identified: diabetes, asthma, hypertension, and congestive heart failure (CHF). Two major diagnoses (need), musculoskeletal disorders and mental illness, were also included because they represented a large number of claims for the MSI population and a significant potential predictor of health care use.

Last, several interaction variables were created to determine the confounding or mitigating effect of race/ethnicity with medical home assignment, race/ethnicity with disease status, and disease status with medical home assignment. Each of these three variables was interacted separately with each other (race/ethnicity with time, race/ethnicity with disease, and time with disease). Although earlier versions of the models included time-based interactions, none of them were significant and were removed from the final versions. The time-based interactions did not have any impact on the other independent variables in predicting ER use or number of ER visits.

Modeling Approach

A standard two-part model was used to examine the relationship between the medical home and ER visits. In the first part, a logistic regression model was used to assess the independent association of medical home assignment and any ER visits, controlling for other predisposing, enabling, and need variables ($N = 2,708$). In the second part, a negative binomial model was used to determine the independent association of medical home assignment and the number of ER visits for those who used the ER at least once ($N = 1,300$). The same covariates were used in both models.

Results

Individuals were assigned to a medical home for 16 months on average (minimum = 6 months, maximum = 19 months). The majority (72%) had changed their medical home between one and two times, while the remainder had changed three or more times. About half (48%) of the study population had an ER visit at least once. Among those who used the ER during the study period, the average number of ER visits was four.

The odds of having an ER visit declined with longer enrollment in a medical home (odds ratio [OR] = 0.96, $p < .05$; see Table 2). Those with three or more medical home changes had higher odds of an ER visit (OR = 1.28, $p < .05$).

Without using race/ethnicity and chronic illness interaction variables, a number of disease conditions (asthma, CHF, mental illness, and musculoskeletal) were associated with an increased likelihood of ER visit. However, after introducing the interaction terms for racial and ethnic groups with disease status, only individuals with musculoskeletal conditions (OR = 2.16, $p < .001$) had a statistically significant increased risk of ER visits (Table 2).

Younger individuals were more likely to have ER visits than the oldest group. However, Vietnamese (OR = 0.19, $p < .001$) were less likely to have ER visits compared with Whites. Gender and income were not statistically significant predictors of having any ER visits.

Among those with ER visits, the likelihood of additional visits declined with longer enrollment in the medical home ($\exp \beta = 0.95$, $p < .001$; (see Table 3). Furthermore, individuals with three or more changes in medical homes were more likely to have additional ER visits ($\exp \beta = 1.13$, $p < .05$). All disease conditions other than diabetes and CHF increased the likelihood of additional ER visits, even controlling for the interaction between race/ethnicity and chronic illness. However, no racial or ethnic groups were identified as significant predictors of increased ER visits. It appears that the interaction variables did mitigate the ethnic effect. Those with incomes below 100% of FPL were more likely to have multiple ER visits than those in the higher income group ($\exp \beta = 1.23$, $p < .001$). Females were less likely to have multiple ER visits compared with males ($\exp \beta = 0.84$, $p < .001$). Younger enrollees with at least one ER visit were more likely to have multiple ER visits than the oldest age-group (21-44: $\exp \beta = 1.76$, $p < .001$; 45-55: $\exp \beta = 1.26$, $p < .001$). Notably, there were

Table 2. Logistic Regression Results: Odds Ratios for Independent Variables Predicting Having Any Emergency Room Visits ($N = 2{,}702$), $R^2 = .30$

	Odds Ratios	95% Confidence Intervals
Predisposing		
Age (years)		
22-44	2.37***	1.72, 3.28
45-54	1.82***	1.46, 2.26
Female gender	0.93	0.76, 1.13
Race/ethnicity		
Latino	0.74	0.41, 1.34
Vietnamese	0.19***	0.11, 0.35
Other	0.45	0.18, 1.12
Unknown/missing race	0.91	0.45, 1.86
Enabling		
Federal poverty level		
≤100%	0.97	0.81, 1.17
Medical home		
3 or more medical home changes	1.28*	1.04, 1.58
Time with medical home (months)	0.96*	0.92, 1.00
Need		
Chronic conditions		
Diabetes	1.03	0.64, 1.66
Asthma	1.93	0.77, 4.86
Congestive heart failure	2.08	0.91, 4.73
Hypertension	1.15	0.71, 1.87
Mental illness diagnosis	1.35	0.82, 2.21
Musculoskeletal conditions	2.16***	1.41, 3.31
Significant interactions (ethnicity and disease)		
Vietnamese * Mental Illness	2.41*	1.15, 5.04
Vietnamese * Musculoskeletal	0.54*	0.32, 0.90
Unknown race * Musculoskeletal	0.37*	0.19, 0.74

*$p < .05$. ***$p < .001$.

significant interactions that predicted decreased ER visit numbers for Latinos, Vietnamese, and the other racial and unknown race groups with mental illness and musculoskeletal disorders (Table 3).

Discussion

The findings provide evidence that PCMH enrollment and continuity of care with the same medical home can significantly reduce utilization of ER services. This effect may have been achieved through a number of mechanisms including increased access to primary care, improved care coordination, and delivery of case management and patient education on self-management. However, the individual impact of each component of

Table 3. Negative Binomial Logistic Regression Results: Independent Variables Predicting Number of Emergency Room Visits (N = 1,300)

	Exponentiated Estimates	95% Confidence Intervals
Predisposing		
Age (years)		
22-44	1.76***	1.52, 2.04
45-54	1.26***	1.12, 1.42
Gender	0.84**	0.75, 0.93
Race/ethnicity		
Latino	1.16	0.86, 1.55
Vietnamese	0.92	0.62, 1.36
Other	1.48	0.92, 2.37
Unknown/missing race	0.87	0.62, 1.24
Enabling		
Federal poverty level		
≤100%	1.23***	1.10, 1.37
Medical home		
3 or more medical home changes	1.13*	1.01, 1.26
Time with medical home (months)	0.95***	0.93, 0.97
Need		
Chronic conditions		
Diabetes	1.03	0.85, 1.24
Asthma	2.04***	1.54, 2.70
Congestive heart failure	1.23	0.94, 1.60
Hypertension	1.25*	1.03, 1.53
Mental illness diagnosis	2.36***	1.97, 2.82
Musculoskeletal conditions	1.95***	1.62, 2.35
Significant interactions (ethnicity and disease)		
Latino * Mental Illness	0.67**	0.51, 0.87
Latino * Musculoskeletal	0.64***	0.49, 0.82
Vietnamese * Mental Illness	0.44***	0.29, 0.68
Vietnamese * Musculoskeletal	0.64**	0.47, 0.88
Other Race * Mental Illness	0.21***	0.09, 0.50
Other Race * Musculoskeletal	0.52**	0.33, 0.82
Unknown Race * Musculoskeletal	0.62**	0.44, 0.86

*$p < .05$. **$p < .01$. ***$p < .001$.

medical home is not isolated in this study. In addition, MSI administrators and staff allow some flexibility in medical home implementation among participating clinics and physicians, which leads to variations in care. However, the MSI program affects some aspects of care delivered in medical homes by providing financial incentives, monitoring care delivery, and providing support services to patients.

The increased likelihood of ER visits with three or more medical home changes over time suggests that while medical homes are successful in reducing reliance on

episodic care at the ER, lack of continuity counteracts this effect. Patients should have the choice of changing medical homes that may not suit their needs. However, identification of the reasons for frequent changes is essential and would maximize the positive effects of medical home assignment. It is also possible that the enrollees switching medical home frequently could be losing eligibility, moving residences, or are unhappy with their medical home providers when assigned. These issues could also contribute to higher rates of ER visits and identify the need for specific programmatic improvements.

Among the predisposing factors included in the model, females with any ER visits were less likely than their male counterparts to visit the ER multiple times. In addition, younger age at enrollment was associated with more ER utilization. It is possible that males and younger individuals are more likely to delay needed care until the situation is urgent and requires an ER visit. Thus, additional education and case management for these patients is indicated. It is also possible that the older age-group, who are more likely to have chronic illnesses and ongoing health-related needs, seek primary care regularly in order to receive their prescription medications and maintain their health. However, younger individuals may be less likely to need prescription drugs and less likely to manage their health problems (i.e., chronic disease, musculoskeletal injuries). Lack of adherence to medication regimens, despite having a chronic illness, and delay in care because of perception of the seriousness of the condition (Ruggiero & Prochaska, 1993)[7] can lead to more ER visits and further exacerbations of disease.

It is also possible that younger individuals who are high users of care have significant need and higher severity conditions than their older counterparts. Unfortunately, lack of patient-level data on severity is not available except for the presence of chronic illness. Another predisposing variable, racial/ethnic minority status (Vietnamese), was associated with no ER use when compared with Whites in the MSI program. In addition, the interaction variables for disease status with racial/ethnic groupings (Latinos, Vietnamese, and other racial groups) were significant predictors of lower ER use. This could indicate that the uninsured minority populations (specifically Latinos and Vietnamese people with mental illness or musculoskeletal problems) in Orange County are benefitting more from having a PCMH than the White uninsured population. There could also be an ethnic enclave effect, where medical homes that do provide same-language services to Latinos and Vietnamese groups and provide significant enabling services are able to recognize significant gains in the health and access to primary care for minority populations by managing their chronic disease or treatment behaviors related to mental illness or musculoskeletal conditions. This issue requires further study of the impact of the PCMH on ethnic groups who often experience health care disparities prior to most interventions.

Only one diagnosis (musculoskeletal disorders) resulted in increased likelihood of having at least one ER visit, while several were associated with multiple ER visits over time: asthma, hypertension, mental illness, and musculoskeletal conditions.

Limitations

There are some limitations of the study. The concept of medical home has been implemented in Orange County for a relatively short time. It is not clear if the effect of medical home can truly be realized in only 19 months. Although ER visits appear to decrease for uninsured patients when they have access to a medical home, it is not clear if these decreases are sustainable over time or if further improvements might occur in other areas. Further research will be conducted over the next 2 years to assess the long-term impact on ER use of medical home assignment and use.

This is not an insurance program. The county does not pay or track services that may be delivered to the uninsured Orange County resident population outside of their contracted facilities. The claims data only include encounters that occurred within hospitals located in Orange County. This could result in an undercount of ER visits if MSI enrollees sought care in the neighboring counties of San Diego, Riverside, or Los Angeles.

The current analysis did not include any information on whether services were actually delivered at the assigned medical home. Although all the subjects used in the analysis are users of MSI services, their medical home assignment is not necessarily linked to the location where they received all primary care services. Each of the study participants had at least one visit to the assigned medical home. Although clinics and providers may suggest switching medical home or scheduling a visit with their own assigned medical home provider, the patient is free to seek care at other MSI providers. The effect of the medical home on decreasing ER use may be overestimated if the only change was access to primary care at any location, rather than access to a medical home.

Another data-related limitation exists in the length of time an enrollee was part of the MSI program. Because of their low-income status, these patients could potentially be churning on and off of employer-based insurance or Medi-Cal, and returning to MSI only when they are uninsured. However, it is unlikely that an insured individual would continue paying enrollment fees to stay in the MSI program. MSI enrollees using outside services could also cause underestimation of the number of ER visits, or underestimation of the use of a medical home from outside of the MSI system. Knowing the level of continuous enrollment and eligibility as well as services used when outside the system would be helpful. In addition, understanding the link between indigent care programs and existing Medicaid or SCHIP eligibility and enrollment mechanisms will be useful in providing some level of continuity between multiple programs. If coordination is possible between MSI and Medi-Cal providers (CalOptima) in Orange County to maintain continuity in an enrollee's medical home, it could serve to improve care for people even if they lose or gain health care coverage through public insurance, a coverage initiative, or a commercial insurance plan. It would also provide an excellent natural experiment that could be used to assess the role of the medical home in improving care, while also examining the role of insurance in facilitating use of the medical home versus an organized safety net indigent care program.

Despite these limitations, the results support the idea that an uninsured population can benefit from PCMH assignment. Future studies could confirm whether longer periods of time (the MSI program is likely to continue for at least 3 years) assigned to medical home have an effect on ER visits in the long term. As additional data become available from the MSI program, more analyses to deal with some of these limitations will be conducted. It will also be important for the costs of adopting a medical home model to be considered against the outcomes obtained and the money spent reimbursing medical home providers and providers of other care. The HCCI program as a whole is undergoing a Centers for Medicare and Medicaid Services mandated evaluation from the financial, humanistic, clinical, and organizational perspectives. This evaluation will allow counties and states to determine whether the medical home model is sustainable, effective, and achieves cost savings.

Conclusion

Orange County's MSI program achieved reductions in ER visits after implementing an assigned PCMH for the uninsured. Although assignment itself may not determine having an ER visit or the number of ER visits, it does appear that having a medical home reduces ER use from the previous 12 months and that continuity of care with the same medical home also decreases ER use. Switching medical homes appears to increase likelihood of ER visits and multiple ER visits; therefore, it is important to assign, enforce, and allow patients to stay with a medical home they are comfortable with. Temporary changes and transitions to a new medical home because of contracting issues, patient satisfaction, and other issues could potentially affect ER use. It is important for the MSI program to continue providing a pathway for the uninsured to obtain needed primary care from their medical home and to take advantage of additional county services. Together, the county and personal physicians have created a PCMH for the enrolled uninsured population. Although the MSI program has not completely implemented every component of the medical home model, they have at least partially fulfilled each of the seven joint principles of the PCMH model. This model could serve other large safety net systems with diverse providers and patient populations in improving health, decreasing expensive, avoidable ER visits, and receiving appropriate primary care in the PCMH.

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The author(s) declared a potential conflict of interest as follows: Authors Roby, Kominski, and Pourat are under contract to the State of California Department of Health Care Services to evaluate the Health Care Coverage Initiatives, of which Orange County's MSI is one of the initiatives. This article was written outside the scope of the HCCI evaluation, and the authors received no compensation for conducting this research or publishing the article. Authors Castillo, Pirritano, Vrungos, and Dajee are all employed by the Orange County Health Care Agency, which administers and collects data on the MSI program.

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1. The Health Care Coverage Initiatives demonstration project was implemented under California's Section 1115 Safety Net Financing waiver (No. 11-W-00193/9). California Senate Bill 1448 was enacted to provide a statutory framework for HCCI (California Welfare and Institutions Code, Ch.76, Section 14166.21, 2006). Retrieved from http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb_1401-1450/sb_1448_bill_20060718_chaptered.pdf.
2. State of California (2006, November). *Health care coverage initiative: Request for applications*. Retrieved from http://www.dhcs.ca.gov/services/Documents/RFA.pdf
3. Information about the Orange County Health Care Agency's Medical Services Initiative can be found at http://www.ochealthinfo.com/medical/msi/index.htm
4. These data are from the 2007 California Health Interview Survey and was retrieved from www.askchis.com
5. Rapid Evaluation Performance System Coverage Initiative Program Data retrieved from https://www.coverageinitiative.ucla.edu/About-REPS.aspx
6. Information on the Safety Net Medical Home Initiative is available from The Commonwealth Fund, Qualis Health and Improving Chronic Illness Care (MacColl Institute at Group Health Cooperative) from http://www.qhmedicalhome.org/safety-net/index.cfm
7. To review the elements of Prochaska and DiClemente's stages of change, please visit http://www.cellinteractive.com/ucla/physcian_ed/stages_change.html

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