By Karen E. Joynt Maddox, E. John Orav, Jie Zheng, and Arnold M. Epstein

Medicare's Bundled Payments For Care Improvement Advanced Model: Impact On High-Risk Beneficiaries

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Karen E. Joynt Maddox
(kjoyntmaddox@wustl.edu),
Washington University in
St. Louis, St. Louis, Missouri.

E. John Orav, Harvard
University and Brigham and
Women's Hospital, Boston,
Massachusetts.

Jie Zheng, Harvard University.

Arnold M. Epstein, Harvard
University and Brigham and
Women's Hospital.

ABSTRACT **Medicare's Bundled Payments for Care Improvement Advanced Model (BPCI-A) is a voluntary Alternative Payment Model in which participating hospitals are held accountable for ninety-day episodes of care. To meet spending targets, hospitals must either decrease utilization or attract a less sick patient population; this could lead to the elimination of necessary care or avoidance of patients with medical or social vulnerability. We used publicly available data on BPCI-A participation, along with Medicare claims from the period 2017–19, to examine patient selection, changes in Medicare payment, and key clinical outcomes among three groups: patients with frailty, patients with multimorbidity, and patients with dual enrollment (both Medicare and Medicaid). We found no consistent change in patient selection associated with BPCI-A participation. Patients with frailty, multimorbidity, or dual enrollment were more expensive at baseline, but Medicare payments decreased similarly in these groups compared with lower-risk patients. There were no differential negative changes in clinical outcomes between BPCI-A participants and nonparticipants among patients with medical or social vulnerability.**

Medicare's Bundled Payments for Care Improvement Advanced Model (BPCI-A), launched in October 2018, is a voluntary Alternative Payment Model in which participating hospitals or physician groups are held accountable for the costs and outcomes of ninety-day episodes of care. Participants can select from a range of medical and surgical conditions and are given spending targets for each that are based on their own historical data, along with other factors. Average spending per episode is reconciled against these targets retrospectively, and participants earn bonuses or incur penalties that are based on this reconciliation. The BPCI-A program has had broad participation among hospitals[1] and in its first year was associated with reductions in overall Medicare payments per episode and improvements in clinical outcomes, although the benefits were small.[2]

Despite the positive outcomes previously reported, concern persists that BPCI-A could negatively affect subgroups of patients with the highest care needs, especially those who may require expensive postacute and rehabilitative care, because to meet spending targets, hospitals must either decrease utilization or attract a less sick patient population. To that end, researchers worry that providers may eliminate necessary rehabilitative care or discourage enrollment of patients with medical vulnerability, especially those who are particularly frail or who have high levels of multimorbidity.[3] There is similar concern about patients with high levels of social vulnerability, including people living in poverty

who may have less access to high-quality ambulatory care along with less social support, poorer nutrition, and other barriers to wellness.

Understanding whether vulnerable populations are harmed under payment incentives has implications for BPCI-A and other value-based payment programs as Medicare and other payers increasingly move toward these payment models. Therefore, we aimed to assess whether patients with frailty or multimorbidity or those dually enrolled in Medicare and Medicaid, compared to beneficiaries without these conditions or without dual enrollment, were more likely to suffer adverse selection, increased costs, or worsening clinical outcomes at BPCI-A-participating hospitals compared with comparison hospitals in the first year of BPCI-A. Because of data limitations, this study focused on hospital participants only and did not study participating physician groups.

Study Data And Methods

DATA We obtained publicly available BPCI-A participation lists from the Center for Medicare and Medicaid Innovation, which identified the conditions selected by each hospital. Hospitals could choose up to twenty-nine inpatient conditions and three outpatient conditions; this study focuses on the inpatient conditions.

Initial hospital enrollment in BPCI-A occurred in October 2018. There was a second opportunity for enrollment in January 2020; we excluded hospitals that joined at the later time from our comparison group. All other general acute care hospitals currently paid under the inpatient prospective payment system were eligible to be included as comparators. We obtained data on hospital characteristics from the American Hospital Association 2017 Annual Survey and market characteristics from the Area Health Resources File of the Health Resources and Services Administration. Eleven of 832 BPCI-A participants and 54 of 2,198 comparison hospitals did not match to either data set and were excluded from further analyses. We used a one-to-one matching algorithm to match each participating hospital with a comparison hospital based on a propensity score for program participation (online appendix exhibit 1 contains variables used in the propensity score).[4] Of BPCI-A hospitals, ten did not have a satisfactory match and were excluded from further analyses. Our final sample consisted of 811 BPCI-A hospitals and 811 matched comparison hospitals.

Patient episodes were identified using Medicare claims data spanning January 2017–September 2019, with data through December 2019 used to allow ninety days of follow-up for each initiated episode. January 2017–September 2018 was defined as the pre period, and October 2018–September 2019 was defined as the program period. BPCI-A relies on Medicare Severity-Diagnosis Related Groups (MS-DRGs) to qualify patients for attribution to the program. Index admissions were identified using fee-for-service inpatient claims with live discharges and a primary DRG on the BPCI-A condition list. For participating hospitals, we included only patients admitted for the conditions selected by that hospital; for comparison hospitals, we included patients admitted for any of the twenty-nine conditions on the BPCI-A condition list. We followed exclusion criteria per programmatic specifications, excluding beneficiaries without continuous enrollment in Medicare Parts A and B during their episode of care, as well as the year before, and those with end-stage renal disease.

Our primary predictors were patient-level indicators of medical or social vulnerability. We classified patients in the top quintile of a validated claims-based frailty index[5] as frail. We considered patients with six or more comorbidities (the median number in the Medicare population) to be multimorbid. We used dual enrollment in Medicare and Medicaid as a proxy for poverty.

Our primary patient selection outcome was the change over time in the proportion of patients in each of our groups of interest (frailty, multimorbidity, and dual enrollment) in BPCI-A hospitals relative to comparison hospitals. Our primary payment outcome was the change in standardized allowed Medicare payments per episode in BPCI-A hospitals relative to comparison hospitals, as has been used in similar previous research,[6] and our primary clinical outcome was change in ninety-day readmission rates from baseline to the end of the first year of the program among BPCI-A versus comparison hospitals. Secondary outcomes included changes in ninety-day mortality and ninety-day healthy days at home[7] in BPCI-A hospitals compared with non-BPCI-A hospitals. Standardized allowed Medicare payments per episode include payments across all care settings, including inpatient, outpatient, and postacute care, as well as payments for physician fees and durable medical equipment. Standardized payments remove regional and special payment variation (for example, payments for graduate medical education and disproportionate share hospital payments), allowing for valid cross-hospital comparisons. Payments were Winsorized at the first and ninety-ninth percentiles per program specifications and adjusted for inflation to prices in 2019.

ANALYSES We compared patient, hospital, and market characteristics based on our groups of interest. We used difference-in-differences mod-

It is reassuring that we did not see increases in readmission or mortality rates or reductions in healthy days at home for high-risk groups.

els to compare changes in patient selection, standardized Medicare payments, and key clinical outcomes among patients discharged from BPCI-A hospitals and patients discharged from nonparticipating hospitals. We first examined preintervention trends for our primary outcomes and found that they were parallel between the BPCI-A hospitals and comparison hospitals, with the exception of proportion of multimorbid patients. (The appendix contains detailed methods on testing of pre trends, and appendix exhibits 2–6 contain graphical representations.)[4] We then proceeded with analyses controlling for age, sex, primary condition based on DRG, month of admission, hospital ownership, teaching status, rural location, and census region. In all models except those including the frailty groups, we included medical comorbidities in risk adjustment. All models were run at the episode level and included a match group fixed effect to control for correlation over time and to exclude confounding between match groups. Following Centers for Medicare and Medicaid Services (CMS) specifications, we modeled total payments using a linear approach and binary outcomes using a log link function. Interaction terms between BPCI-A status; time; and an indicator for frailty, multimorbidity, or dual enrollment indicated whether the effect of the BPCI-A program differed by patient population.

We conducted two sensitivity analyses: First, we performed segmented regression models to assess for a difference in changes in trends. These models have a different set of assumptions than the parallel pre-trends assumption for standard difference-in-differences models and thus are a good robustness check on the findings. Second, we conducted a sensitivity analysis in which we included hospital fixed effects in lieu of match group fixed effects.

For our three primary outcomes—the difference in change in case-mix, total standardized allowed Medicare payments per episode, and ninety-day readmissions—among participants compared with comparison hospitals, we used the Benjamini-Hochberg approach with a false discovery rate of 5 percent to assess for statistical significance. (This method helps control for multiple comparisons by setting sequentially more conservative p value thresholds, depending on the number of primary outcomes assessed.) Secondary outcomes and analyses should be considered exploratory. This study was approved by the Human Research Protection Office at Washington University in St. Louis. Because data were deidentified, the requirement for informed consent was waived. Analyses were performed using SAS software on the Medicare Virtual Research Data Center.

LIMITATIONS There were limitations to our study. Our definitions of *frailty* and *multimorbidity* relied on claims and therefore may have missed patients for whom diagnoses had not been recorded. Similarly, we used Medicaid enrollment as a proxy for poverty. Although patients enrolled in Medicaid are low income or impoverished, there are many poor and near-poor patients who are not enrolled in Medicaid and who therefore could have been misclassified. Although in theory Medicare patients qualify for Medicaid based on a federal standard, some states have waivers for this standard, and states with expanded Medicaid may be more able and likely to enroll eligible patients.

We used Chronic Conditions Warehouse data to classify comorbidities. Although these data may be less sensitive to upcoding than the hierarchical conditions categories used in other research,[8] they may be less predictive of costs. If BPCI-A participation was associated with simultaneous risk aversion and upcoding, our results could be biased toward the null, particularly for the multimorbid group.

Our measures may have been inadequately sensitive to detect changes in functional status or too limited to detect longer-term changes in outcomes, both of which warrant future study. We were only able to evaluate the first year of the program, and larger effects may take time to accrue. However, because of the COVID-19 pandemic, the program was effectively paused by Medicare for 2020. A new service line–based model was introduced in 2021, which will be important to evaluate in future years.

Our study did not examine changes associated with BPCI-A participation by physician groups, and we were unable to identify patients in either BPCI-A or comparison hospitals who were also

cared for by physicians who were participating in BPCI-A via their physician group practice. This could have biased us either toward an effect or toward the null, depending on whether physician groups affiliated with participating hospitals were more or less likely to also participate in BPCI-A themselves and whether they were more or less successful than hospitals in saving money or improving outcomes. This is an important area for future study.

Study Results

PATIENT CHARACTERISTICS There were 6,827,172 patients in our sample, of whom 1,415,712 (20.7 percent) were classified as frail, 3,654,565 (53.5 percent) as multimorbid, and 1,792,738 (26.3 percent) as dually enrolled, at 811 BPCI-A hospitals and 811 comparison hospitals. Patient characteristics are shown in exhibit 1. Frail and multimorbid patients were older, were more often female, were more often dually enrolled in Medicaid, were more often entitled to Medicare as the result of disability, and had a higher number of comorbidities than nonfrail and nonmultimorbid patients. Dually enrolled patients were younger, were more often female, were more often entitled to Medicare as the result of a disability, were more likely to be Black or Hispanic, and had a slightly higher number of comorbidities than non–dually enrolled patients. Characteristics of matched and unmatched hospitals are shown in appendix exhibit 1.[4] Although BPCI-A hospitals were more often teaching, for profit, and urban compared with all other hospitals, these differences were minimal after matching.

PATIENT SELECTION In the pre-program period 21.2 percent of patients at BPCI-A hospitals were frail compared with 20.1 percent of patients at comparison hospitals. During the program that proportion decreased by 0.66 percentage points at BPCI-A hospitals compared with 0.49 percentage points at comparison hospitals, for a differential change of −0.17 percentage points (95% confidence interval: −0.30, −0.04) (exhibit 2). Appendix exhibit 2 contains graphical findings, and appendix exhibit 7 contains more detailed results with confidence intervals.[4] There was no differential change in the proportion of patients

EXHIBIT 1

Patient characteristics at hospitals in the Medicare Bundled Payments for Care Improvement Advanced Model and matched comparison hospitals, by patient subgroup, 2017–19

	Frail		Multimorbid		Dually enrolled	
	Yes	No	Yes	No	Yes	No
Total no. of patients	1,415,712	5,408,746	3,654,565	3,172,607	1,792,738	5,034,434
Percent of patients	20.7	79.3	53.5	46.5	26.3	73.7
No. of patients per hospital per condition	5.8	15.1	11.3	9.4	6.4	14.5
Age, years (%)						
Younger than 65	12.1	11.0	9.3	13.4	28.8	5.0
65–79	39.0	50.8	42.7	54.9	38.9	51.8
80 and older	48.9	38.2	48.0	31.7	32.3	43.3
Female (%)	61.9	54.3	56.7	55.0	61.4	54.0
Disabled (%)	30.7	22.7	25.4	23.1	49.1	15.5
Frail (%)	100.0	0.0	30.1	10.0	31.8	16.8
Multimorbid (%)	77.7	47.2	100	0.0	62.1	50.5
Dually enrolled (%)	40.3	22.6	30.5	21.4	100.0	0.0
Race and ethnicity (%)						
White	79.7	82.3	80.7	83.0	63.5	88.2
Black	10.9	8.5	9.9	8.1	17.6	6.0
Hispanic	6.0	5.0	5.8	4.6	12.2	2.8
Other	3.4	4.1	3.7	4.3	6.8	3.0
No. of CCW comorbidities per patient	8.03	5.41	8.53	2.98	6.66	5.70
Patients in the highest-complexity DRG (%)	61.8	39.5	51.3	35.8	52.7	41.0
Patients with outlier payments (%)	3.9	3.1	3.2	3.3	3.2	3.3[a]

SOURCE Authors' analysis of data from Medicare inpatient files from January 1, 2017, to December 31, 2019; American Hospital Association Annual Survey data from 2017; and Area Health Resources Files data from 2017. **NOTES** "Frail" indicates patients in the top quintile of a validated frailty index. "Multimorbid" indicates patients with more than 5 Chronic Conditions Warehouse (CCW) comorbidities. "Dually enrolled" indicates people enrolled in both Medicare and Medicaid; it is a proxy for poverty. All *p* values for comparison between frail and nonfrail, multimorbid and nonmultimorbid, and dually enrolled and non–dually enrolled patients are <0.001 except where otherwise indicated. A total of 2,714 patients were missing data elements needed to calculate the frailty index. DRG is diagnosis-related group. [a]$p = 0.75$.

EXHIBIT 2

Changes in patient selection for hospitals in the Medicare Bundled Payments for Care Improvement Advanced Model (BPCI-A) relative to matched comparison hospitals, 2017–19

	BPCI-A			Comparison			
Patient group	Pre period	Program period	Difference[a]	Pre period	Program period	Difference[a]	Difference in differences[a]
Frail	21.2%	20.5%	−0.66****	20.1%	19.6%	−0.49****	−0.17***
Multimorbid	53.7	54.6	0.95****	51.7	52.7	0.99****	−0.04
Dually enrolled	26.4	25.3	−1.12****	26.7	25.5	−1.29****	0.17**

SOURCE Authors' analysis of data from Medicare inpatient files from January 1, 2017, to December 31, 2019. **NOTES** Frail, multimorbid, and dually enrolled patient groups are defined in the notes to exhibit 1. Pre period is January 1, 2017–September 30, 2018. Program period is October 1, 2019–December 31, 2020. [a]Percentage points. **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

with multimorbidity, although this finding should be interpreted with caution because of the lack of parallel pre trends. BPCI-A hospitals had less of a drop than comparison hospitals in the proportion of patients with dual enrollment; the differential change was 0.17 percentage points (95% CI: 0.03, 0.31).

MEDICARE PAYMENTS PER EPISODE Frail patients had higher standardized allowed payments per episode than nonfrail patients in the pre period (frail BPCI-A patients, $38,797 per episode; nonfrail BPCI-A patients, $24,479 per episode) (exhibit 3). Appendix exhibit 3 contains graphical findings, and appendix exhibit 8 contains more detailed analyses with confidence intervals.[4] Among frail patients, payments at BPCI-A hospitals decreased in the program period compared with the pre period by $1,412 per episode, whereas payments for comparison hospitals decreased by $1,209 per episode, for a differential change of −$204 (95% CI: −348, −59) per episode. Among nonfrail patients, Medicare payments at BPCI-A hospitals decreased by $631 per episode in the program period compared with the pre period, whereas payments at comparison hospitals decreased by $550 per episode, for a differential change of −$81 (95% CI: −153, 9). BPCI-A was associated with similar differential decreases in spending for frail and nonfrail patients. The change over time in per episode payment at BPCI-A hospitals relative to comparison hospitals was −$123 for frail patients compared with nonfrail patients, but the difference was not statistically significant (95% CI: −284, 39).

Findings were similar for multimorbidity (exhibit 3, appendix exhibit 3, and appendix exhibit 8).[4] Payments decreased differentially under BPCI-A compared with comparison hospitals in both multimorbid and nonmultimorbid patients. The differential change per episode was −$147 (95% CI: −238, −56) for patients with multimorbidity and −$124 (95% CI: −220,−27) for patients without. BPCI-A was associated with similar differential decreases in spending for multimorbid and nonmultimorbid patients. The

EXHIBIT 3

Changes in total episode payments for hospitals in the Bundled Payments for Care Improvement Advanced Model (BPCI-A) relative to matched comparison hospitals, 2017–19

	BPCI-A			Comparison				
Patient groups	Pre period	Program period	Difference	Pre period	Program period	Difference	Difference in differences	Triple difference[a]
Frail	$38,797	$37,385	−$1,412****	$37,473	$36,265	−$1,209****	−$204**	−123
Nonfrail	24,479	23,849	−631****	23,886	23,336	−550****	−81	
Multimorbid	27,436	26,390	−1,045****	26,553	25,654	−899****	−147***	−23
Not multimorbid	27,527	26,741	−787****	26,903	26,240	−663****	−124	
Dually enrolled	30,169	29,093	−1,076****	29,133	28,424	−709****	−367****	−301****
Not dually enrolled	26,520	25,680	−839****	25,841	25,069	−773****	−66	

SOURCE Authors' analysis of data from Medicare inpatient files from January 1, 2017, to December 30, 2019. **NOTES** Frail, multimorbid, and dually enrolled patient groups are defined in the notes to exhibit 1. Pre period is January 1, 2017–September 30, 2018. Program period is October 1, 2019–December 31, 2020. [a]Triple difference cells apply to the two "Difference in differences" cells for each patient group. For example, for frailty, the triple difference of −$123 is the difference between −$204 and −$81. **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

change over time in per episode payment at BPCI hospitals relative to comparison hospitals was –$23 for multimorbid patients compared with nonmultimorbid patients, but the difference was not statistically significant (95% CI: –156, 110).

Findings were different for dually enrolled patients compared with non–dually enrolled patients. Dually enrolled patients had pre-period Medicare payments that were higher than those of their non–dually enrolled counterparts (exhibit 3, appendix exhibit 3, and appendix exhibit 8).[4] However, among dually enrolled patients, payments decreased differentially under BPCI-A. The differential change per episode was –$367 per episode (95% CI: –498, –237) compared with –$66 per episode (95% CI: –143, 10) among non–dually enrolled patients. BPCI-A was associated with a greater decrease in spending among dually enrolled than non–dually enrolled patients. The change over time in per episode payment at BPCI hospitals relative to comparison hospitals was –$301 (95% CI: –452, –149) for dually enrolled compared with non–dually enrolled patients, which was a statistically significant difference.

CLINICAL OUTCOMES Frail patients had much higher ninety-day readmission rates than nonfrail patients in the pre period. At BPCI-A hospitals, 52.3 percent of frail patients were readmitted in the pre period compared with 22.6 percent of nonfrail patients. However, there were no differential changes in readmission related to BPCI-A participation (exhibit 4). Appendix exhibit 4 contains graphical findings, and appendix exhibit 9 contains detailed findings with confidence intervals.[4] Patients with multimorbidity had similar readmission rates compared to those without, and patients with dual status had somewhat higher readmission rates than those without, but there were no differential changes related to BPCI-A participation for either group.

Frail patients had higher mortality rates than nonfrail patients in the pre period (14.4 percent versus 9.9 percent). Pre period mortality rates were similar for multimorbid and nonmultimorbid patients and for dually enrolled and non–dually enrolled patients (exhibit 4, appendix exhibit 4, and appendix exhibit 9).[4] There were no differential changes in mortality related to BPCI-

EXHIBIT 4

Changes in clinical outcomes for hospitals in the Medicare Bundled Payments for Care Improvement Advanced Model (BPCI-A) relative to matched comparison hospitals, 2017–19

	BPCI-A			Comparison				
Patient group	Pre period	Program period	Difference[a]	Pre period	Program period	Difference[a]	Difference in differences[a]	Triple difference[a,b]
90-day readmission								
Frail	52.3%	51.8%	–0.57****	51.5%	50.8%	–0.73****	0.16	0.14
Nonfrail	22.6	23.0	0.35****	22.2	22.6	0.33****	0.01	
Multimorbid	28.5	28.3	–0.16***	27.8	27.8	27.6	–0.01	0.02
Nonmultimorbid	29.3	29.2	–0.08	28.9	28.8	–0.06	–0.03	
Dually enrolled	31.5	31.2	–0.30****	30.6	30.6	–0.08	–0.22	–0.28
Non–dually enrolled	27.9	27.9	–0.02	27.5	27.4	–0.08	0.05	
90-day mortality								
Frail	14.4	14.0	–0.38****	14.6	14.2	–0.35****	–0.03	0.03
Nonfrail	9.9	9.4	–0.49****	10.0	9.6	–0.43****	–0.06	
Multimorbid	10.9	10.3	–0.62****	11.1	10.5	–0.58****	–0.04	–0.01
Nonmultimorbid	10.7	10.4	–0.30****	10.8	10.6	–0.27****	–0.03	
Dually enrolled	10.9	10.5	–0.41****	11.0	10.8	–0.25***	–0.17	–0.16
Non–dually enrolled	10.8	10.3	–0.50****	10.9	10.4	–0.49****	–0.01	
Healthy days at home								
Frail	61.0	62.7	1.78****	61.7	63.2	1.54****	0.24**	0.09
Nonfrail	74.7	75.5	0.88****	75.0	75.7	0.73****	0.15***	
Multimorbid	71.7	73.0	1.38****	72.1	73.3	1.22****	0.15***	–0.07
Nonmultimorbid	72.0	72.9	0.90****	72.4	73.0	0.67****	0.22****	
Dually enrolled	67.0	68.5	1.44****	67.7	68.7	1.06****	0.38****	0.24**
Non–dually enrolled	73.5	74.5	0.99****	73.9	74.7	0.84****	0.15***	

SOURCE Authors' analysis of Medicare inpatient files from January 1, 2017, to December 31, 2019. **NOTES** Frail, multimorbid, and dually enrolled patient groups are defined in the notes to exhibit 1. Pre period is January 1, 2017–September 30, 2018. Program period is October 1, 2019–December 31, 2020. [a]Differences for Patient Group and 90-day mortality are in percentage points; differences in Healthy Days at Home are in days. [b]Triple difference cells apply to the two "Difference in differences" cells for each patient group. For example, for frailty under 90-day readmission, the triple difference of 0.14 percentage points is the difference between 0.16 percentage points and 0.01 percentage points. These values are subject to rounding. **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

Savings were greater among patients with social vulnerability as measured by Medicaid enrollment.

A participation.

Frail patients had fewer healthy days at home than nonfrail patients in the pre period (61.0 versus 74.7) (exhibit 4, appendix exhibit 4, and appendix exhibit 9).[4] BPCI-A was associated with a differential increase in healthy days at home for both frail patients and nonfrail patients. The differential change at BPCI-A hospitals relative to comparison hospitals was 0.24 days per episode (95% CI: 0.06, 0.42) for frail patients and 0.15 days per episode (95% CI: 0.06, 0.24) for nonfrail patients. The increase was similar in both groups, with a triple difference of 0.09 (95% CI: −0.12, 0.29), although these findings should be interpreted with caution because of nonparallel pre trends for healthy days at home.

BPCI-A was also associated with a differential increase in healthy days at home relative to comparison hospitals for patients with multimorbidity and those without, and for dually enrolled patients and those not dually enrolled. For multimorbid patients, the differential change was 0.15 days per episode (95% CI: 0.04, 0.26); for nonmultimorbid patients, the differential change was 0.22 days per episode (95% CI: 0.11, 0.34). The triple difference was −0.07 days (95% CI: −0.23, 0.09). For dually enrolled patients, the differential change was 0.38 days (95% CI: 0.22, 0.54); for non–dually enrolled patients, the differential change was 0.15 days (95% CI: 0.06, 0.24). The triple difference was 0.24 days (95% CI: 0.05, 0.42).

Sensitivity analyses yielded similar results. Appendix exhibits 10–14 contain difference in difference in trend analyses, and appendix exhibits 15 and 16 contain analyses with hospital fixed effects.[4]

Discussion

Despite concerns that Alternative Payment Models may create incentives for providers to avoid high-risk patients or reduce necessary care for these groups, we did not find consistent evidence of negative impacts of BPCI-A among Medicare beneficiaries with frailty, those with multimorbidity, or those dually enrolled in Medicare and Medicaid.

Prior studies have demonstrated an association between public reporting of procedural outcomes and risk aversion by clinicians[9,10] and have raised concerns about avoidance of high-risk patients in accountable care organizations.[11,12] We had hypothesized that hospitals in BPCI-A might engage in patient selection via a number of mechanisms, as might physicians. For elective conditions, hospitals or physicians could decline to offer procedures to patients at high risk for adverse outcomes. For more emergent conditions, selection might be blunter—for example, hospitals could avoid providing admitting privileges to physicians practicing in areas with particularly ill (or poor) patients, influencing the pool of patients coming to the hospital instead of selecting patients individually. Other opportunities for strategic selection within BPCI-A could also interact with direct patient selection, including decisions to participate in the program at all and, if so, for which conditions to enroll. However, we did not find consistent evidence of adverse selection in this study. We found a small relative decrease in the proportion of patients with frailty and a small relative increase in the proportion of patients who were dually enrolled, but these findings were not robust to sensitivity analyses.

Other studies have suggested the potential for worsening clinical outcomes for some high-risk groups under value-based payment models,[13–15] although studies of BPCI-A's predecessor, BPCI, did not demonstrate adverse outcomes for these groups.[3,16–19] Although our measures of clinical outcomes were limited to those that could be captured in claims, it is reassuring that we did not see increases in readmission or mortality rates or reductions in healthy days at home for high-risk groups, although mortality and healthy days at home should be considered exploratory because they were secondary endpoints. Further study is needed, including data on functional status where feasible, to determine whether there were any more subtle decrements in outcomes.

A rich literature describes the higher costs and worse clinical outcomes associated with medical or social vulnerability.[20–24] We confirmed those findings here, with high-risk groups demonstrating higher Medicare payments per episode and clinical event rates compared with their counterparts. In theory, these groups should therefore stand to benefit even more from novel payment models that incentivize meaningful, innovative changes in care delivery. Indeed, sav-

ings were greater among patients with social vulnerability as measured by Medicaid enrollment. These findings suggest that programs that explicitly incentivize clinicians to develop interventions for high-risk populations may have the potential for improving outcomes and reducing costs of care. However, the degree to which higher costs and worse outcomes are modifiable with rigorously tested and scalable interventions such as care pathways, enhanced care coordination, or other care delivery innovations is unclear. Further qualitative work should seek to define the specific changes in processes of care that might be associated with benefit, both overall and within high-risk groups, and that could be scaled more broadly for greater benefit.

Conclusion

We found no consistent evidence of adverse selection or negative changes in clinical outcomes associated with BPCI-A participation among patients with medical or social vulnerability in the program's first year. These findings have implications for ongoing efforts to use Alternative Payment Models to improve care and reduce costs among Medicare beneficiaries. ■

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NOTES

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4 To access the appendix, click on the Details tab of the article online.

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