

Modeling of an Alternative Reimbursement Method for Palliative Care

Sean M. Reed, PhD, APRN; Erin Austin, PhD; Kathryn Colborn, PhD, MSPH; Lisa M. Schilling, MD, MSPH; and Jean S. Kutner, MD, MSPH

Patients who contend with serious, chronic, life-limiting illness are often not well served by the current fragmented health care system.¹ Fragmentation occurs unintentionally when patients see multiple clinicians, each of whom may treat an isolated health care need without attending to other aspects of the patient (eg, physical, psychological/psychiatric, social, cultural, ethical, legal).² Clinician inattention to the patient as a whole may result in care misaligned with the patient's values, preferences, wishes, or goals and may exacerbate the patient's emotional, spiritual, and financial distress.

Palliative care (PC), by virtue of its interdisciplinary nature and its broad focus on addressing symptoms and stress caused by serious illness, aims to bind the disparate fragments of health care delivery.³ PC is appropriate at any age and/or any stage of illness; it can partner with curative and interventional-based treatment.³ Unlike hospice, PC services are not dependent on a patient's prognosis of 6 months or less. As a result, interdisciplinary PC has been shown to improve quality of life, prevent and alleviate patient pain and suffering,⁴⁻⁷ and improve caregiver quality of life.⁸ Furthermore, randomized clinical trials have demonstrated that patient and family satisfaction levels are higher when care delivery regimens incorporate PC.⁹⁻¹¹ In fact, the body of evidence supporting the effectiveness of customized PC delivery continues to grow.¹²

PC Reimbursement in the Health Care System

The goal of any health care delivery system is to improve value¹³ by maximizing patient outcomes and minimizing patient costs. PC consultation teams in acute care settings effectively reduce length of stay, hospital charges and costs, and intensive care unit utilization.¹⁴⁻¹⁸ Additionally, studies addressing its economic impact in postacute care and ambulatory settings show a reduction in 30-day hospital readmissions, emergency department (ED) visits, and health care utilization.¹⁹⁻²¹ Further, PC has been shown to increase hospice use,^{20,21} which reduces health care costs. Finally, shared-risk population health reimbursement structures that include PC programs have shown promise in improving population health and economic outcomes.²¹

ABSTRACT

OBJECTIVES: Patient and Caregiver Support for Serious Illness (PACSSI), a per-member per-month (PMPM) alternative reimbursement structure for palliative care (PC) services, has been described as overly generous by HHS. We developed a modified version, PACSSI-Flexible (PACSSI-F), by modeling reimbursement for PC based on the changes in patient functional status. We estimated reimbursement for the first year that an organization might implement the PACSSI-F for PC services.

STUDY DESIGN: Secondary analysis using data from the Statin Discontinuation in Advanced Illness Trial.

METHODS: We evaluated the PACSSI vs the PACSSI-F in 3 phases. In the first phase, we calculated variable-appropriate frequencies/relative frequencies or means/SDs for the study population's available demographics and comorbidities, focusing on age, Charlson Comorbidity Index score, race and ethnicity, gender, and continued statin use. Exploratory analyses specific to reimbursement were conducted in a second phase. For each payment structure, we calculated the (1) mean (SD) total reimbursement and (2) number of weeks that a health care system would receive reimbursement, with both weekly and PMPM (4-week) averages. The third phase was designed to quantify any within-person (paired) differences in reimbursement between the original PACSSI and the PACSSI-F.

RESULTS: PACSSI-F provides reimbursement for sustainable PC services and was cost-advantageous over PACSSI by \$69.92 PMPM for 28.6% of the seriously ill population.

CONCLUSIONS: Modeling of the PACSSI-F using secondary data provides a novel example of economic forecasting for alternative reimbursement structures in PC. Alternative reimbursement payment policies are necessary to expand PC for the seriously ill population.

Am J Manag Care. 2022;28(6):e221-e227. doi:10.37765/ajmc.2022.89160

TAKEAWAY POINTS

Palliative care is primarily reimbursed by direct clinician encounters through fee-for-service (FFS) payment structures. Unfortunately, FFS covers only 20% to 60% of operating expenses. We modeled the Patient and Caregiver Support for Serious Illness (PACSSI) reimbursement structure and a modified version (PACSSI-Flexible [PACSSI-F]) to estimate reimbursement for the first year that an organization implements this payment structure for PC services.

- ▶ PACSSI and PACSSI-F are per-member per-month (PMPM) capitated reimbursement structures.
- ▶ Mean monthly PACSSI and PACSSI-F reimbursement values for the seriously ill population were \$565 and \$542, respectively.
- ▶ Expected 4-week PMPM cost reduction with PACSSI-F was \$19,985 for 1000 covered lives, or \$259,805 annually.

Despite evidence around the benefits of PC, expanding its application among the seriously ill requires changes in reimbursement payment policy.^{2,12} Health care consumers, purchasers, insurers, and providers in the United States express interest in moving from the current, prevalent fee-for-service (FFS) payment structure to alternative, value-based structures.²² However, there are few examples of alternative reimbursement structures for PC services.

Currently, PC is reimbursed as a medical specialty under Medicare Part B (through FFS) and less commonly by commercial Medicare Advantage (MA) plans or accountable care organizations (ACOs). Recent changes in MA plans and ACOs make it more financially advantageous to offer PC.²³ Regardless of insurer, patients may be left with out-of-pocket expenses. For example, Medicare Part B has a 20% co-pay for covered services, which often creates a financial burden, especially for those without additional supplemental insurance.

FFS-imposed financial burdens extend beyond patients and families. Nationally, FFS reimburses from 20% to 60% of a PC program's operating expense.²⁴ Funding for outpatient PC practices in the United States has been reported as 49% through FFS billing, 45% through institutional support, and 6% through philanthropy.²⁵ PC structures (eg, 24/7 coverage, full interdisciplinary team), services (eg, time-intensive, repeated discussions with patients/families regarding care priorities), and specialized symptom management are mismatched to the FFS reimbursement structure through which most PC programs currently deliver care.²⁶ Alternative reimbursement structures may provide PC programs an opportunity to be financially sustainable while encouraging expansion in acute, postacute, and ambulatory settings.

Patient and Caregiver Support for Serious Illness

Recently, the American Academy of Hospice and Palliative Medicine proposed an alternative reimbursement structure for PC services: Patient and Caregiver Support for Serious Illness (PACSSI).¹ PACSSI is a 2-tiered, per-member per-month (PMPM) reimbursement structure: Tier 1 (moderate complexity) is reimbursed at \$450 PMPM, and tier 2 (high complexity) is reimbursed at \$600 PMPM (Table 1²⁷). In addition to maximizing PC access, PACSSI was designed to replace FFS reimbursement and provide financial support to PC programs. PACSSI payments are based on a 6-month eligibility

period wherein tier 1–level or tier 2–level payments are paid *prospectively* each month. In turn—and key to the PACSSI structure—PC programs are reimbursed for services at the appropriate level regardless of whether there are periods when the patient's functional status improves or declines, and regardless of overall health care utilization. PACSSI eligibility is dependent on meeting *all* the following patient criteria¹:

Serious illness. Patient has either (1) one or more designated diseases, disorders, or health conditions that have progressed to a stage at

which patients frequently experience avoidable complications typically treated using expensive acute care services or (2) three or more chronic conditions.

Functional limitation. Patient has significant functional limitations indicated by physical performance on the Palliative Performance Scale or the ECOG Scale of Performance Status, or the need for assistance with activities of daily living; or, for the moderate complexity tier only, patient has a claim for specified durable medical equipment (ie, oxygen, a wheelchair, or a hospital bed).

Health care utilization. Patient has had unscheduled health care services, including inpatient hospitalizations, ED visits, or observation stays, in the past year.

Patients enrolled in PACSSI are assessed every 6 months for ongoing eligibility and placed into tier 1 or tier 2 based on specified criteria. Patients in hospice are not PACSSI eligible.

METHODS

Study Overview

Any new reimbursement strategy requires time and testing. An example is the rollout of the Medicare & Medicaid Primary Care First reimbursement structure. This structure began accepting payer statements of interest and practice applications in fall 2019 and subsequently 2 cohorts of participating practices began in January of 2021 and January of 2022. However, data on the economic impact may not be realized until 2022–2023. Therefore, economic modeling will take approximately 3 years. To address this time-sensitivity in PACSSI economic forecasting, our novel study used secondary data for modeling purposes. Our intention was to model PACSSI and then contrast it with a new, modified version (PACSSI-Flexible [PACSSI-F]) by tracking the fluctuation of patient functional changes during the study period. We developed PACSSI-F to match reimbursement for patients who moved between moderate and high complexities (and vice versa) monthly during the 6-month eligibility period. This presented a theoretical opportunity to allocate the limited reimbursement-based resources to those patients in greatest need while benefiting insurers. In addition, we sought to estimate whether PACSSI-F may effectively respond to the critique of the former secretary of

TABLE 1. PACSSI Eligibility and Tiering Criteria^{27,a}

Tier	Diagnosis of serious illness (one of the below)	Function (noncancer)	Function (cancer)	Health care utilization
Tier 1: moderate complexity	One of the specified diseases, disorders, or health conditions listed below: <ul style="list-style-type: none"> • Metastatic cancer • Pancreatic, gastrointestinal, lung, brain, or hematologic cancers • Heart failure with Class III or IV level function under the NYHA functional classification • Heart failure with an LVAD • Advanced pulmonary disease • Advanced dementia with stage 6 or 7 using FAST or ≥ 2 ADLs • Progressive neurologic disorder • Hepatic failure (cirrhosis) • End-stage (V) renal disease (excluding patients on dialysis) • Protein-calorie malnutrition • Cachexia • Hip fracture (with functional decline) or diagnosis of 3 or more serious chronic conditions	PPS of $\leq 60\%$ or ≥ 1 ADL or durable medical equipment order (oxygen, wheelchair, hospital bed)	PPS of $\leq 70\%$ or ECOG ≥ 2 or ≥ 1 ADL or durable medical equipment order (oxygen, wheelchair, hospital bed)	1 significant health care utilization in the past 12 months, which may include the following: <ul style="list-style-type: none"> • ED visit • Observation stay • Inpatient hospitalization
Tier 2: high complexity	Same as tier 1, excluding dementia as the primary illness	PPS of $\leq 50\%$ or ≥ 2 ADLs	PPS of $\leq 60\%$ or ECOG ≥ 3 or ≥ 2 ADLs	Inpatient hospitalization in past 12 months and 1 of the following: <ul style="list-style-type: none"> • ED visit • Observation stay • Inpatient hospitalization

ADL, activities of daily living; ED, emergency department; FAST, Functional Assessment Staging Tool; LVAD, left ventricular assist device; NYHA, New York Heart Association; PPS, Palliative Performance Scale.

^aAdapted from American Academy of Hospice and Palliative Medicine and serious chronic conditions as described in the Dartmouth Atlas.²⁷

HHS, in which he categorized PACSSI as being overly generous in PC reimbursement.²⁸

Study Methods

As a secondary analysis of deidentified data, this study was deemed “not human subjects research” by the Colorado Multiple Institutional Review Board. We employed a 3-step process to model PACSSI-F and evaluate its impact during the first year that a health care organization implements this payment structure.

Step 1: Search for a suitable data source. We sought a data source that contained representative data elements of the PC population, with data aligned with PACSSI criteria. We identified the Statin Discontinuation in Advanced Illness Trial, or Statin Trial (ST),²⁹ designed to evaluate the safety and clinical impact of discontinuing statin medications for patients in the PC setting. Data were collected from June 3, 2011, to May 2, 2013, and this multicenter, parallel-group, unblinded, randomized, pragmatic clinical trial (NCT 01415934) was conducted at 15 Palliative Care Research Cooperative Group member sites in the United States.²⁹ Inclusion and exclusion criteria are described in [eAppendix A](#) (eAppendices available at [ajmc.com](#)). For purposes of the current study, we operated under the assumption

that all patients in the ST had at least 1 significant health care utilization event (eg, ED visit, observation stay, and/or inpatient hospitalization) in the 12 months prior to enrollment. In addition, because PACSSI criteria do not provide reimbursement for patients in hospice, we excluded the ST hospice patients from our study.

Step 2: Identify PACSSI criteria. We extracted data including recorded patient primary diagnosis, *International Classification of Diseases, Ninth Revision* codes, and Charlson Comorbidity Index (CCI) scores to determine eligibility for serious illness and prospective tiering criteria based on the PACSSI reimbursement structure. Functional status in the ST was determined by scores on the Australian-modified Karnofsky Performance Status (AKPS).³⁰ Using a deterministic approach coupled with statement derivation,³¹ we concluded that the AKPS scoring was aligned with the Palliative Performance Scale. Because PACSSI does not penalize PC programs that are effective in reducing unnecessary utilization during a patient’s 6-month enrollment period,¹ we operated under the assumption that all patients continued to meet the health care utilization criterion.

Step 3: Model the PACSSI and PACSSI-F reimbursement structures. We modeled both the PACSSI and PACSSI-F reimbursement structures during the course of a 6-month eligibility period, the

TABLE 2. Patient Characteristics (N=234)

Characteristic	Group	n (%) ^a
Gender	Female	99 (42.3)
	Male	135 (57.7)
Non-Hispanic White	Yes	177 (75.6)
	No	57 (24.4)
Statin use	Yes	115 (49.1)
	No	119 (50.9)
Age at baseline in years (mean [SD], 70.8 [10.7])	≤ 50	7 (3.0)
	51-60	32 (13.7)
	61-70	80 (34.2)
	71-80	65 (27.8)
	81-90	50 (21.4)
CCI score (mean [SD], 5.1 [2.8])	CCI score: 0	13 (5.6)
	CCI score: 1 or 2	36 (15.4)
	CCI score: 3 or 4	41 (17.5)
	CCI score: ≥ 5	144 (61.5)

CCI, Charlson Comorbidity Index.

^aResults presented as number in group (% of total sampled).

primary difference being that PACSSI-F allows movement in reimbursement tiers month by month based on changes in patient functional status. For the specific modeling, we began by identifying the first eligible tier 1 or tier 2 week for each patient. The first week began at the start of the 6-month (24-week) period, and payment is prospective for each month within this period (or until death). Within the 6-month period, we assumed each month was equal to 4 weeks and paid at least at the tier 1 level. The process repeated itself until the 6-month period ended or until the end of the ST. Patients with a primary diagnosis of dementia were restricted to tier 1.¹ We imputed missing functional status data using the previously recorded AKPS score on record.

Analysis

We analyzed the PACSSI and PACSSI-F reimbursement structures using R version 3.6.3 (R Foundation for Statistical Computing) in 3 phases: demographic, exploratory, and differential analyses. For the demographic phase, we calculated frequencies or means/SDs for the available demographics and comorbidities, focusing on age, CCI score, race and ethnicity, gender, and continued statin use. During the exploratory analyses, for each payment structure, we calculated the mean (SD) total reimbursement and number of weeks that a health care system would receive reimbursement, with both weekly and PMPM averages during the study period.

The third phase quantified any differences in reimbursement between the PACSSI and PACSSI-F structures. We calculated reimbursement under the 2 payment structures, the paired (within-person) differences in reimbursement between the 2 structures, then the association between reimbursement differences and demographic variables. Analysis of the reimbursement comparisons for the paired data required modeling with either true zeros (as opposed

to assumed truncated zeros) or positive values representing reimbursement reductions from PACSSI-F. The cost distribution, estimated means and proportions, and statistical approach for this study are detailed in [eAppendix B](#).

RESULTS

The ST included 381 patients, with 137 (35.9%) enrolled in hospice. We excluded the 137 hospice patients as well as 10 additional nonhospice patients for not meeting the PACSSI serious illness criterion. This resulted in a sample size of 234 ([Table 2](#)). The mean (SD) baseline age was 70.8 (10.7) years (range, 47-90), and the mean (SD) CCI score was 5.1 (2.8). Men comprised 57.7% (n=135), 75.6% were non-Hispanic White, and 49.1% had statin use. Age was truncated at 90 years.

Comparison of PACSSI and PACSSI-F

For the PACSSI and PACSSI-F reimbursement structures, the mean (SD) for total cost and PMPM cost (4-week averages) were calculated. Reimbursement was computed for a mean (SD) of 6.5 (4.4) months. The PMPM cost was \$23.54 lower, on average, for the PACSSI-F structure. Beyond a shift in the mean payment, [Figure 1](#) demonstrates reimbursement under the PACSSI-F structure to be skewed lower than the original PACSSI.

Using the fitted Tweedie distribution plotted with a dotted line in [Figure 2](#), an estimated 71.4% (95% CI, 65.5%-77.0%) of the PC population will not derive cost reductions under PACSSI-F. For the remaining 28.6% (95% CI, 23.0%-34.5%), the expected PMPM cost reduction is estimated to be \$69.92 (95% CI, \$59.45-\$81.75) PMPM. This estimated proportion that would have a PMPM cost reduction matched the observed proportion in our study, in which 67 of the 234 participants (28.6%) had a PMPM cost reduction under the PACSSI-F reimbursement structure. Interestingly, the expected \$69.92 PMPM reduction calculated from our Tweedie model for this 28.6% who had a reduction represented a conservative estimate compared with the mean (SD) cost reduction observed in our data, which was \$82.21 (\$50.34) PMPM. For context, the PACSSI-F estimated proportion with reduced reimbursement and resulting expected mean PMPM reduction translates to \$19,985.44 per 1000 members in cost reduction every month.

We tested for associations between the cost reduction from using PACSSI-F and any of the 5 considered covariates: age, CCI score, race and ethnicity, gender, and continued statin use ([Table 3](#)). In addition, we tested for associations between cost reduction and squared age or squared CCI score. No covariates showed evidence of an effect on the PMPM cost reduction (all 95% CIs included 0 or no effect). Finding no candidate covariates individually with a clear association with the PMPM mean cost reduction, no combinations of covariates were further studied. Model diagnostics revealed generally reasonable fits for all linear models. The linear models including the squared age or CCI terms did show potential for excess influence on fit from a small number of points as measured by

leverage and Cook's distance. However, as the respective models with only age or CCI as the main effects did not have this concern and did not show evidence of an association between the covariate and cost reduction, we believe this reinforces that the squared terms were not useful in explaining PMPM cost reduction.

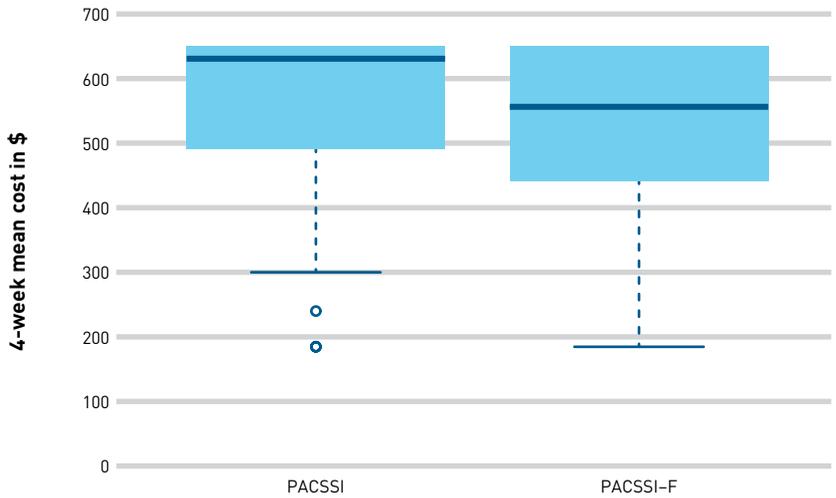
DISCUSSION

The findings from modifications to PACSSI (ie, PACSSI-F) suggest that tier reclassification provides payers cost savings for 28.6% of the PC population (mean savings of \$69.92 PMPM). We identified cost savings to PACSSI by allowing payment to lower from tier 2 to tier 1 when a patient's functional status improved. Overall, we believe that PACSSI-F may be more acceptable to payers while providing improved reimbursement for sustainable PC structures and services.

Most FFS PC billing is time based due to the intensity of counseling, advanced communications, and anticipatory guidance. We reviewed the general CMS Physician Fee Schedule for outpatient time-based reimbursement and determined that a new patient seen for between 60 and 74 minutes would result in a mean reimbursement of \$229.30.³² We assumed that follow-up visits (40-54 minutes each) would occur once within the initial month and then monthly thereafter (reimbursed at \$204.89 per visit).³³ Under the FFS structure, the mean (SD) reimbursement for professional PC services for our study is estimated to be \$1602.24 (\$754.43) per patient enrolled in equal time of PACSSI and PACSSI-F, or \$248.37 (\$28.44) PMPM. Although our estimates do not take into consideration geographical and contractual agreement differences, PACSSI and PACSSI-F provide additional reimbursement of approximately \$2005.45 and \$1822.76, respectively, for PC services on a per-patient basis. PACSSI and PACSSI-F are a substantial and necessary improvement for PC reimbursement when considering the need for individualized care for patients with serious illness. Under the alternative reimbursement structure, PC services will be reimbursed appropriately to provide the necessary physical, psychological, social, spiritual, and cultural care for patients and their family contending with a serious illness.

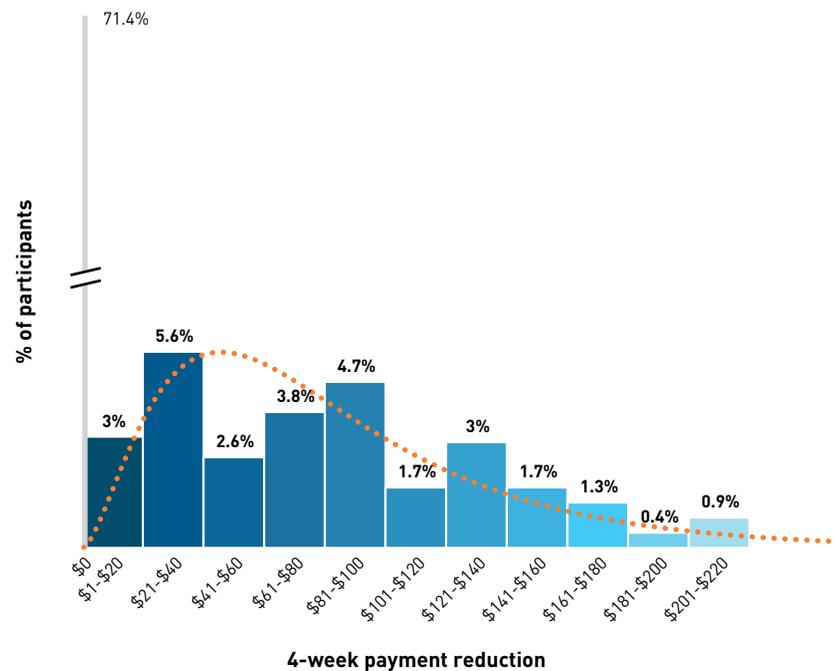
FIGURE 1. Mean Per-Member Per-Month Reimbursement in Dollars: PACSSI vs PACSSI-F Structures (N = 234)

Structure	Total cost ^a	4-week cost ^a
PACSSI	\$3607.69 (\$2450.28)	\$565.08 (\$107.39)
PACSSI-F	\$3425.00 (\$2327.03)	\$541.54 (\$107.74)



PACSSI, Patient and Caregiver Support for Serious Illness; PACSSI-F, PACSSI-Flexible.
^aValues reported in mean (SD).

FIGURE 2. Tweedie Distribution of Cost Reductions Between the PACSSI and PACSSI-F Alternative Reimbursement Structures



PACSSI, Patient and Caregiver Support for Serious Illness; PACSSI-F, PACSSI-Flexible.

TABLE 3. Estimated Effect of Individual Factors on Reimbursement Reductions (N = 234)

Model (effect)	Estimated mean effect	95% CI
Age (1 year)	−\$0.54	−\$1.17 to \$0.18
Age +	\$4.07	−\$2.03 to \$9.16
Age ²	−\$0.03	−\$0.07 to \$0.01
CCI score (1 point)	\$0.95	−\$0.70 to \$3.07
CCI score +	\$4.24	−\$1.87 to \$8.33
CCI score ²	−\$0.38	−\$0.84 to \$0.34
Race and ethnicity (not non-Hispanic White)	−\$5.92	−\$18.30 to \$7.48
Gender (female)	−\$0.59	−\$12.48 to \$11.78
Statin (continued use)	−\$0.77	−\$12.77 to \$10.68

CCI, Charlson Comorbidity Index.

PACSSI-F still maintains the 6-month evaluation window of guaranteed reimbursement used by the original PACSSI structure. There could be further reductions in reimbursement from modifications such as (1) allowing no payment for months within the 6-month evaluation period when patients are at the highest function level or (2) fully eliminating the 6-month evaluation window and evaluating reimbursement monthly. Our findings of reduced reimbursement in the PACSSI-F structure represent a potential response addressing the former secretary of HHS' critique that the original PACSSI design is overly generous and challenging to account for patient's functional status.²⁸ PACSSI-F attempts to mirror the changing severity of illness using functional status as a proxy, resulting in potential allocation of appropriate and timely PC services for individualized care. In doing so, PACSSI-F attempts to account for the population's changes in tier status monthly (eg, dynamic movement between high to moderate tiers and vice versa) while pragmatically matching reimbursement with allocated resources.

A potential barrier to implementing PACSSI-F is the burden on PC teams to continuously reclassify patients in aligned tiers. This may cause an increase in administrative workload that offsets some of the potential cost reduction.²⁸ A solution to this barrier is to ensure that the electronic health record has an embedded algorithm capable of computing data points entered by the PC team to automatically assign the patient to the appropriate tier. This straightforward approach requires minimal data entry on behalf of the PC team while recording their visit note. In addition, this solution may help billers to easily identify the tier for charging the payer source.

Interestingly, our study also revealed little evidence of an economic impact on potential reimbursement changes from variables such as comorbidities. Future work is needed to identify other patient characteristics, qualities, or behaviors that may affect utilization of PC resources and services. Key to this discussion is the importance of the support that the seriously ill and their families will obtain from a specialized, trained interdisciplinary PC team at an estimated overall annual cost range of \$6500.

Limitations

This study has several limitations. First, in performing a secondary analysis, we are limited to the set of previously collected data. Second, despite originating from a randomized pragmatic approach, our sample size is relatively modest in scope. Also, our seriously ill population was specifically derived from the ST, which is not representative of the entire PC population. Finally, although the CCI is commonly used to classify patients with comorbid diseases and associated risk for death, it does not account for changes in disease severity.³⁴ Disease severity is key to understand the individual's PC needs and match those needs with appropriate patient-centered resources. Although we attempt to capture these needs based on the CCI score and functional status, our study is limited in representing the entire PC population.

CONCLUSIONS

Our modification to the PACSSI provided a novel exemplar of economic forecasting for alternative reimbursement structures in PC. Use of PMPM reimbursement structures could be a viable way to expand PC in the acute, postacute, and ambulatory settings. ■

Author Affiliations: College of Nursing (SMR) and School of Medicine (KC, LMS, JSK), University of Colorado Anschutz Medical Campus, Aurora, CO; College of Liberal Arts and Sciences, University of Colorado, Denver (EA), Denver, CO.

Source of Funding: This study was supported in part by the National Institute of Nursing Research (award numbers: UC4-NR012584 and U24-NR014637) (Dr Jean Kutner) and the National Institute on Aging (award number: 5T32AG044296) (Dr Jean Kutner). None of the funders had any role in the conduct, collection, management, analysis, or interpretation of data or in the preparation, review, or approval of the manuscript.

Author Disclosures: The authors 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 (SMR, EA, LMS, JSK); acquisition of data (SMR, JSK); analysis and interpretation of data (SMR, EA, KC, LMS); drafting of the manuscript (SMR, EA, KC, LMS); critical revision of the manuscript for important intellectual content (EA, KC, LMS, JSK); statistical analysis (EA, KC); provision of patients or study materials (JSK); obtaining funding (JSK); administrative, technical, or logistic support (SMR, EA); and supervision (KC, LMS).

Address Correspondence to: Sean M. Reed, PhD, APRN, College of Nursing, University of Colorado Anschutz Medical Campus, ED 2 North, Room 4317, 13120 E 19th Ave, Aurora, CO 80045. Email: Sean.Reed@cuanschutz.edu.

REFERENCES

1. Payment reforms to improve care for patients with serious illness. American Academy of Hospice and Palliative Medicine. March 2017. Accessed August 15, 2017. http://aahpm.org/uploads/AAHPM_Palliative_Care_APM_Draft.pdf
2. Miller BF, Ross KM, Davis MM, Melek SP, Kathol R, Gordon P. Payment reform in the patient-centered medical home: enabling and sustaining integrated behavioral health care. *Am Psychol*. 2017;72(1):55-68. doi:10.1037/a0040448
3. What is palliative care? *Get Palliative Care*. Accessed January 30, 2020. <https://getpalliativecare.org/whats/>
4. Fulton JJ, LeBlanc TW, Cutson TM, et al. Integrated outpatient palliative care for patients with advanced cancer: a systematic review and meta-analysis. *Palliat Med*. 2019;33(2):123-134. doi:10.1177/0269216318812633
5. Rogers JG, Patel CB, Mentz RJ, et al. Palliative care in heart failure: the PAL-HF randomized, controlled clinical trial. *J Am Coll Cardiol*. 2017;70(3):331-341. doi:10.1016/j.jacc.2017.05.030
6. Tabibian BE, Salehani AA, Kuhn EN, Davis MC, Shank CD, Fisher WS III. Transitioning the treatment paradigm: how early palliative care service involvement affects the end-of-life course for critically ill patients in the neuro-intensive care unit. *J Palliat Med*. 2019;22(5):489-492. doi:10.1089/jpm.2018.0428
7. Qian Y, Haider A, Lu Z, et al. Factors associated with improvement in uncontrolled cancer pain without increasing the opioid daily dose among patients seen by an inpatient palliative care team. *J Palliat Med*. 2020;23(4):483-488. doi:10.1089/jpm.2019.0243
8. El-Jawahri A, Greer JA, Pirl WF, et al. Effects of early integrated palliative care on caregivers of patients with lung and gastrointestinal cancer: a randomized clinical trial. *Oncologist*. 2017;22(12):1528-1534. doi:10.1634/theoncologist.2017-0227

9. McDonald J, Swami N, Hannon B, et al. Impact of early palliative care on caregivers of patients with advanced cancer: cluster randomised trial. *Ann Oncol*. 2017;28(11):163-168. doi:10.1093/annonc/mdw438
10. Ng AYM, Wong FKY. Effects of a home-based palliative heart failure program on quality of life, symptom burden, satisfaction and caregiver burden: a randomized controlled trial. *J Pain Symptom Manage*. 2018;55(1):1-11. doi:10.1016/j.jpainsymman.2017.07.047
11. Casarett D, Shreve S, Luhrs C, et al. Measuring families' perceptions of care across a health care system: preliminary experience with the Family Assessment of Treatment at End of Life Short form (FATE-S). *J Pain Symptom Manage*. 2010;40(6):801-809. doi:10.1016/j.jpainsymman.2010.03.019
12. Unroe KT, Meier DE. Research priorities in geriatric palliative care: policy initiatives. *J Palliat Med*. 2013;16(12):1503-1508. doi:10.1089/jpm.2013.9464
13. Kaplan RS, Porter ME. How to solve the cost crisis in health care. *Harv Bus Rev*. 2011;89(9):46-52, 54, 56-61 passim.
14. Albanese TH, Radwany SM, Mason H, Gayomali C, Dieter K. Assessing the financial impact of an inpatient acute palliative care unit in a tertiary care teaching hospital. *J Palliat Med*. 2013;16(3):289-294. doi:10.1089/jpm.2012.0243
15. Morrison RS, Penrod JD, Cassel JB, et al; Palliative Care Leadership Centers' Outcomes Group. Cost savings associated with US hospital palliative care consultation programs. *Arch Intern Med*. 2008;168(16):1783-1790. doi:10.1001/archinte.168.16.1783
16. Whitford K, Shah ND, Moriarty J, Branda M, Thorsteinsdottir B. Impact of a palliative care consult service. *Am J Hosp Palliat Care*. 2014;31(2):175-182. doi:10.1177/1049909113482746
17. Wu FM, Newman JM, Lasher A, Brody AA. Effects of initiating palliative care consultation in the emergency department on inpatient length of stay. *J Palliat Med*. 2013;16(11):1362-1367. doi:10.1089/jpm.2012.0352
18. Morrison RS, Dietrich J, Ladwig S, et al. Palliative care consultation teams cut hospital costs for Medicaid beneficiaries. *Health Aff (Millwood)*. 2011;30(3):454-463. doi:10.1377/hlthaff.2010.0929
19. Lukas L, Foltz C, Paxton H. Hospital outcomes for a home-based palliative medicine consulting service. *J Palliat Med*. 2013;16(2):179-184. doi:10.1089/jpm.2012.0414
20. Rabow M, Kvale E, Barbour L, et al. Moving upstream: a review of the evidence of the impact of outpatient palliative care. *J Palliat Med*. 2013;16(12):1540-1549. doi:10.1089/jpm.2013.0153
21. Lustbader D, Mudra M, Romano C, et al. The impact of a home-based palliative care program in an accountable care organization. *J Palliat Med*. 2017;20(1):23-28. doi:10.1089/jpm.2016.0265
22. Conrad DA, Vaughn M, Grembowski D, Marcus-Smith M. Implementing value-based payment reform: a conceptual framework and case examples. *Med Care Res Rev*. 2016;73(4):437-457. doi:10.1177/1077558715615774
23. Enguidanos S, Rahman A, Fields T, et al. Expanding access to home-based palliative care: a randomized controlled trial protocol. *J Palliat Med*. 2019;22(suppl 1):58-65. doi:10.1089/jpm.2019.0147
24. Spragens LH, Pipke J. Billing and coding for palliative care consultations: getting paid for what you do. Presented at: Center to Advance Palliative Care; September 17, 2008.
25. Rabow MW, Smith AK, Braun JL, Weissman DE. Outpatient palliative care practices. *Arch Intern Med*. 2010;170(7):654-655. doi:10.1001/archinternmed.2010.56
26. Bowman BA, Twohig JS, Meier DE. Overcoming barriers to growth in home-based palliative care. *J Palliat Med*. 2019;22(4):408-412. doi:10.1089/jpm.2018.0478
27. List of ICD-9-CM codes by chronic disease category. Dartmouth Atlas Project. March 3, 2008. Accessed May 10, 2022. https://data.dartmouthatlas.org/downloads/methods/Chronic_Disease_codes_2008.pdf
28. Azar AM. Physician-Focused Payment Model Technical Advisory Committee (PTAC); the secretary of Health and Human Services response. CMS. June 13, 2018. Accessed June 5, 2020. <https://downloads.cms.gov/files/cmim/ptac-hhsresponse-oct17-may18.pdf>
29. Kutner JS, Blatchford PJ, Taylor DH, et al. Safety and benefit of discontinuing statin therapy in the setting of advanced, life-limiting illness: a randomized clinical trial. *JAMA Intern Med*. 2015;175(5):691-700. doi:10.1001/jamainternmed.2015.0289
30. Abernethy AP, Shelby-James T, Fazekas BS, Woods D, Currow DC. The Australia-modified Karnofsky Performance Status (AKPS) scale: a revised scale for contemporary palliative care clinical practice [ISRCTN81117481]. *BMC Palliat Care*. 2005;4:7. doi:10.1186/1472-684X-4-7
31. Walker LO, Avant KC. *Strategies for Theory Construction in Nursing*. 6th ed. Pearson; 2019.
32. Search the Physician Fee Schedule: new O/P patient non-facility: HCPCS 99205. CMS. Accessed April 1, 2021. <https://www.cms.gov/medicare/physician-fee-schedule/search?Y=0&T=4&HT=0&CT=3&H1=99205&M=5>
33. Search the Physician Fee Schedule: established O/P patient non-facility: HCPCS 99215. CMS. Accessed April 1, 2021. <https://www.cms.gov/medicare/physician-fee-schedule/search?Y=0&T=4&HT=0&CT=3&H1=99215&M=5>
34. Austin SR, Wong YN, Uzzo RG, Beck JR, Eggleston BL. Why summary comorbidity measures such as the Charlson Comorbidity Index and Elixhauser score work. *Med Care*. 2015;53(9):e65-e72. doi:10.1097/MLR.0b013e318297429c

Visit ajmc.com/link/89160 to download PDF and eAppendix

eAppendix A. The Statin Trial Inclusion and Exclusion Criteria¹

Inclusion: English-speaking adults (aged ≥ 18 years) receiving a statin for 3-months or longer for primary or secondary prevention of cardiovascular disease and: (1) patients had a documented diagnosis of advanced, life-limiting illness determined by (2) at least one physician indicating they would not be surprised if the patient died in the next year, (3) life expectancy of more than one month, and (4) recent deterioration in functional status.

Exclusion: (1) patient had active cardiovascular disease (CVD) or sufficient risk of CVD to require ongoing statin medications, (2) symptoms of myositis, (3) abnormal liver function tests, (4) creatine kinase levels > 2.5 times upper limit of normal, or (5) other contraindications to continuing statin therapy. Patients were also excluded if the patient or proxy was unwilling/unable to provide informed consent or the treating physician was unwilling to have the patient enrolled. Patient specific data were collected for up to 12 months.

eAppendix B. Cost distribution, estimated means and proportions, and statistical approach

Reductions in cost were distributed consistent with the Poisson-Gamma Distribution and within the Tweedie distribution family. The Poisson element allowed estimation for the proportion of patients with *no* cost reduction, and the Gamma element described the distribution of cost reduction for those patients resulting in less PMPM reimbursement under the PACSSI-F.²⁻⁴ Data was fitted and plotted to a Poisson-Gamma distribution with no covariate adjustments and we used this estimated distribution to calculate an expected proportion with no cost reductions and the mean of those with cost reductions. Furthermore, the Tweedie distribution is an exponential family, lending itself easily to general linear models with the respective link function. Consequently, we modeled any cost differences as a function of the demographics and comorbidities to identify factors associated with PMPM cost differences.

For all estimated means and proportions, we provided two-sided 95% bootstrapped confidence intervals. The Tweedie distribution was estimated in two stages. The first stage estimated the best mixture of the Poisson and Gamma distributions. This estimated mixture was then used in a second stage to estimate the proportion of patients with no change between payment methods and the mean change for patients with a difference across payment methods. Our two-stage estimation process creates multiple sources of error in our estimates. Consequently, bootstrapping was used to provide robust confidence intervals. Specifically, the confidence interval was calculated as the 2.5 to 97.5 percentiles of 1500 bootstrap samples (1500 was chosen from an empirical study of convergence of bootstrap samples' quantiles). All assumptions for the statistical models were checked for reasonableness.

Our event of interest was total PMPM differences between PACSSI and PACSSI-F over the full ST study period; and not a difference calculated by first estimating the number of months with PMPM differences. Thus, our Poisson parameter was functionally used in a binary fashion to calculate a percentage of members who would experience PMPM differences for at least one month, or not experience differences in any month. A 5% significance level was utilized and we used the Tweedie R package⁵⁻⁷ for all Tweedie distribution-based analyses.

eAppendix References

1. Kutner JS, Blatchford PJ, Taylor DH, et al. Safety and benefit of discontinuing statin therapy in the setting of advanced, life-limiting illness: a randomized clinical trial. *JAMA Intern Med.* 2015;175(5):691-700. doi:10.1001/jamainternmed.2015.0289
2. Jorgensen B. *The Theory of Dispersion Models.* 1st ed. Chapman and Hall/CRC; 1997.
3. Kurz CF. Tweedie distributions for fitting semicontinuous health care utilization cost data. *BMC Med Res Methodol.* 2017;17(1):171. doi:10.1186/s12874-017-0445-y
4. Tweedie MCK. An index which distinguishes between some important exponential families. In: Ghosh JK, Roy J, eds. *Proceedings of the Indian Statistical Institute Global Jubilee International Conference.* Indian Statistical Institute; 1984:579-604.
5. Dunn PK, Smyth GK. Series evaluation of Tweedie exponential dispersion model densities. *Stat Comput.* 2005;15(4):267-280. doi:10.1007/s11222-005-4070-y
6. Dunn PK, Smyth GK. Evaluation of tweedie exponential dispersion model densities by fourier inversion. *Stat Comput.* 2008;18(1):73-86. doi:10.1007/s11222-007-9039-6
7. Dunn PK. *Tweedie: Evaluation of Tweedie Exponential Family Models.*; 2017. <https://cran.r-project.org/web/packages/tweedie/index.html>