

Impact of Point-of-Care Case Management on Readmissions and Costs

Andrew Kolbasovsky, PsyD, MBA; Joseph Zeitlin, MD; and William Gillespie, MD

Objective: To measure the impact of point-of-care case management by a team of diverse clinical specialists at a large medical group on 30-day readmissions and associated costs.

Study Design: An intent-to-treat, historical, baseline cohort comparison design.

Methods: A case management team employed by a managed care organization was integrated into the point of care at 4 medical offices of a medical group to provide services to health plan members who were medically hospitalized. Measures included case management process measures, 30-day readmissions and associated costs, and total savings.

Results: Among eligible members, 93% were enrolled in the case management program. In the baseline cohort, 17.60% of members were readmitted within 30 days, compared with 12.08% in the intervention group. Regression models identified case management intervention, prospective risk score, and Medicaid insurance coverage as significantly associated with readmissions and associated costs. Annual savings in 30-day inpatient utilization costs were \$1040.74 per member, which considerably exceeded the costs of the program.

Conclusions: Point-of-care case management can be an effective strategy for reducing readmissions and associated costs. Providing services at the point of care allows for greater convenience for members and increased collaboration with physicians. This strategy of a managed care organization collaborating with medical groups and hospitals has the potential to enhance outcomes in accountable care organizations and to support patient-centered medical homes.

(Am J Manag Care. 2012;18(8):e300-e306)

For author information and disclosures, see end of text.

The rapidly rising costs of healthcare have led to a need to transform the current system. One of the primary goals of the Health Care Reform Act of 2010 was to transform healthcare by reducing overall costs while enhancing quality.^{1,2} Similarly, the Institute for Healthcare Improvement developed the Triple Aim initiative to encourage organizational transformations aimed at improving the health of the population, enhancing the experience of care, and reducing the per capita cost of healthcare.³ The cost of inpatient utilization is commonly cited as the largest driver of healthcare expenses.^{4,5} Yet despite the high costs of admission, readmissions in the 30 days following discharge are common.^{4,6-8} Development of programs aimed at enhancing transitions from the hospital has the potential to reduce readmissions and corresponding healthcare costs.

Managed care organizations (MCOs) are ideally positioned to implement innovative programs aimed at enhancing services to health plan members at risk for hospital readmission. However, traditional programs have experienced challenges that have often limited their ability to affect members. Typically, managed care programs have used claims to identify hospitalized members over a given period of time, and then targeted these members to receive outbound, telephone-based services from clinical staff aimed at reducing future readmissions.^{9,10} The lag time associated with obtaining and analyzing claims usually prevents timely identification and intervention in the critical first 30 days following discharge. While some organizations use predictive modeling software to identify high-risk members, these models are typically impacted by claims lag, lack of information from nonadministrative sources, and limited discriminative ability.^{9,11}

Another challenge has been enrolling members into the programs. Managed care organizations often lack correct contact information, especially for their members without stable housing, who may be at the highest risk for admission. In addition, members may be wary of discussing health-related issues on the telephone with strangers.⁹ As a result, enrollment rates below 30% are common.^{9,12} Even among programs with higher enrollment rates, the mean time to identify and enroll a member may range from 37 to 100 days.^{9,13} Some experts have also suggested that many managed care programs lack the intensity to impact hospital utilization and have difficulty engaging physicians.¹³⁻¹⁵

Promising models with the potential to reduce readmissions have been developed.^{16,17} These models typically involve several key components that are

In this article
Take-Away Points / e301
Published as a Web exclusive
www.ajmc.com

delivered to individuals around the time of hospital discharge. These key interventions include medication reconciliation, identifying red flags for readmission and development of an action plan, needs assessment and linkage to resources, and timely postdischarge aftercare with a primary care physician (PCP) or specialist.¹⁸ The challenge for MCOs has been to find transformative ways to deliver these services via an intervention that incorporates diverse clinical specialties, identifies members at or before the time of discharge, maintains a high enrollment rate, engages physicians, and has the intensity needed to reduce readmissions.

The purpose of this study was to measure the impact on 30-day readmission and associated costs of integrating a case management team consisting of a nurse, social worker, pharmacist, and 2 health navigators at the point of care in a medical group to deliver care transition and case management services to health plan members following a hospitalization.

METHODS

Study Design

This study used an intent-to-treat, historical control design. Point-of-care case management (POC) services were offered to plan members who were discharged from an acute inpatient hospitalization over a 3-month period. All members had commercial, Medicare, or Medicaid coverage with the same large northeastern MCO. Members were identified via hospital notification to the health plan during the preauthorization process. Members received outreach via telephone for the purpose of program enrollment. All eligible members—whether they were enrolled, unreachable, or declined program services—were included as part of the intervention group in all analyses. The baseline group consisted of all members identified via hospital notification during the preauthorization process over the corresponding 3-month period in the year prior to program initiation. The baseline group was identified using the exact same process and eligibility criteria used in the intervention group.

Eligibility for Inclusion

To be eligible for either the intervention group or the baseline group, a member must have been hospitalized for a nonpsychiatric, nonmaternity primary diagnosis and the hospitalization must have been reported to the health plan as part of the standard preauthorization process. In addition, the member must have been discharged home or left against med-

Take-Away Points

A case management team employed by a managed care organization provided services to health plan members who were medically hospitalized.

- Members enrolled in the case management program were less likely to be readmitted within 30 days.
- Annual savings in 30-day inpatient utilization costs considerably exceeded the costs of the program.
- Point-of-care case management can support accountable care organizations and the development of patient-centered medical homes.

ical advice. Members discharged to skilled nursing or other facilities were excluded.

Intervention Group

A POC team consisting of a nurse case manager, social worker case manager, pharmacist, and 2 health navigators was integrated into a large urban medical group to work with hospitalized health plan members at 4 medical offices. These offices provide services to approximately 23,000 members under a capitated financial arrangement. These health plan members account for approximately 75% of the medical group's patients; the remaining 25% are members of other health plans. Each of the offices provides both primary care and specialty services.

On a daily basis, hospitalized members were referred to a member of the POC team who, prior to discharge, attempted to contact the member via telephone for enrollment in the program. During the initial contact, the POC team member introduced the program and confirmed all contact information. In the weeks following initial contact, the team member discussed the importance of aftercare; ensured that a timely aftercare appointment was made; provided appointment reminders and rescheduled any missed aftercare appointments; performed a needs assessment and linked the member to health plan, medical group, and community resources; coached the member on communicating with the PCP; reviewed how to access care resources such as after-hours and express care; identified red flags for readmission; developed a plan of action; identified any barriers to treatment or medication adherence; and worked with the member to overcome these barriers. In addition, the POC team arranged for the pharmacist to conduct medication reconciliation. The pharmacist reviewed medication lists and had telephone or in-person meetings with members. In addition to their own caseload, each team member was also available to consult on cases whenever their specific specialty was needed. Health plan members were able to speak with the POC team via telephone or have face-to-face meetings in the medical office. The team had access to members' clinical information in the electronic medical records used by the medical group.

Baseline Group

The baseline group consisted of members who met eligibility criteria during the corresponding 3-month time period 1 year prior to POC implementation. Members were patients at the same 4 medical offices and were identified using the same strategy and inclusion criteria that were used for the intervention group. Baseline group members had access to the same medical office services, with the exception of the POC program, which did not exist during the historical baseline time period.

Measures

The study measures included case management processes, inpatient utilization, and program costs.

Case Management Processes

Enrollment Rate. Enrollment rate refers to the percentage of members eligible for inclusion in the intervention group who were enrolled in the POC program. The goal was to enroll more than 75% of members.

Days to Enrollment. Days to enrollment was the average number of days between referral to the POC team and member enrollment. The goal was fewer than 7 days.

Days Managed. Days managed was the average number of days between the date a member was enrolled in the program and the date the case was closed.

Inpatient Utilization

Readmissions. Readmissions were the number of readmissions at any hospital for a nonmaternity, non-mental health condition that were paid for by the plan as identified by claims in the 30 days following discharge.

Readmission Costs. Readmission costs were those paid by the plan for all readmissions at any hospital for a nonmaternity, non-mental health condition, as identified by claims, in the 30 days following discharge. Analysis was conducted with a 4-month lag to allow for the inclusion of late claims.

Program Savings

Annual Program Costs. Program costs included annual salaries paid to the nurse and social worker case managers, 2 health navigators, and a 2/5 full-time equivalent pharmacist for time spent providing services over the intervention period.

Annual Program Savings. Annual program savings for inpatient utilization were those attributed to the POC program. To be attributed to the POC program, the condition variable must have been identified as statistically significant. The number of readmissions per member in the baseline group was multiplied by the total number of members in the intervention group to control for differences in the number of mem-

bers between the groups. This number was then multiplied by the average cost per readmission in the intervention group to determine the total cost of expected readmissions for the intervention group if the POC intervention had not been implemented. Outlier readmission costs in the baseline group were removed prior to calculating the average readmission cost to maintain a more conservative estimate of readmission costs.

The average cost per readmission was multiplied by the actual number of readmissions in the intervention group to yield a total cost for the intervention group. The average cost per readmission was also multiplied by the number of readmissions in the baseline group, adjusting for the difference in the number of members of the groups, to yield a total cost for the baseline group. The total cost for the baseline group minus the total cost for the intervention group equalled the program savings. This number was multiplied by 4 to estimate the annual savings. The annual cost of the program was subtracted from the total annual savings. The total annual savings were divided by the costs for the return on investment.

Statistical Analysis

Chi-square and independent samples *t* tests were utilized to test for differences between the baseline group and intervention group prior to intervention for each of the following variables: age, sex, type of insurance coverage (commercial, Medicare, Medicaid), index hospitalization length of stay, index hospitalization cost, and predictive risk score. The predictive risk score was calculated using a proprietary risk algorithm that predicts the prospective risk of hospitalized days in the future year. The higher the predictive risk score, the greater the number of predicted future hospitalized days. Poisson regression was conducted to examine differences in number of readmissions during the 30-day postdischarge outcome period.

Linear regression was conducted to examine differences in inpatient costs during the outcome period. Because these costs were not normally distributed, a log base 10 transformation was conducted. For all regression analyses the following independent variables were included: centered age; sex; type of insurance coverage (commercial, Medicare, Medicaid); length of stay of the index hospitalization (ie, the one where the member became eligible for the POC program); cost of index hospitalization; and condition (intervention group or baseline group). Commercial insurance coverage served as the reference category for type of insurance coverage. For all analyses, statistical significance was set at .05.

RESULTS

There were no statistically significant differences between

■ **Table 1.** Preintervention Group Characteristics

Characteristic	Intervention Group	Baseline Group
Age, mean (SD), y	60.97 (22.57)	59.30 (22.79)
Sex, %		
Male	39.60	40.16
Female	60.40	59.84
Type of insurance coverage, %		
Commercial	38.59	40.57
Medicare	47.32	40.57
Medicaid	14.09	18.85
Index length of stay, mean (SD), d	4.57 (5.38)	4.48 (5.75)
Index hospital cost, mean (SD), \$	12,493.79 (24,890.22)	9586.83 (11,585.11)
Predictive risk score, mean (SD)	905.00 (907.10)	902.13 (928.09)
SD indicates standard deviation.		

the 244 baseline group members and the 298 intervention group members on any of the following variables: age, sex, type of insurance coverage, index hospitalization length of stay, index hospitalization cost, or predictive risk score. Descriptive data for all preintervention group comparisons are presented in **Table 1**.

Case Management Processes

A total of 278 of the 298 (93.29%) intervention group members were enrolled in the POC program, 17 (5.70%) were unreachable, and 3 (1.01%) refused to participate. The program met its goal of enrolling more than 75% of members. On average, members were enrolled within 4.99 days (standard deviation [SD] 7.49 days). This result met the goal of an average number of days to enrollment of fewer than 7. On average, members received services from the POC team for 30.78 days.

Impact of Point-of-Care Case Management on Readmissions

Of the baseline group members, 43 were readmitted (17.60%) with a total of 46 readmissions. This corresponds to 0.19 readmissions per member of the baseline group. A total of 36 intervention group members were readmitted (12.08%) with a total of 37 readmissions. This corresponds to 0.12 readmissions per member of the intervention group. The 0.07 reduction in readmissions per member is a 36.84% reduction.

Baseline group members were readmitted for a total of 338 days, or 1.39 days (SD 4.24 days) per baseline group member, whereas intervention group members were readmitted for a total of 236 days, or 0.79 days (SD 2.76 days) per intervention group member. This 0.6 reduction in the average number of readmitted days per member corresponds to a 43.17% reduction.

■ **Table 2.** Poisson Regression Results for Number of 30-Day Readmissions

Variable	Parameter Estimate	SE	Wald χ^2	P
Condition	0.49	0.23	4.82	<.05
Sex	-0.24	0.23	1.06	.30
Medicaid	-0.88	0.36	6.00	<.05
Medicare	-0.65	0.35	3.59	.06
Centered age	0.01	0.01	1.05	.31
Index hospital cost	0.00	0.00	14.16	<.001
Index length of stay	0.01	0.02	0.12	.73
SE indicates standard error.				

■ **Table 3.** Linear Regression Results for Log-Transformed 30-Day Readmission Costs

Variable	Parameter Estimate	SE	t	P
Condition	-0.28	0.12	-2.27	<.05
Sex	0.15	0.12	1.17	.24
Medicaid	0.44	0.19	2.34	<.05
Medicare	0.33	0.17	1.95	.05
Centered age	0.00	0.00	1.07	.29
Index hospital cost	0.00	0.00	4.15	<.001
Index length of stay	-0.00	0.01	-0.25	.12

SE indicates standard error.

The results of the Poisson regression model yielded 3 statistically significant variables: condition (Wald $\chi^2 = 4.82$, degrees of freedom [df] = 1, $P < .05$); Medicaid (Wald $\chi^2 = 6.00$, df = 1, $P < .05$); and index hospitalization cost (Wald $\chi^2 = 14.16$, df = 1, $P < .001$). Results of the regression model are presented in **Table 2**.

Impact of Point-of-Care Case Management on Readmission Costs

The total cost of readmissions in the 30-day outcome period for baseline group members was \$673,103.22. This corresponds to \$2758.62 (SD \$7710.87) per member. The average cost per readmission for baseline group members was \$15,653.56 (SD \$11,719.50). The minimum cost for a readmission in the baseline group was \$2287.38 and the maximum was \$50,679.47.

The total cost of readmissions in the 30-day outcome period for intervention group members was \$640,505.50. This corresponds to \$2149.35 (SD \$9153.90) per member. The minimum cost for a readmission in the baseline group was \$2287.38 and the maximum was \$97,758.53. After removing 1 high-cost outlier, the average cost per readmission in the intervention group was \$15,507.06 (SD \$7286.34).

Results of the regression model yielded 3 statistically significant variables: condition ($t = -2.27$, df = 1, $P < .05$); Medicaid ($t = 2.34$, df = 1, $P < .05$); and index hospitalization cost ($t = 4.15$, df = 1, $P < .001$). Results of the regression model are presented in **Table 3**.

Program Savings

The average cost per readmission in the intervention group was \$15,507.06. The baseline group had 0.19 readmissions per member. If the 298 intervention group members had readmissions at this rate, 56 readmissions would occur for a total cost of \$868,395.36. Multiplying the 36 readmissions

that occurred in the intervention group by the same average cost per readmission resulted in total costs of \$558,254.16. The difference in these costs is \$310,141.20, which corresponds to a \$1040.74 savings per member. The total annual savings is \$1,240,564.80. The annual cost of the program was \$386,000, resulting in an annual return on investment of 3.2:1.

CONCLUSIONS

Results of this study demonstrate that integrating a POC team with diverse clinical specialties into the offices of a medical group was associated with significant reductions in 30-day readmissions and associated costs. The savings were more than sufficient to cover the cost of the program. By locating the team at the point of care rather than in the office of the MCO and by utilizing protocols designed to reach hospitalized members as soon as possible, the POC team was able to overcome many of the challenges commonly faced by managed care programs, as evidenced by the team's ability to enroll 93% of identified members with an average time to enrollment of fewer than 5 days.

Location of the team at the point of care had additional benefits. Members were able to meet with the team in person, often just prior to their initial PCP appointment, allowing the team to deliver care transition interventions while preparing members for their postdischarge appointment. Also, in 1 simple visit or call, each member could access pharmacy, social work, nursing, and health navigator specialties. In addition, team members could easily communicate with and prepare physicians for the initial postdischarge appointment. Lastly, the team was able to arrange for needed preventive health screenings such as mammograms, colorectal screenings, and retinal eye exams.

Regression models identified predictive risk score and Medicaid insurance coverage as statistically significant predic-

tors of readmissions and associated costs. The predicted risk score was expected to be identified as a statistically significant predictor, as it is an estimate of future inpatient utilization. The identification of Medicaid as a predictor underscores the importance of including Medicaid members in interventions aimed at reducing readmissions and associated costs. However, many managed care programs have focused exclusively on Medicare members.

This study has several limitations. Most notably, a randomized trial was not possible within the context of the study. Although the historical comparison group was similar in all assessed demographic and index hospitalization variables and had the same predictive risk scores for readmission, future randomized trials would be beneficial. Also, the intervention was implemented within a medical group with a capitated financial arrangement and a high volume of the MCO's health plan members. The medical group was willing and able to provide a small space for the POC team in exchange for its services. Future studies should evaluate strategies for adapting this model to medical groups with fewer plan members and with other financial arrangements. In addition, the first 30 days following hospitalization were targeted in this study because it is a time of high rates of readmission. However, additional studies are needed to evaluate the impact of POC programs over longer time periods and to also assess the impact on emergency department, outpatient, and pharmacy utilization over time.

Healthcare reform has generated significant interest in new shared savings payment models such as accountable care organizations, in which medical groups, hospitals, and MCOs partner to lower costs, with each stakeholder sharing in the savings. This study was not completed within an accountable care organization. However, the model of an MCO providing an experienced case management team at the point of care, whose members work closely with both hospital and medical group physicians, is a highly applicable strategy that should enhance shared savings.

Typically, MCOs have the most experience with case management, and many of the traditional obstacles (eg, low enrollment rates, difficulty engaging physicians) can be overcome by integrating the team into the medical office. In addition, the POC intervention emphasizes collaboration between PCP and POC team members to prepare physicians prior to medical appointments to ensure that all member needs are met. This hallmark of patient-centered medical homes can help medical practices meet the standards for these homes.¹⁹

To achieve healthcare transformations that meaningfully address the triple aims of improving population health, enhancing the experience of care, and reducing costs, key stakeholders such as MCOs, medical groups, and hospi-

tals will need to collaborate in new ways to best address the unique needs of health plan members at high risk for hospitalization. Integrating a case management team of diverse specialists at the point of care is a promising strategy for overcoming barriers to traditional telephone-based case management to reduce the number of readmissions and enhance member experience by providing services in a setting that is most convenient for members.

Author Affiliations: From EmblemHealth, New York, NY.

Funding: None.

Author Disclosures: The authors (AK, JZ, WG) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (AK, JZ, WG); acquisition of data (AK); analysis and interpretation of data (AK); drafting of the manuscript (AK); critical revision of the manuscript for important intellectual content (AK, JZ, WG); statistical analysis (AK); administrative, technical, or logistic support (JZ, WG); and supervision (JZ, WG).

Address correspondence to: Andrew Kolbasovsky, PsyD, MBA, 55 Water St, New York, NY 10041. E-mail: akolbasovsky@emblemhealth.com.

REFERENCES

1. **Henry J. Kaiser Family Foundation.** *Summary of New Health Reform Law.* Focus on Health Reform. Publication #8061. <http://www.kff.org/healthreform/upload/8061.pdf>. Published April 2011. Accessed December 11, 2011.
2. **Office of Management and Budget.** *Budget of the United States government.* US Government Printing Office. <http://www.gpo.gov/fdsys/browse/collectionGPO.action?collectionCode=BUDGET>. Published 2010. Accessed December 11, 2011.
3. **Institute for Healthcare Improvement.** The IHI Triple Aim. <http://www.ihi.org/offering/initiatives/tripleaim/pages/default.aspx>. Published 2007. Accessed December 11, 2011.
4. **Fazzi R, Agoglia R, Mazza, G, Glading-DiLorenzo J.** The Briggs National Quality Improvement/Hospitalization Reduction Study. *Caring.* 2006;25(2):70-75.
5. **McCaig LF, Nawar EW.** National Hospital Ambulatory Medical Care Survey: 2004 emergency department summary. *Adv Data.* 2006;(372): 1-29.
6. **Alliance for Health Reform.** Covering health issues 2006-2007. <http://www.allhealth.org/sourcebooktoc.asp?SBID=1>. Accessed December 7, 2011.
7. **Anderson G, Herbert R.** Medicare hospital 30-day readmission rates and associated costs, by hospital referral regions, 2003. Source: Commonwealth Fund National Scorecard on U.S. Health System Performance, 2006. Slide presentation at: AHRQ 2007 Annual Conference; September 28, 2007; Bethesda, MD. <http://archive.ahrq.gov/about/annualmtg07/0928slides/schoen/Schoen-17.html>. Accessed December 12, 2011.
8. **Jencks S, Williams M, Coleman E.** Rehospitalizations among patients in the Medicare fee-for-service program [published correction appears in *N Engl J Med.* 2011;364(16):158]. *N Engl J Med.* 2009;360(14): 1418-1428.
9. **Linden A, Adler-Milstein J.** Medicare disease management in policy context. *Health Care Financ Rev.* 2008;29(3):1-11.
10. **Linden A, Goldberg S.** The case-mix of chronic illness hospitalization rates in a managed care population: implications for health management programmes. *J Eval Clin Pract.* 2007;13(6):947-951.
11. **Kansagara D, Englander H, Salanitro A, et al.** Risk prediction models for hospital readmission: a systematic review. *JAMA.* 2011;306(15): 1688-1698.
12. **Pacific Business Group on Health.** *Disease Management Effectiveness Project: A Final Report From the Pacific Business Group on Health.* San Francisco, CA: Pacific Business Group on Health; 2002.

- 13. McCall N, Cromwell J, Bernard S.** *Evaluation of Phase I of Medicare Health Support (Formerly Voluntary Chronic Care Improvement) Pilot Program Under Traditional Fee-For-Service Medicare.* Report to Congress. CMS Contract 500-00-0022. RTI International. <http://www.cms.gov/reports/downloads/McCall.pdf>. Published June 2007. Accessed December 15, 2011.
- 14. Coberley C, McGinnis M, Orr P, et al.** Association between frequency of telephonic contact and clinical testing for a large, geographically diverse diabetes disease management population. *Dis Manage.* 2007;10(2):101-109.
- 15. Leider H.** Gaining physician buy in for disease management initiatives. *Dis Manage Health Outcomes.* 1999;6(6):327-333.
- 16. Coleman E, Parry C, Chalmers S, Min S.** The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med.* 2006;166(17):1822-1828.
- 17. Naylor M, Brooten D, Campbell R, et al.** Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA.* 1999;281(7):613-620.
- 18. Brown R.** The promise of care coordination: models that decrease hospitalizations and improve outcomes for Medicare beneficiaries with chronic illnesses. Mathematica Policy Research. Presented at: American Society on Aging and the New York Academy of Medicine National Forum on Care Coordination; March 2009; Las Vegas, NV.
- 19. National Committee for Quality Assurance.** Patient-Centered Medical Home. <http://www.ncqa.org/tabid/631/default.aspx>. Published 2011. Accessed December 22, 2011. ■