

Effects of a Population Health Community-Based Palliative Care Program on Cost and Utilization

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Abstract

Background: New population health community-based models of palliative care can result in more compassionate, affordable, and sustainable high-quality care.

Objectives: We evaluated utilization and cost outcomes of a standardized, population health community-based palliative care program provided by nurses and social workers.

Design: We conducted a retrospective propensity-adjusted study to quantify cost savings and resource utilization associated with a community-based palliative care program. We analyzed claims data from a Medicare Advantage (MA) plan and used a proprietary predictive model to identify 804 members at high risk for overmedicalized end-of-life care. We enrolled 204 members in the palliative care program and compared them with 600 who received standard, telephonic, health plan case management. We excluded members with fewer than two months of enrolled experience or those with insufficient data for analysis, leaving 176 members in the study group and 570 in the control group for evaluation. We compared differences in utilization and costs (medical and pharmacy), hospital admissions, bed days (acute and intensive care unit [ICU]), and emergency department visits.

Setting/Subjects: A 30,000-member MA plan and a health system in Central Ohio between October 2015 and June 2016.

Results: Members who received community-based palliative care showed a statistically significant 20% reduction in total medical costs (\$619 per enrolled member per month), 38% reduction in ICU admissions, 33% reduction in hospital admissions, and 12% reduction in hospital days.

Conclusion: A structured nurse and social work model of community-based palliative care using a predictive model to identify MA candidates for intervention can reduce utilization and medical costs.

Keywords: community-based; cost; Medicare Advantage; population health

Introduction

THE INSTITUTE OF MEDICINE'S 2014 report,¹ *Dying in America: Improving Quality and Honoring Individual Preferences Near the End of Life*, concluded that people nearing the end of life encounter high rates of preventable and burdensome care transitions and hospitalizations.

During their final year, persons with serious illness often undergo unnecessary nonbeneficial treatment despite overriding expert opinion that when patients are terminally ill, at some point, more treatment does not equal better care.² Efforts to improve care at the end of life are resulting in some positive trends in health care utilization. Compared with 2000, fewer Medicare fee-for-service beneficiaries who died

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Accepted March 7, 2019.

in 2015 are dying in hospitals (19.8%) and more than half received hospice care. However, there continue to be worrisome trends. Of those who died in 2015, almost two-thirds were hospitalized during the last 90 days, and 29% were admitted to an intensive care unit (ICU) during the last 30 days of life. These rates have increased since 2000. During their last 30 days of life, more than half of patients with cancer are hospitalized, over 25% are admitted to the ICU, and 10% receive chemotherapy, which is even more concerning because prognosis is more predictable.³ Patients who spend their final days at home or in hospice, where most people prefer to be, taper their health care activity (with less intensive services and lower costs) toward the end.⁴

Palliative care programs are evolving to address the needs of those with serious illness in the community. Serious illness is defined as a condition that carries a high risk of mortality, negatively impacts quality of life and daily function, and/or is burdensome in symptoms, treatments, or caregiver stress.⁵ The needs of people with serious illness extend beyond the medical model of health to include social support, symptom relief, care coordination, communication, and decision support delivered by palliative care teams in the community.

We describe a nurse and social work model of community-based palliative care that uses predictive analytics to identify candidates for the program and a clinical model with standardized assessments and acuity-based care paths supported by a mobile platform.

Patient identification and outreach

We identified members for outreach through a proprietary predictive algorithm designed to identify patients who are at risk of overmedicalized death in the next 6–12 months, using a definition from Clark.⁶ What differentiates our program from others is the overmedicalized component. Our algorithm does not simply predict mortality, but predicts members at risk for overmedicalized death.

Overmedicalized death is defined as one or more of the following documented in the patient's record at the time of death: chemotherapy for cancer patients within 28 days of death, unplanned hospitalization within 60 days of death, more than one emergency department (ED) visit within 30 days of death, ICU admission within 30 days of death, or life-sustaining treatment within 30 days of death.

The identification algorithm used in this study is not intended to identify all end-of-life patients; instead, it identifies and stratifies those at risk of overmedicalized death, who are likely to use inpatient care, and who consume considerable medical services during their final months of life. According to the definition above, patients who experience overmedicalized death account for approximately half of all Medicare decedents in a year. Predictor variables in the model include age, sex, diagnoses (mapped to CMS hierarchical condition category [HCC] codes based on multiple diagnosis codes for patients), hospital inpatient and ED visits, cost of care, and Medicare Part B drug data. Note that while we would normally expect race to be a predictor in the model because of racial disparities in care, this variable was not available in the dataset. The algorithm assigns a probability or score to each patient based on the patient's claims in the prior 6–12 months. The statistical approach to identification and stratification contrasts with the rule-based approach often used in

high-risk population programs (e.g., Kelley⁵). Rule-based approaches are essentially univariate (e.g., identifying patients based on diagnoses, admissions, or use of home oxygen). It is difficult to prioritize patients based on univariate identification criteria, whereas multivariate statistical models take all factors into consideration and apply weights accordingly. Multivariate models also provide a score that stratifies patients in order of likelihood of outcome. The model was built and tested on samples from the Medicare Limited Data Set. Test statistics for model accuracy for prediction of overmedicalized death in the test sample were sensitivity 52.5% and positive predictive value 63.4%.

After the Medicare Advantage (MA) plan sent a letter to identified members to introduce the program, we loaded the list of high-scoring patients (e.g., most at risk for overmedicalized death) onto a mobile platform for the palliative care team to outreach for enrollment. The palliative care team contacted members for enrollment, beginning with the highest risk ranking and working their way down the list. Over the subsequent eight months, we performed quarterly data refreshes and model runs to identify new candidates for the program.

Palliative care program

Mount Carmel Hospice and Palliative Care, located in Columbus, Ohio, is part of Trinity Health System, a national Catholic health system with 94 hospitals in 22 states, 22 home care agencies, 16 hospices, 13 Programs of All-Inclusive Care of the Elderly (PACE) Centers, and 109 continuing care locations. Patients who were enrolled in the program and the comparison group were members of Medigold, a provider-owned MA health plan owned by the Trinity Health System. Trinity Health System granted Mount Carmel Hospice and Palliative Care an innovation award to fund the project in keeping with Trinity Health's system-wide initiative to improve palliative care across the continuum.

Turn-Key Health, a national population health palliative care company, supported the program with predictive analytics for member identification, clinical support tools, and palliative assessments and a mobile platform for documentation, workflows, quality monitoring, reporting, and clinical oversight.

The program was available to MA beneficiaries from one designated MA plan with a high presence in the region and who lived in Mount Carmel's hospice and palliative care program's service area.

The palliative care team comprised 2 registered nurses, 1.5 social workers, 0.5 nurse practitioner (NP), and 0.25 physician from Mount Carmel's Hospice and Palliative Care program. The nurses and social workers performed outreach calls to enroll members and provided phone and home-based visits. The NP and physician participated in weekly case management meetings, provided consultation related to prognosis and hospice eligibility, and visited patients and families with complex needs.

The team underwent palliative care training offered through the Center to Advance Palliative Care (CAPC),⁷ such as managing pain and symptoms, discussing goals of care, and completing advance care plans. Turn-Key Health trained the team to conduct patient outreach, document home and telephonic palliative assessments, and follow workflows designed to communicate and coordinate care with the designated

TABLE 1. INTERVENTION LEVELS AND FREQUENCY OF INTERVENTION

	<i>Intervention level</i>		
	<i>Low</i>	<i>Medium</i>	<i>High</i>
Symptoms	Controlled	Mild/moderate	Active/worsening/severe
Medication adherence	High	In question	Low
Caregiver stress	Low	Moderate	High
Social support	High	High/adequate	Low
Emergency department/hospitalization	None past 30 days	None past 30 days	One or more past 30 days
Visit frequency	Monthly	Every two weeks	Weekly and PRN

case manager from the MA plan and the patients' primary care providers.

The four main program components were as follows: (1) patient identification through predictive analytics, (2) specially trained palliative nurses and social workers performing in-home and telephonic visits, (3) caregiver support, and (4) goals-of-care discussions⁸ and documentation of advance care plans.

During home visits, the team proactively managed clinical problems and symptoms, offered disease-specific education, attended to patient's and caregiver's psychosocial and spiritual needs, conducted home safety and access adaptation evaluations, provided health coaching and caregiver training, discussed and documented goals of care, assisted in completing advance directives, and made referrals to community services and other resources to help patients remain independent at home. In addition, palliative-trained Pharm Ds performed and documented medication reviews.

The nurse and social worker teams conducted calls and visits according to predetermined care pathways based upon intervention levels that the clinician determined at completion of an assessment (Table 1). Low intervention-level patients receive a safety evaluation, medication and disease management education, and goals-of-care discussions with a phone call or visit once a month. Medium intervention-level patients are called and visited twice a month to assess the need for additional community support services, to manage symptoms, or assist with advance care planning. High intervention-level patients have more urgent needs ranging from active symptoms, recent hospital or ED visits, home safety concerns, or caregiver stress. These members receive weekly or more frequent calls or visits for crisis intervention, medication management, disease self-management education, caregiver and social support services, or to be evaluated for hospice. Patients are directed to contact their primary care physician (PCP) or other providers to manage urgent needs after hours and on weekends.

The palliative care team directly contacted the patient's PCP for any medical-related concerns, such as unmanaged symptoms, medication needs, safety issues, or significant changes in goals of care. The team coordinated care with the MA plan case manager for services that required insurance authorization, such as home health care and medical equipment. The nurses and social workers arranged community services to address transportation, housing, financial/legal, or food support needs and made referrals to adult day care and support groups.

Case management meetings were held weekly to review the enrolled population and discuss patients who were at risk

for unplanned care, were hospitalized, or had challenging clinical or social circumstances. Turn-Key Health provided weekly, monthly, and quarterly reports of operational and clinical metrics to monitor enrollment, engagement, and clinical outcomes.

The team followed patients until they were admitted to hospice or a nursing home, moved out of the service area, or no longer required services.

Population

Over the course of nine months, we used predictive analytics to identify a total of 804 patients who could benefit from the palliative care program. Nurses and social workers called 701 of the top-ranked members and successfully reached 82% (n = 575). Of those reached, 24% (n = 138) had a change in status and were not eligible and 34% (n = 194) declined to participate in the outreach call. Of those who completed the outreach call, 204 patients enrolled in the program. We included 176 of these patients in the study group with at least two months and at most nine months of program exposure and sufficient data for analysis (Table 2). The comparison group consists of patients who did not enroll because they were unreachable, opted out, expired before they could be enrolled, or were already referred to hospice. We launched the program on October 1, 2015, and analyzed data through June 30, 2016.

At enrollment, 88% of the study group was over the age of 80, 53.7% were male, and 36% lived alone. Compared with the study group, the identified (but not enrolled) group was relatively younger (83.7% over 80 years of age) and the proportion of males was higher (55.0%).

The 28 members excluded from the study consisted of 2 groups. We excluded 14 members with fewer than two

TABLE 2. DETERMINATION OF COHORT SIZE

	<i>No. of patients</i>
Identified	804
Outreach attempted	701
Outreach successful	575
Not eligible for the program	(138)
Eligible	437
Declined to participate	(196)
Agreed to participate	241
Enrolled	204
Not eligible for evaluation	(28)
Included in evaluation	176

TABLE 3. COMPARISON BETWEEN EXCLUDED AND INCLUDED INTERVENTION MEMBERS

Members' demographic and clinical attributes	Excluded intervention group (%)	Included intervention group (%)	p
Age (in years)	85.4	86.5	<0.5156
65–74	6.7	2.8	<0.5585
75–84	26.7	25.4	<0.9167
85–99	66.7	71.8	<0.6876
Male	40.0	54.8	<0.2635
Female	60.0	45.2	<0.2635

months of program exposure. We compared the excluded members with the included members and no significant differences were observed (Table 3). We excluded an additional 14 members because they lacked complete data. Due to lack of data, we are unable to compare their profiles with that of the included members.

Study design

To control for differences between patients' demographic and clinical attributes, we conducted a retrospective propensity score-adjusted study to quantify cost savings and patient utilization. Appendix Table A1 compares demographic and clinical attributes of participants and nonparticipants. In most of the demographic attributes, such as age and sex, there are no measurable differences between groups. In certain clinical attributes—ischemic heart condition and Alzheimer's disease and dementia—there are some measureable differences between groups. The inverse propensity score adjustment method, as applied in this article, adjusts statistically by applying weights to differences in members' attributes across participant and nonparticipant groups.⁹ Compared with cohort matching methods, this approach has the advantage of using all the data, not just those lives that represent close matches.

We used the two-stage propensity adjustment model developed by Hogan and Lancaster¹⁰ for determining the impact of program intervention. In the first stage, we applied a logistic regression model to develop propensity scores between program participants and nonparticipants to predict the likelihood of program participation. The dependent variable in the logistic regression is the binary variable 1/0, representing enrolled versus nonenrolled members. Scores were developed on the basis of patient demographic (age and sex variables) and clinical attributes, as described in Appendix Table A1. Each member's claims were grouped to one or more disease states. This adjustment addresses measurable differences between enrolled and nonenrolled members. Individuals who are underrepresented in the enrolled group are overweighted and those who are overrepresented are underweighted.

In the second stage, we used a generalized linear model (GLM) to apply multivariate regression analysis where the inverse values of propensity scores developed in the first stage are used as weights for each observation in the model. We then fitted a multivariate regression model to compare the impact of palliative care program participation on the outcome of costs and utilization while controlling for other covariates. The covariates are age–sex variables and various

TABLE 4. COUNTS OF ENROLLED AND NONENROLLED MEMBERS

Cohort type	Study participants	
	Members	Member months
Enrolled members	176	1065
Nonenrolled members	570	5097

clinical conditions, all deviated from their overall mean to ensure that the binary variable indicating program enrollment (intervene = 1) versus program nonenrollment (intervene = 0) captures the full effect of the program impact.

Table 4 shows the sizes of cohorts used in this analysis.

Note that for nonenrolled members, we counted plan costs, utilization, and member months for the full nine-month duration of the study subject to plan enrollment and termination, while for enrolled members, we counted plan costs, utilization, and member months from the time of enrollment in the palliative care program until the end of the study period or plan termination, whichever occurred first.

Results

We report the comparison of population outcomes in Table 5.* Program enrollees have on average of \$619 as lower costs per patient per month (PPPM) ($p=0.0404$) than controls, primarily driven by reductions in medical costs of \$699 PPPM ($p=0.0176$). There is a slight increase of \$79 in pharmacy costs PPPM ($p=0.0513$). Although these numbers are lower than those reported by Lustbader et al.,¹¹ it is important to note that the Lustbader population is retrospective and consisted of decedents only, whereas our population is prospective and includes survivors.

Table 5 also shows various reductions in other utilization measures. The most (statistically) significant reductions are in acute care admission rates by 219 per 1000 patients per year ($p=0.0021$), reductions in acute care hospital days of 1494 per 1000 patients/year ($p=0.0126$), and ICU admission rate reduction by 101 per 1000 patients per year ($p=0.0137$). ICU days and ER rates also declined, but those changes are not statistically significant.

Admissions per 1000 in this population are lower than admissions in other end-of-life populations. We hypothesize that this is due, at least in part, to the MA plan and health system's robust case management program. We have estimated total savings by multiplying savings PPPM (\$619.63) by the number of the intervened group's patient member months (1065) or \$ 659,906.

During the study period, 33 members in the study group transitioned to hospice. Hospice length of stay (LOS) for study participants was significantly longer (median 51.5 days) compared with the study hospice's usual median LOS of 16 days. Hospice data for the nonenrolled group are not available.

*Per patient per month costs are lower than those of comparable MA plans, possibly reflecting the provider-owned nature of the MA plan.

TABLE 5. SAVINGS ESTIMATES USING PROPENSITY SCORE-ADJUSTED GENERALIZED LINEAR MODEL

Categories	Control group (PPPM \$)	Intervention group (PPPM \$)	p	Savings (PPPM \$)	Savings percent
Medical	\$3,546	\$2,847	<0.0176	\$699	19.7
Pharmacy	\$232	\$312	<0.05 < 13	(\$79)	-34.2
Total	\$3,778	\$3,159	0.0404	\$620	16.4
	Control group	Intervention group	p	Reduction	Reduction percent
ICU admission rate per 1000 patients/year	270	168	<0.0137	101	37.6
ICU days, rate per 1000 patients/year	1805	1586	<0.5872	219	12.1
Admission rate per 1000 patients/year	680	455	<0.0021	225	33.1
Hospital days, rate per 1000 patients/year	4734	3240	<0.0126	1494	31.6
ED rate per patient/year	1.55	1.41	<0.2771	0.14	9.0
<i>Total savings</i>					
Member count	570	176			
Member month count	5097	1065		\$659,906	

ED, emergency department; ICU, intensive care unit; PPPM, per patient per month.

Discussion

As the U.S. health care system moves toward value-based payment models, MA and other health plans are incentivized to provide higher quality care at a reduced cost by eliminating nonbeneficial and wasteful care.¹² Community-based palliative care programs are associated with decreased hospitalizations and costs in the last months of life.^{11,13-17} Whereas the Lustbader study¹¹ compares costs of decedents only, our study, like most of those cited here, includes persons still living during the study period and whose costs are expected to rise in the months preceding death. This study’s short program duration and prospective nature explain the relatively low hospice conversion rate. These patients’ illnesses are likely to progress the longer they are in the program such that they eventually meet the eligibility requirements for hospice.

This program incorporated key components of population health, including proactive identification, multidisciplinary team care management, phone and home visits, emphasis on care coordination, collaboration with physicians and health plans, and leveraging a mobile platform to support workflows and reporting.¹⁸ The clinical team also followed a consistent care process guided by standardized assessments, intervention-based care paths, and real-time clinical dashboards.

Identifying appropriate candidates through predictive analytics removes the subjectivity and delays in deciding who is appropriate for community-based palliative care. Patients are supported earlier in their disease process and the service is streamlined and normalized as part of the continuum of care.

The program focuses on helping patients and their families integrate health and social services to support independence at home and reduced unplanned care. The team elicited and clarified goals of care and assisted in advance care plan documentation that facilitated shared decision making, promoted goal-concordant care, and reduced the provision of nonbeneficial care. The team also developed a plan of care based upon cultural and spiritual diversity and individualized meaning of illness. Other studies demonstrate that patients who have goals-of-care discussions are less likely to die in the ICU or receive other aggressive end-of-life treatment compared with those who did not have these discussions.^{19,20}

Patients with advanced illness who receive clear and consistent information about their illness, have insight into their prognosis, trust their health care providers, and attend to advance care planning are often able to shift their focus away from curative efforts to one more focused on comfort.²¹

The nurse/social worker team successfully established relationships with the patient and family that permitted introducing hospice earlier, resulting in a longer LOS in hospice (median 51.5 days compared with the study hospice’s baseline of 16 and 12 days for patients referred to the hospice from the MA plan). Enrolling patients in hospice earlier contributed to improved family satisfaction and financial savings for the health plan. Increasing hospice participation and earlier hospice use result in cost savings for the health plan because MA plans are not currently authorized to cover hospice benefits.

We had fewer patients with Alzheimer’s and other dementias enrolled in the program compared with the control group. One possible reason for this is that their predictive model ranking is lower than other disease states. Consequently, they were not a high-priority target for outreach and enrollment.

Limitations

This was a retrospective study that is subject to bias and limitations related to missing data and limited ability to follow-up because the pilot ended. However, the propensity score-adjusted approach resulted in comparable intervention and control groups. Some participants’ exposure to the intervention was short, limiting the opportunity to put a palliative plan in place to affect patient outcomes. We excluded individuals who were enrolled for less than two months from the analysis to control for this. Members were from a single MA plan that was not racially diverse and may not be generalizable to other individuals in other settings or geographic regions. It was not possible to gather death data or data on patients who enrolled in hospices outside of Mount Carmel’s hospice program. Per member per month costs were relatively low perhaps due to the nature of contracts between the provider group and health plan.

Conclusions

A population health community-based palliative care program staffed by nurses and social workers was associated with lower costs, decreased hospitalizations and ICU days, and increased hospice utilization while improving care quality and member satisfaction. Care that is primarily driven by values, goals, and preferences of seriously ill individuals and their family members results in more compassionate, affordable, sustainable, and high-quality care.

Acknowledgment

This program and study were funded by an innovation grant from Trinity Health Plan.

Presented as a poster at CAPC Annual Conference, Orlando Florida, November 2016 and AAHPM Annual Conference, Phoenix, Arizona, February 2017.

Author Disclosure Statement

No competing financial interests exist.

IRB approval was obtained from the Mount Carmel Health System IRB.

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APPENDIX TABLE A1. BASELINE DIFFERENCES BETWEEN THE CONTROL (NONPARTICIPANT) AND INTERVENTION (PARTICIPANT) GROUPS

<i>Members' demographic and clinical attributes</i>	<i>Control group (%)</i>	<i>Intervention group (%)</i>	<i>p</i>
Age (in years)	85.1	86.5	<0.0337
65–74	5.4	2.8	<0.1598
75–84	30.9	25.0	<0.1350
85–99	63.2	72.2	<0.0283
Male	54.2	54.6	<0.9380
Female	45.3	45.5	<0.9643
Program length of stay (in days)	272	184	<0.0000
AMI	4.2	2.3	<0.2371
Alzheimer's disease and related disorders or senile dementia	21.4	11.9	<0.0053
Atrial fibrillation	47.7	49.4	<0.6910
CKD	54.2	46.0	<0.0573
Chronic obstructive pulmonary disease and bronchiectasis	43.7	39.8	<0.3592
Depression	23.3	19.9	<0.3386
Diabetes type 1	5.6	6.8	<0.5534
Diabetes type 2	34.0	33.0	<0.7911
HF	46.3	43.2	<0.4656
Hip/pelvic fracture	3.9	2.3	<0.3157
IHD	50.5	42.1	<0.0491
RA/OA	38.3	40.9	<0.5263
Stroke/transient ischemic attack	12.6	10.8	<0.5153
Female/male breast cancer	4.56	2.8	<0.3174
Colorectal cancer	5.1	5.1	<0.9891
Prostate cancer	7.5	7.4	<0.9447
Lung cancer	9.8	8.5	<0.6069

AMI, acute myocardial infarction; CKD, chronic kidney disease; HF, heart failure; IHD, ischemic heart disease; RA/OA, rheumatoid arthritis/osteoarthritis.