Evaluation of Care Management for the Uninsured

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Background: In 2008, Kern Medical Center established a Care Management Program (CMP) for low-income adults identified as frequent users of hospital services. Frequent users are defined as having 4 or more emergency department (ED) visits or admissions, 3 or more admissions, or 2 or more admissions and 1 ED visit within 1 year. The CMP helps patients access primary care and medical and social resources.

Objective: To determine whether the CMP reduces ED visits and hospitalizations among frequent users.

Method: Between August 2007 and January 2010, a retrospective analysis was conducted using Kern Medical Center encounter data. ED visits and inpatient visits were compared pre- and postenrollment for care managed patients (n = 98). The analysis included a comparison group (n = 160) of frequent users matched on the basis of race and age. Multivariate analyses were performed to evaluate the difference in utilization between groups, and to adjust for potential group differences.

Results: There was a reduction in the median number of ED visits per year from 6.0 ± 5.0 (median ± interquartile range) preenrollment to 3.0 ± 4.2 postenrollment ($P < 0.0001$). The difference in inpatient admissions pre- and postenrollment was 0.0 ± 1.0 ($P < 0.0001$). After adjusting for multiple factors, multivariate analysis demonstrated that care managed patients had a 32% lower risk of visiting the ED than the comparison group ($P < 0.0001$). There was no difference in inpatient admissions between groups.

Conclusions: CMP that helps patients navigate the health care system and access social and medical resources show significant promise in reducing ED utilization.

Key Words: care management, access to health care, Medicaid

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With the passage of health reform, controlling health care costs will be increasingly important for the sustainability of government health programs, such as Medicaid. Among the Medicaid population, 4% of patients account for nearly half of all Medicaid spending.[1] Although estimates vary, studies have shown that up to 49% of emergency department (ED) utilization is attributed to avoidable causes.[2] Medicaid patients are also more likely to be hospitalized than privately insured patients for avoidable causes,[3] and 1 in 10 Medicaid patients are readmitted within 30 days.[4] Therefore, increasing attention has focused on the need to reduce avoidable and preventable ED visits and hospitalizations in the Medicaid population.

Expanding access to primary care has been considered a strategy to curb hospital utilization in the safety net population. A study by Kravet et al showed that a high proportion of primary care physicians, compared with other physicians, is associated with lower inpatient and ED visits[5]; other studies have found that patients who access primary care at community health centers are less likely to have ED visits or hospitalizations for avoidable reasons.[6,7] In recognizing the importance of increasing primary care to reduce ED utilization, the Deficit Reduction Act of 2005 provided up to $4 million funding in grant for states to establish alternate nonemergency provider networks, including increased funding for community health centers. However, the reported effect of primary care on ED use is variable across literature, with several studies showing no reduction in avoidable ED visits among patients with health care coverage and access to primary care,[8,9] and no clear association between hospital utilization and the proportion of primary care providers.[10]

Even among patients with access to primary care, navigation of the health care system is often challenging because of fragmentation of care and little communication among providers.[11,12] Navigation is more difficult for patients in the safety net because of lower functional status, multiple comorbidities, and communication barriers.[12]

In response to the system challenges and access barriers faced by safety net patients, the Care Management Program (CMP) for frequent users was established at Kern Medical Center (KMC), a public hospital safety net provider, based on the Care Transitions & Coordination[SM] Program developed by COPE Health Solutions. The CMP was designed to decrease avoidable utilization of ED and inpatient admissions by patients identified to be frequent users of these services. For this program, frequent users were defined as having 4 or more ED visits or admissions, 3 or more admissions, or 2 or more admissions and 1 ED visit within 1 year. They comprise the top 10% of the uninsured population in terms of ED use and hospitalizations. Patients who were diagnosed with human immunodeficiency virus or cancer were excluded from

the program. Through the CMP, patients were assigned a personal care manager who assisted with access to social and medical resources, helped patients schedule primary care appointments, and helped bridge barriers between the patients and the health care system.

Although similar interventions have shown success in reducing hospitalizations, most focus on reducing admissions for the Medicare population.[13–15] Findings from these interventions cannot be generalized for other populations, especially to the uninsured or Medicaid population, as Medicare patients tend to be older, more highly educated, and have lower prevalence of mental illness and substance abuse disorders as compared with Medicaid patients.[16] Some states have implemented CMPs to assist patients with navigating and coordinating services. However, a study of 5 state programs for the Medicaid population showed that programs varied widely in design and implementation, and all programs faced significant limitations in reducing hospital utilization.[16]

The objective of this study is to determine whether providing navigation of the systems and improved access to social and medical resources through the CMP reduces ED visits and hospitalizations among frequent users of hospital services.

METHODS

Setting

Kern County, situated in the Central Valley, is the third largest county in California consisting of 37 rural census tracts and a population of over 800,000 individuals. In 2007, Kern County was 1 of 10 counties in California selected to participate in the Health Care Coverage Initiative, a Medicaid demonstration project, to expand healthcare coverage for low-income uninsured individuals. The Health Care Coverage Initiative program developed in Kern County was referred to as the Kern Medical Center Health Plan (KMCHP), a network of county and community clinics that provided patients with a primary care home, improved coordination of care between specialists and primary care providers, and care management for frequent users of hospital services. Patients were eligible for KMCHP if they were between 18 and 64 years of age, below 200% of the Federal Poverty Level, uninsured, and not eligible for any public insurance programs. The program covered services rendered by the patients' primary care home and any services provided by KMC. KMC is owned and operated by the County of Kern, serving as the main source of care for the indigent and uninsured population.

Program Description

As a component of KMCHP, the CMP was established in 2008 to help reduce avoidable ED and inpatient utilization while maintaining quality of care. Frequent users enrolled into the CMP are assigned a care manager. The care managers for KMCHP had previous experience as case workers or medical office assistants and received initial and ongoing education on social and community resources, communication, and health topics as part of their training for the CMP. All enrolled patients were assigned to a primary care clinic at

1 of 3 KMC outpatient primary care clinics. Care managers met with patients at least monthly, at appointments, patients' homes, or resource centers, to assist patients in obtaining and coordinating needed services. Patients were managed for various lengths of time depending on their needs and were graduated from the program when the care manager felt they understood how to make appointments, receive medications, and follow-up on goals. Patients who were lost to follow-up, deceased, or became ineligible for KMCHP before graduating were considered inactive.

Enrollment

To identify patients eligible for the CMP, KMC generated a monthly report of KMCHP patients who met frequent user criteria. The care managers used these reports to contact and recruit patients for enrollment through phone. If a patient was admitted during the time of recruitment, the care managers met the patient in the hospital. Enrollment was voluntary, and all patients were enrolled in-person by the care managers and provided informed consent. Once enrolled, the patient's assigned care manager worked with him or her during the program.

Components

1. Goal creation and assistance in reaching goals: Care managers work with patients to create and achieve care plan goals, ranging from applying for benefits and receiving stable housing to losing weight and receiving specialty care appointments.
2. Assistance with care navigation: Care managers schedule appointments, follow-up on referrals, and help patients refill medications.
3. Arranging for support services: Care managers make personal connections with staff at various agencies around the community and refer patients to appropriate services, including transportation resources, Legal Aid, homeless shelters, faith-based services, and substance abuse resources.
4. Care transitions: Care managers meet with patients daily while they are admitted and work with discharge planners to assist patients in receiving recommended follow-up care and understanding discharge instructions.
5. Communication with providers: Care managers serve as liaisons between patients and providers, accompanying them to appointments, creating and prioritizing problems lists, coaching patients about questions to ask, and sitting with patients after their visit to explain follow-up instructions.

Study Samples

Between August 2008 and January 2010, 120 patients were enrolled into the CMP. As of January 2010, 22 patients had been active in the program for 90 days or less and were excluded from this analysis. Among the patients included in the analysis (n = 98), 49 patients were still actively receiving care management services, 16 patients had graduated from the program, and 33 patients were considered inactive, as defined earlier in the text.

A comparison group (n = 160) of frequent users was identified who were also in the KMCHP program but who did not participate in the CMP. The patient groups were com-

pared using χ^2 tests for qualitative variables and 2-sample *t* tests for quantitative variables.

Data and Outcome Measures

All hospital encounter data were obtained between 2007 and 2009 from KMC's financial record system. The data included admission and discharge dates of ED and inpatient visits, diagnoses at each encounter, insurance information, and health care expenditures. The Charlson comorbidity index (CCI) was calculated using primary diagnostic codes for inpatient admissions before the start of the CMP, based on the methods described by Deyo et al.[17]

Data specific to the CMP were captured in NaviLinx™, a software program developed by COPE Health Solutions used to track relevant activities and goals of care managed patients. Data captured by NaviLinx™ include patient participation status, patient demographics, primary care home, and encounter notes between the care manager and the patient.

The primary outcomes of interest were change in ED visits, change in inpatient admissions, change in inpatient days, and change in ED and inpatient costs. Observations were weighted to annualize the number of ED visits, inpatient admissions, and inpatient days for patients in the analysis.

Statistical Analysis

All statistical analyses were conducted using SAS v9.1.3 (SAS Institute Inc, Cary, NC). Patient demographic characteristics were described using frequencies or descriptive statistics including means, medians, standard deviations, and interquartile ranges. The distributions of the differences in ER visits, inpatient admission, and outpatient visits were not found to be normal. As such, depending on the variable, the Wilcoxon test or the Kruskal-Wallis test was used for comparisons between or within the groups.

Unadjusted comparisons between the care managed group and comparison group were performed for outcomes of interest occurring in the CMP period. These comparisons were tested for statistical significance using the Wilcoxon test. Multivariate analyses were also performed to adjust for the effects of covariates on primary outcome measures. A Poisson regression was used to model the distribution of count outcomes (ie, number of ED Visits, number of inpatient admissions, and number of inpatient days). The SAS procedure, GENMOD, was used for this modeling. Regressions were performed for all patients with care management as a predictor variable, along with demographic, diagnostic, and other variables. Separate regressions were performed for the care management patients that included variables specific to the program, such as program participation status, whether a patient ever visited an assigned medical home, number of visits to assigned medical home, and number of care management encounters. For all multivariate analyses, interaction effect terms were tested and retained if model fit was improved, but the specific interactions to consider were determined in advance of any model building.

The methods were approved by KMC's Institutional Review Board.

RESULTS

Patient Characteristics

Table 1 describes the baseline characteristics of the care management patients and patients in the comparison group. There were no significant differences between patient group with regard to age or race/ethnicity. The percentage of females was greater in the comparison group but of borderline significance ($P = 0.055$). The mean CCI score was significantly higher in the care management group than in the comparison group ($P = 0.03$), ranging from 0 to 9 in the care management group and 0 to 8 in the comparison group.

Table 2 shows the 5 most common principle diagnoses for admissions in the care management and comparison groups. Care management patients were more frequently admitted with conditions of pancreatitis and coccidioidomycosis (a disease caused by a fungal organism prevalent in the central valley) than patients in the comparison group. These 2 diseases are not accounted in the Charlson Index.

Utilization Before and After Care Management Enrollment

As shown in Table 3, the care management group experienced a significant reduction in the median number of ED visits per year, from 6.0 ± 5.0 pre-enrollment (median $\pm$ interquartile range) to 1.7 ± 3.3 postenrollment ($P < 0.0001$). The Wilcoxon sign rank test was used to test for significance of the paired pre- and postenrollment differences. ED visits decreased across care management patients regardless of their program status; pre- and postenrollment differences in median visits among patients considered to be graduated (n = 16), active (n = 49), and inactive (n = 33) at the time of analysis were all significant.

The median number of inpatient admissions pre- and post-program enrollment is also shown in Table 3. Care management patients had an average decrease of 0.0 ± 1.0 admissions per year after enrolling into the program ($P <$

TABLE 1. Baseline Characteristics of Care Management Patients and Comparison Patients

Characteristics	Care Management Patients (N = 98)	Comparison Patients (N = 160)	P*
Age in years, mean $\pm$ SD	46.4 ± 9.6	46.0 ± 10.7	0.8
Gender, n (%)			0.055
Male	58 (59.2)	75 (46.9)	
Female	40 (40.8)	85 (53.1)	
Race/ethnicity, n (%)			0.2
Asian/Pacific Islander	3 (3.1)	0 (0.0)	
Black/African-American	12 (12.2)	18 (11.3)	
Caucasian	46 (46.9)	80 (50.0)	
Hispanic	37 (37.8)	62 (38.8)	
Charlson comorbidity index, mean $\pm$ SD	1.4 ± 1.6	0.98 ± 1.3	0.03

*Wilcoxon rank sum tests were used to compare variables with 2 groups and Kruskal-Wallis tests were used to compare variables with 3 or more groups.
SD indicates standard deviation.

TABLE 2. Most Frequent Reasons for Admission Among Care Management Patients and Comparison Patients

Diagnosis	Admissions (n)	Admissions (%)
Care management group		
Diseases of pancreas	28	15.56
Asthma	12	6.67
Coccidioidomycosis	7	3.89
Diabetes mellitus	7	3.89
Symptoms involving respiratory system and other chest symptoms	6	3.33
Comparison group		
Symptoms involving respiratory system and other chest symptoms	5	4.67
Diabetes mellitus	4	3.74
Other cellulitis and abscess	4	3.74
Malignant neoplasm of bladder	3	2.8
Pneumonia, organism unspecified	3	2.8

TABLE 3. Changes in Median Number of ED Visits and Inpatient Visits in the Care Management Group*

	N	Pre-Enrollment	Postenrollment	Difference
ED visits (median ± IQR)	98	6.0 ± 5.0	1.7 ± 3.3	3.9 ± 4.9
Inpatient admissions (median ± IQR)	98	0.0 ± 1.0	0.0 ± 0.0	0.0 ± 1.0

*Paired differences were calculated (Pre-Post). The number of visits is not distributed normally so a nonparametric test, the sign rank test, was used to evaluate whether this difference in visits was statistically different from zero.
ED indicates emergency department; IQR, interquartile range.

TABLE 4. Poisson Regression Results for Number of Emergency Department Visits

Parameter	DF	Estimate	Exp (Estimate)	Standard Error	χ^2	Pr > χ^2
Intercept	1	1.2813	3.6013	0.2574	24.78	<0.0001
Intervention group						
CM	1	−0.3933	0.6748	0.0941	17.47	<0.0001
Comparison	0	0	1.0000	0	—	—
Duration	1	0.0024	1.0024	0.0003	52.85	<0.0001
Charlson	1	−0.562	0.5701	0.1842	9.31	0.0023
Pre-ED visits	1	0.0857	1.0895	0.0109	62.06	<0.0001
Age	1	−0.0367	0.9640	0.0051	50.72	<0.0001
Gender						
Female	1	−0.0112	0.9889	0.0818	0.02	0.891
Male	0	0	1.0000	0	—	—
Race						
Asian	1	0.5905	1.8049	0.3034	3.79	0.0516
Black	1	−0.0565	0.9451	0.1295	0.19	0.6625
Hispanic	1	0.0474	1.0485	0.0864	0.3	0.5836
White	0	0	1.0000	0	—	—
Cellulitis/abscess	1	−0.341	0.7111	0.1722	3.92	0.0476
Alcohol dependence	1	0.2844	1.3290	0.1813	2.46	0.1168
Drug dependence	1	−0.2838	0.7529	0.2631	1.16	0.2807
Mood disorders	1	0.5551	1.7421	0.1838	9.12	0.0025
Charlson*age	1	0.0115	1.0116	0.0037	9.95	0.0016
Charlson*pre-ED visits	1	0.021	1.0212	0.0068	9.54	0.002

CM indicates care management; ED, emergency department; Charlson, Charlson comorbidity index; DF, degrees of freedom; Exp, exponential; Pr, probability.

0.0001). Median inpatient days also significantly decreased ($P < 0.0001$); however, the distribution of inpatient days was skewed, ranging up to 88 days pre-enrollment and up to 52 annualized days postenrollment.

The regression models for CMP patients compared the effect of patient status (active, inactive, and graduated) on likelihood of utilization when adjusting for race, gender, ethnicity, comorbidities, alcohol and drug disorders, program duration, and mood disorders. Graduated patients had a decreased likelihood of visiting the ED after enrollment compared with patients who were inactive ($P = 0.0035$). However, for inpatient bed days, active patients had an increased likelihood of experiencing an additional bed day, compared with inactive patients ($P = 0.0026$). Patient status was not a significant predictor for inpatient visits.

Care Management Versus Comparison Utilization

Unadjusted comparisons showed no significant differences between the care management and comparison groups during the postenrollment period for ED visits ($P = 0.8$), inpatient admissions ($P = 0.4$), and inpatient days ($P = 0.7$). In contrast to the unadjusted comparisons, the multivariate analysis demonstrated that care management patients had a 32% lower risk of visiting the ED than the comparison group ($P < 0.0001$). Table 4 displays the results of the Poisson

regression used to evaluate the effect of care management on ED visits while adjusting for the effects of duration of follow-up, number of ED visits pre-enrollment, race, age, gender, severity of existing medical conditions (CCI), interaction effects, and primary diagnoses for cellulitis/abscess, alcohol dependence, drug dependence, and mood disorders.

A diagnosis of cellulitis/abscess was associated with a relative risk of ED visits of 0.71, or a decrease of 29% in the risk of increased ED visits, whereas for patients with episodic mood disorders, the relative risk of an ED visit was 1.7. In addition, age, duration of follow-up, Charlson index score, and number of ED visits pre-enrollment were statistically significant predictors in the model.

The results of the Poisson regression for inpatient admissions are shown in Table 5. After controlling for covariates, care managed patients were associated with a 19% lower risk of additional admissions than patients in the comparison group; however, this difference was not statistically significant. Duration of follow-up, number of pre-enrollment admissions, age, and drug dependence were significantly associated with differences in admissions. The relative risk of an inpatient admission for patients with a diagnosis of drug dependence was 5.6.

The multivariate model for inpatient days also showed no significant difference between care management patients and comparison patients.

TABLE 5. Poisson Regression Results for Number of Inpatient Admissions

Parameter	DF	Estimate	Exp (Estimate)	Standard Error	χ^2	Pr > χ^2
Intercept	1	−1.371	0.2539	0.7101	3.73	0.0535
Intervention group						
CM	1	−0.2144	0.8070	0.2428	0.78	0.3771
Comparison	0	0	1.0000	0	—	—
Duration	1	0.0037	1.0037	0.001	12.7	0.0004
Charlson	1	−0.6582	0.5178	0.3766	3.05	0.0805
Pre IP Adm	1	0.2322	1.2614	0.0479	23.5	<0.0001
Age	1	−0.0307	0.9698	0.0135	5.19	0.0227
Gender						
Female	1	0.0689	1.0713	0.2111	0.11	0.7443
Male	0	0	1.0000	0	—	—
Race						
Black	1	0.0886	1.0926	0.3159	0.08	0.7791
Hispanic	1	−0.2656	0.7667	0.2249	1.4	0.2376
White	0	0	1.0000	0	—	—
Cellulitis/abscess	1	−0.2437	0.7837	0.3198	0.58	0.446
Alcohol dependence	1	0.3916	1.4793	0.4145	0.89	0.3448
Drug dependence	1	1.7226	5.5991	0.4571	14.2	0.0002
Mood disorders	1	−0.9703	0.3790	0.5395	3.24	0.0721
Charlson* age	1	0.0163	1.0164	0.0075	4.69	0.0304

CM indicates care management; IP Adm, inpatient admission; Charlson, Charlson comorbidity index.

Costs

Paired differences in ED and hospital expenditures were determined for care management patients pre- and postenrollment. The sign rank test was used to evaluate whether differences in cost were significantly different between these periods. These are only ED and inpatient costs and do not include pharmacy expenditures, costs for services received outside of KMC, durable medical equipment, or the cost of the CMP. Unadjusted ED costs per patient per year decreased from $2545 pre-enrollment to $1874 postenrollment ($P < 0.0001$). For inpatient admissions, mean costs per year decreased from $20,298 pre-enrollment to $7053 postenrollment ($P < 0.001$).

DISCUSSION

The results from this study indicate that the CMP significantly decreased the likelihood of ED utilization for enrolled patients compared with a matched comparison group. The CMP was designed to be a low-cost intervention to provide low-income patients with skills and supportive services that enable them to take a more active role in their care. By addressing factors commonly attributed to frequent use, such as communication barriers and lack of social stability, the goal of the program was to ultimately reduce avoidable overutilization of hospital services.

The effect of the CMP on inpatient utilization is less clear. The care management group had slightly fewer inpatient admissions than the comparison group; however, the difference was not found to be statistically significant. Two of the most common admission diagnoses in the care management group included pancreatitis and coccidioidomycosis, neither of which was present in the comparison group. The ability to reduce utilization attributable to these conditions through resource connectivity and better linkages to outpatient care is likely minimal, because neither is considered preventable through regular outpatient care.[18] Moreover, inpatient utilization outcomes appeared to be influenced by outlying data points from a handful of patients who were admitted for long durations.

Although selection bias is a concern with nonrandomized studies, we analyzed the groups using a multivariate analysis to control for multiple factors that could affect utilization. The fact that the unadjusted bivariate results for ED visits were not significant and the multivariate results were significant indicates that factors such as comorbidities and number of visits pre-enrollment were important predictors of utilization. Nevertheless, patients who agreed to enroll into the CMP may have differed in terms of their willingness to engage in the management of their health and by their underlying health profile.

Other limitations to this study include the lack of longitudinal data points—particularly for inpatient utilization—and the reliance on financial data of hospital encounters, which may not fully depict the acuity or complexity of presenting conditions. Because the evaluation was a retrospective analysis, it neither measured changes in patients' knowledge and self-efficacy to manage their conditions nor determined which aspects of the CMP were most effective, which could affect the replicability of the program. Another factor that may affect replicability is that program participants were fairly homogenous in terms of income, health insurance status, and age. Still, patients did have a number of different diagnoses and comorbidities, indicating that the program may be effective for various populations. Finally, there were less than 100 patients in the CMP; however, the fact that results were significant is evidence that the sample size was significant to yield meaningful results.

The findings from our analysis are consistent with current evidence from the literature. Peikes et al conducted one of the most extensive studies on care management to date, evaluating 15 randomized trials in different settings. The study identified common components among successful programs, which included frequent in-person contact to establish trust, connectivity to social resources, and close relationships between care managers, local hospitals, and providers at local clinics.[13,19] These components are among those that had been incorporated in the design of the CMP and may have served a crucial role in decreasing ED utilization and costs among enrolled patients.

By providing navigation of the systems and connectivity to social resources, the CMP shows significant potential for its ability to reduce frequent ED use and costs among previously uninsured patients who have recently gained health care coverage. These findings may be particularly timely as the need to constrain health care spending becomes an increasing priority for policy makers. In parallel, studies have shown that frequent users are more likely to be insured than uninsured,[20,21] and as Medicaid eligibility expands to an

estimated 17 million individuals through the recently passed health insurance reform bill,[22] there is a critical need to address overutilization over the next few years.

Future care management interventions may be able to adopt and expand upon the CMP model to enhance care and decrease costs. However, further studies should be conducted to confirm the effectiveness of the CMP model. In addition, more research is needed to determine how to better define and target patients most likely to benefit from care management. The selection criteria used for our CMP was based only on prior utilization, but the fact that CM patients had a high percentage of nonavoidable admissions highlights the need to add clinical diagnoses as an enrollment criteria. Recent literature suggests that interventions should focus on patients who are at high likelihood of having hospitalization but are not so ill that an intervention would have a minimal effect.[19]

As an effort to curb inappropriate utilization, current state and national policies are highlighting the importance of improved care coordination to improve quality of care and decrease costs, as evidenced by federal and state funding opportunities.[23,24] The CMP, by helping patients navigate the health care system and access social and medical resources, shows significant promise in reducing ED utilization.

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