Effects of a Community-Based Care Management Model for Super-Utilizers

Purvi Sevak, PhD; Cara N. Stepanczuk, MPA; Katharine W.V. Bradley, PhD; Tim Day, MSPH; Greg Peterson, PhD; Boyd Gilman, PhD; Laura Blue, PhD; Keith Kranker, PhD; Kate Stewart, PhD; and Lorenzo Moreno, PhD

ABSTRACT

OBJECTIVES: Medicare, Medicaid, and commercial plans have all explored ways to improve outcomes for patients with high costs and complex medical and social needs. The purpose of this study was to test the effectiveness of a high-intensity care management program that the Rutgers University Center for State Health Policy (CSHP) implemented as an adaptation of a promising model developed by the Camden Coalition of Healthcare Providers.

STUDY DESIGN: We estimated the impact of the program on 6 utilization and spending outcomes for a subgroup of beneficiaries enrolled in Medicare fee-for-service (n = 149) and a matched comparison group (n = 1130).

METHODS: We used Medicare claims for all analyses. We used propensity score matching to construct a comparison group of beneficiaries with baseline characteristics similar to those of program participants. We employed regression models to test the relationship between program enrollment and outcomes over a 12-month period while controlling for baseline characteristics.

RESULTS: A test of joint significance across all outcomes showed that the CSHP program reduced service use and spending in aggregate ($P = .012$), although estimates for most of the individual measures were not statistically significant. Participants had 37% fewer unplanned readmissions ($P = .086$) than did comparison beneficiaries. Although we did not find statistically significant results for the other 5 outcomes, the CIs for these outcomes spanned substantively large effects.

CONCLUSIONS: Although these findings are mixed, they suggest that adaptations of the Camden model hold promise for reducing short-term service use and spending for Medicare super-utilizers.

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Team-based care models designed to address the needs of super-utilizers—defined as patients with frequent hospital use and complex health issues—are proliferating in response to the cost of caring for such patients using traditional approaches.[1] Medicare, Medicaid, and commercial insurers have all explored ways to improve quality and cost outcomes for super-utilizers.[2-5] Arguably, the most recognized is the "hotspotting" model pioneered by the Camden Coalition of Healthcare Providers in New Jersey, first brought to national attention by an article in *The New Yorker*.[6] In the Camden model, interdisciplinary mobile care teams provide high-intensity care management and care coordination to individuals with multiple chronic conditions. The model differs from many other care management models in its focus on both medical and social determinants of health among people with high service use.

So far, interest in programs to help super-utilizers has outpaced the available evidence on their effectiveness. Results from an early evaluation of the Camden model were promising: The Camden Coalition reported reductions in emergency department (ED) visits, inpatient admissions, and average charges per month among participants in a pilot program.[7,8] However, the study included only 36 participants and used a pre-post design that did not control for regression to the mean or for confounding factors that might influence outcomes. Regression to the mean is particularly important in interventions in which patients are selected because of their recent service use; some decline in service use post enrollment would be expected without any intervention.[9] No independent rigorous evaluation of the Camden model has been published to date, although a randomized controlled trial is ongoing.[1] Evaluations of similar care management models have yielded mixed findings over time.[3,4,10-13]

Recognizing the need for evidence, the Center for Medicare & Medicaid Innovation awarded a $14.3-million Health Care Innovation Award to the Rutgers University Center for State Health Policy (CSHP) to support adoption of the Camden model by provider groups in 4 states: (1) an independent physician association in San Diego, California; (2) a nonprofit community health center in Aurora, Colorado; (3) a nonprofit health system with 2 hospitals in Kansas City, Missouri; and (4) a nonprofit operator of 2 federally qualified health centers

TAKEAWAY POINTS

An independent evaluation of a high-intensity care management program implemented by provider groups in 4 states shows that the model holds promise for efforts to reduce short-term service use and spending based on an analysis of 149 Medicare patients with complex medical and social needs. These findings may help managed care decision-makers to:

- Reduce spending among super-utilizers through the use of mobile interdisciplinary care teams
- Address social determinants of health that contribute to high spending
- Adapt community-based care management models to suit local contexts

in Allentown, Pennsylvania. These provider groups targeted super-utilizers living in poor neighborhoods within their service areas.

Researchers affiliated with the Aurora site provided suggestive evidence on the program's impacts on a group of primarily Medicaid-eligible beneficiaries. They found that it reduced ED visits and hospitalizations and increased primary care use among program participants in Colorado.[14] However, the study's comparison group included patients who declined to participate in the program, potentially biasing results.

In this article, we present evidence from an independent evaluation of the CSHP program across all 4 sites. Our evaluation included prespecified hypotheses that the program would (1) reduce total admissions, particularly readmissions, and (2) reduce Medicare parts A and B spending.[15] We used rigorous tests that account for regression to the mean with a well-matched comparison group. This study provides a unique perspective on how the original Camden model can be adapted to a variety of settings and provider groups and adds to the available evidence on care management programs for super-utilizers.

METHODS

Enrollment

The 4 CSHP sites enrolled 1068 participants between January 2013 and June 2015. Initially, all 4 sites used the same utilization-based criteria as the Camden model—2 or more hospital admissions in the past 6 months—to identify potential participants. Two sites amended these thresholds early in the award period to expand the pool of potential participants: One site targeted individuals with 2 or more hospital admissions in the prior 6 months or 3 or more admissions in the prior 12 months, and the other targeted individuals with 3 or more hospital events (admissions or ED visits) in the prior 6 months. Among those who met the utilization-based criteria, the sites excluded patients whose conditions, such as cancer or serious behavioral issues, could not be managed with existing program resources.[16]

Intervention

All 4 sites received technical assistance from the Camden Coalition to guide implementation of the intervention. The sites implemented the same basic set of activities, including development of individualized care plans, integrated care management services through mobile care teams, and education to improve patients' ability to manage their medical and social needs. Care teams, which included some combination of nurses, community health workers, social workers, medical assistants, and/or behavioral health providers, provided education about the importance of using primary and specialty care instead of, or as a follow-up to, emergency and hospital care. They also addressed participants' nonmedical needs, including enrollment in social services (such as housing and Social Security disability benefits) and behavioral health service programs.

On average, teams contacted participants 10 times per month, spending roughly 6 hours with each participant per month. The majority of that time (87%) was spent in person, at the participants' homes and medical appointments, and the remainder was on the phone. Participants remained in the program for an average of 4.2 months, ideally until their health and social circumstances had stabilized and the program could graduate them. By June 2015, the program had graduated 673 participants, although some continued to receive occasional support from the care teams. Additional detail on the intervention is available in a CMS evaluation report.[16]

Study Population

Although the program's 1068 participants had public, private, or no insurance, our study population is limited to 149 participants with Medicare fee-for-service (FFS) coverage for whom we could obtain service use and spending data for a 12-month period prior to program enrollment. At the time that we conducted the evaluation, these data were only available for Medicare FFS beneficiaries. Using Medicare claims, we selected 1130 comparison Medicare FFS beneficiaries who met the health and utilization criteria for CSHP program eligibility and were similar to the treatment group beneficiaries on other characteristics. For each potential comparison beneficiary, we created a pseudo-enrollment date to approximate the date that the beneficiary would have enrolled in the intervention if he or she had been in the treatment group. We used propensity scores to match potential comparison beneficiaries to treatment group beneficiaries using geography, baseline (preintervention) measures of service use and spending, chronic conditions, and other demographic and health-related variables (**Table 1**[17-26]).[27]

Data Sources and Measures

We used data from the Medicare enrollment database and claims. We defined outcomes quarterly for the 12 months before and after each beneficiary's enrollment date, so each beneficiary had outcomes in 4 baseline quarters and up to 4 postenrollment quarters in the analysis sample. We estimated impacts on 6 outcomes that the program was designed to address, which we specified prior to the evaluation: all-cause inpatient admissions, inpatient admissions for ambulatory care–sensitive conditions (ACSCs), 30-day unplanned

readmissions, outpatient ED visits, Medicare parts A and B spending, and inpatient spending.

Analytic Strategy

We estimated impacts as the regression-adjusted difference between comparison and treatment group beneficiaries in each of the outcomes during the year after enrollment. We used an intent-to-treat design and thus included some patients who dropped out of the program prior to graduation. The regressions adjusted for the same variables used in matching (Table 1[17-26]). We used 2-sided tests of significance with a $P < .10$ threshold rather than a $P < .05$ threshold because we were concerned about both type II and type I errors given the small size of the treatment population. This threshold has been applied in other evaluations of care management programs when policy makers needed to identify promising care models even if additional evidence was necessary before those models could be deemed to have significant impacts at the standard threshold of $P < .05$.[11] To examine the aggregate impact of the program on service use and spending, we also conducted a test of joint significance across all outcomes. We used bootstrapping to estimate standard errors in all tests; this method accounted for clustering of outcomes at the individual level.

RESULTS

Baseline Characteristics

The characteristics of the treatment group were consistent with CSHP's target population: individuals with multiple chronic conditions (7.7 on average) who were frequent users of hospital care (Table 1[17-26]). Service use and spending were roughly 10 times and 7 times the Medicare FFS average, respectively. The treatment group was also distinct from the average Medicare beneficiary in terms of demographic characteristics and reason for Medicare eligibility. They were younger and more likely to live in high-poverty areas, be entitled to Medicare due to disability or end-stage renal disease, and have dual Medicare and Medicaid coverage.

TABLE 1. Characteristics of Treatment and Matched Comparison Groups at Baseline[a]

Characteristic	Treatment Group (n = 149)	Matched Comparison Group (n = 1130)	Medicare FFS Average
Mean Service Use and Spending Over the 12 Months Before Enrollment			
30-day unplanned hospital readmissions[b]	1.5	1.5	N/A
All-cause inpatient admissions	4.1	4.0	0.303[17]
ACSC inpatient admissions	1.2	1.2	N/A
Outpatient ED visits	5.5	5.5	0.420[18]
Medicare parts A and B spending ($)	69,960	69,831	10,320[19]
Medicare FFS inpatient spending ($)	45,627	44,705	5230[20]
Health Status and Chronic Conditions			
HCC risk score (mean)	3.9	3.8	1.0
Chronic conditions (mean, of 25)[c]	7.7	7.6	N/A
Mental health conditions (mean, of 6)[d]	1.4	1.4	N/A
Alzheimer (%)	7.4	8.7	4.7[21]
Cancer (%)	5.4	5.3	N/A
CHF (%)	56.4	56.0	15.0[21]
CKD (%)	64.4	63.0	17.0[21]
COPD (%)	57.1	56.2	11.9[21]
Diabetes (%)	70.5	71.2	28.4[21]
Medicare-Related Characteristics			
Original reason for entitlement is disability or ESRD (%)	85.2	85.2	16.0[19]
Dual coverage at enrollment (%)	70.5	69.2	21.0[e]
Demographic Characteristics			
Age, years (mean)	58.5	59.0	71[22]
Female (%)	45.6	43.4	54.5[23]
Race: Black (%)	51.7	48.0	10.4[18]
Race: Hispanic (%)	8.1	8.5	2.8[18]
Zip code poverty rate (%)	26.2	25.5	15.0[20]

ACSC indicates ambulatory care–sensitive condition; CHF, congestive heart failure; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; ED, emergency department; ESRD, end-stage renal disease; FFS, fee-for-service; HCC, Hierarchical Condition Category; N/A, not available.

[a]Characteristics are measured at the time of enrollment (for the treatment group) or pseudo-enrollment (for the potential and matched comparison groups). The matched comparison group means are weighted based on the number of matched comparisons per treatment beneficiary. For example, if 4 comparison beneficiaries are matched to 1 treatment beneficiary, the 4 comparison beneficiaries each have a matching weight of 0.25. We also exact matched on discharge status and utilized service use and spending measures 6 months prior to enrollment or pseudo-enrollment in propensity score matching.

[b]30-day unplanned readmissions are measured over an 11-month window.

[c]We use 25 of the 27 chronic condition categories defined by the Chronic Conditions Data Warehouse.[24] We exclude the Alzheimer disease and the acute myocardial infarction flags because other flags include these conditions. The chronic condition flags are calculated using 1 to 3 years of claims before the enrollment or pseudo-enrollment date (depending on the condition), using the Chronic Conditions Data Warehouse definitions.

[d]The 6 mental health conditions are conduct disorders and hyperkinetic syndrome, anxiety disorder, bipolar disorder, personality disorders, schizophrenia and other psychotic disorders, and depressive disorders, as defined by the Chronic Conditions Data Warehouse.[25]

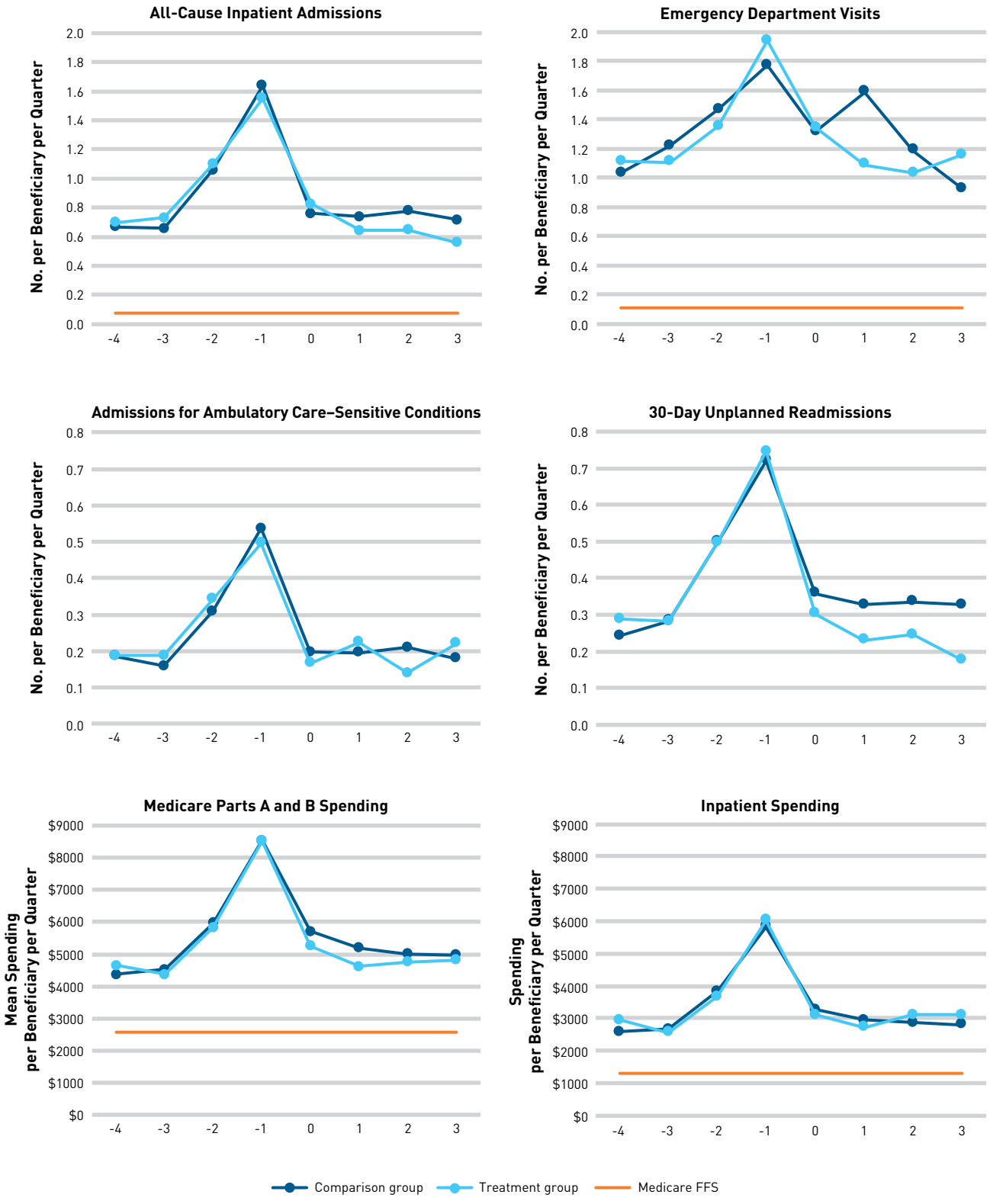
[e]We estimate the Medicare FFS average using the percentage of Medicare beneficiaries who were dually eligible in 2011.[26]

The observable characteristics of the matched comparison group were very similar to those of the treatment group at the start of the intervention. Groups were well balanced on all variables (Table 1[17-26]) and had similar trends in the outcome variables over the 4 quarters leading up to the intervention (**Figure**).

Impact Estimates

The treatment group had 0.126 (37%) fewer unplanned readmissions on average per quarter than comparison beneficiaries ($P = .086$; 90% CI, −0.247 to −0.004]). The point estimates for admissions (−16%), ACSC admissions (−14%), and total spending (−9%) were all large

FIGURE. Mean (unadjusted) Outcomes by Quarter and Intervention Group[a]



FFS indicates fee-for-service.

[a]Quarters –4, –3, –2, and –1 are baseline quarters; quarters 0, 1, 2, and 3 are intervention quarters.

TABLE 2. Regression-Adjusted Differences in Outcomes Between Treatment and Matched Comparison Groups[a]

Outcome	Comparison Group Mean	Impact Estimate, Absolute	Impact Estimate, Percentage[b]	90% CI	*P* (2-sided)
All-cause inpatient admissions (no./person/quarter)	0.748	−0.116	−15.5%	−0.252 to 0.020	.155
ACSC inpatient admissions (no./person/quarter)	0.196	−0.027	−13.8%	−0.081 to 0.028	.423
Outpatient ED visits (no./person/quarter)	1.160	0.057	4.9%	−0.194 to 0.309	.704
30-day unplanned readmissions (no./person/quarter)	0.337	−0.126[c]	−37.4%	−0.247 to −0.004	.086
Medicare parts A and B spending ($/person/quarter)	15,666	−1405	−9.0%	−3509 to 700	.268
Medicare inpatient spending ($/person/quarter)	8895	−120	−1.4%	−1891 to 1652	.911
χ^2 test for joint significance across all outcomes: 16.31[d]					.012
Sample size: Treatment group includes 149 beneficiaries (518 beneficiary quarters) and matched comparison group includes 1130 beneficiaries (3772 beneficiary quarters).					

ACSC indicates ambulatory care–sensitive condition; ED, emergency department.

[a]All outcomes are measured as averages over the 4 quarters after enrollment.

[b]Percentage difference is calculated as the impact estimate divided by the comparison group mean.

[c]Significantly different from zero at the .10 level.

[d]Significantly different from zero at the .05 level.

and in the favorable direction, whereas the estimates for ED visits (5%) and inpatient spending (–1%) were close to zero. None of these 5 estimates was individually statistically significant (Table 2). A joint test indicated that, as a group, the estimates for all 6 prespecified outcomes were significantly different from zero ($P = .012$).

DISCUSSION

CSHP's intervention contributes to a growing body of evidence on the use of care management programs to improve patient outcomes. Our results indicate that the program substantially reduced readmissions (by an estimated 37%) and suggest that it may have reduced all-cause admissions, ACSC admissions, and Medicare parts A and B spending. Many other care management interventions have not achieved this type of success.[11,13,28] However, the CSHP program shares several distinctive features with the relatively few other models that have succeeded in reducing hospital admissions and/or readmissions, including targeting very high-risk patients and providing frequent in-person contact.[4,12]

Another distinguishing feature of the CSHP program was its attention to social determinants of health. There is a growing understanding that social determinants affect health and service use, but payers and providers need more evidence on interventions that effectively address these issues, as they are particularly difficult to attend to during medical encounters.[1] The results of this study suggest that adaptations of the Camden model are promising for these purposes and are feasible to implement in various settings.

Limitations

Similar to other evaluations of comprehensive care management programs, our study's main limitation was low sample size, in part because we were limited to studying Medicare beneficiaries, who accounted for only 26% of all enrollees in the CSHP program. The low sample size reduced the likelihood of finding a statistically significant impact on outcomes and prevented further investigation into whether effects might have differed for certain subpopulations (eg, by implementation site). Findings by Capp et al of significant reductions in ED visits at the Colorado site, which primarily enrolled Medicaid beneficiaries, suggest that this could be the case.[14] There may also be some selection criteria for program enrollment that we could not fully replicate in claims data when selecting the comparison group. Finally, we could not compare program savings with costs because we estimated savings for only a fraction of participants and the costs were spread over all participants. Although it is possible that the costs of the program exceed the short-term savings to Medicare, any future cost-benefit analysis should take into account long-term costs and benefits of the program.

CONCLUSIONS

This study assessed whether, under CMS's innovation award, the CSHP community-based care management program could improve the outcomes of super-utilizers across 4 implementation sites. Findings on this adaptation of a well-known super-utilizer program provide insight into the ability to replicate program impacts in different settings. In aggregate, there is sufficient evidence to suggest that the CSHP program reduced service use and parts A and B spending among Medicare beneficiaries. Although these results are promising, the Camden model will need further testing at larger scales before it is possible to make stronger conclusions about its impacts. ■

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Author Affiliations: Mathematica Policy Research, Princeton, NJ (PS, CNS, KK, LM), Ann Arbor, MI (KWVB), Washington, DC (GP, LB), Cambridge, MA (BG), and Chicago, IL (KS); Centers for Medicare & Medicaid Services (TD), Baltimore, MD.

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Address Correspondence to: Purvi Sevak, PhD, Mathematica Policy Research, 600 Alexander Park, Princeton, NJ 08540. Email: psevak@mathematica-mpr.com.

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