Association Between Capitated Payments and Low-Value Imaging in Primary Care

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INTRODUCTION

Led by Medicare, there is growing momentum to reform primary care payment using capitation.^{1, 2} Via fixed, recurring per-patient payments, capitation seeks to incentivize primary care clinicians and practices to improve value in part by reducing services that cause harm or provide little to no benefit (i.e., are low-value).

As one type of low-value care with the potential to cause patient harm and increase health care costs, advanced imaging has been targeted by Medicare appropriate use criteria policy and national campaigns.^{3, 4} However, despite the potential for capitation incentives to reduce low-value imaging, little is known about this relationship. Therefore, we used two common primary care scenarios—advanced imaging done in the context of uncomplicated, new-onset low back pain (LBP) and headache—to examine the association between capitation and low-value imaging.

METHODS

We created a sample of outpatient visits from January 1, 2006, to December 31, 2015, using nationally representative data from the National Ambulatory Medical Care Survey (NAMCS), a probability sample of US non-federal office-based visits each year provided by the National Center for Health Statistics. NAMCS includes data on reasons for visit, symptoms, diagnoses, diagnostic tests ordered, and practice characteristics. We limited our sample to visits performed by primary care clinicians (internal medicine, general medicine, and family medicine) and excluded visits for patients presenting with chronic symptoms and patients with cancer diagnoses. We followed approaches used in prior work and used information about diagnoses and reasons for visits to create two samples: one for uncomplicated, new-onset LBP and one for uncomplicated headache.^{5, 6}

Our exposure was the proportion of patient care revenue accounted for by capitation, assessed across quartiles. As an alternate specification, we dichotomized the exposure variable into low (0–25%) versus high (26–100%) capitation revenue. Our outcome was ordering of CT or MRI in the setting of visits for uncomplicated, new-onset LBP or headache (“low-value advanced imaging”).

We performed multivariable logistic regression, adjusted for patient and practice characteristics, to assess the association between capitation and low-value advanced imaging. Separate models were used for LBP and headache. All estimates were weighted to account for the complex multistage sampling design of NAMCS. Statistical tests were two-tailed and considered significant at $\alpha = 0.05$. Analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC). The University of Washington Institutional Review Board exempted this study from review due to use of publicly available data.

RESULTS

Our samples consisted of 1945 LBP visits and 936 headache visits. Low-value CT or MRI was ordered in 7.4% of LBP visits and 14% of headache visits. In adjusted analysis of LBP visits (Table 1), ordering of advanced imaging was not statistically significantly associated with capitation dichotomized (OR 0.52 high versus low capitation, 95% CI 0.22–1.20) or across quartiles (OR 0.65 per quartile increase, 95% CI 0.41–1.02). For LBP visits, there was a statistically significant association between the likelihood of ordering low-value advanced imaging and patients seeing their own personal primary care clinician, as opposed to another clinician.

Similarly, in adjusted analysis, there was no statistically significant association between capitation and ordering of low-value advanced imaging in headache visits (Table 2), whether capitation was dichotomized (OR 0.92 for high versus low capitation, 95% CI 0.43–1.96) or evaluated across quartiles (OR 0.97 per quartile increase, 95% CI 0.64–1.47).

DISCUSSION

In this nationally representative long-term analysis of primary care visits, we did not find statistically significant associations

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Table 1 Association Between Capitation and Advanced Imaging for Uncomplicated, New-Onset LBP

Variable	Revenue from capitation					
	High versus low 0–25% versus 26–100%			Across quartiles 26–50%, 51–75%, 76–100%		
	OR	(95% CI)	P value	OR	(95% CI)	P value
Age, per 10-year increase	1.01	(0.88, 1.17)	0.85	1.02	(0.88, 1.17)	0.83
Male sex	1.15	(0.76, 1.73)	0.52	1.14	(0.76, 1.72)	0.53
Race/ethnicity (ref. = non-Hispanic white)			0.11			0.13
Non-Hispanic black	0.62	(0.29, 1.34)		0.62	(0.29, 1.35)	
Hispanic	0.46	(0.21, 1.00)		0.46	(0.21, 1.02)	
Non-Hispanic other	0.38	(0.09, 1.69)		0.39	(0.09, 1.72)	
Payment type (ref. = private)			0.84			0.82
Medicaid	0.80	(0.38, 1.67)		0.79	(0.38, 1.64)	
Medicare	0.77	(0.41, 1.43)		0.76	(0.41, 1.42)	
Self-pay	0.80	(0.32, 2.03)		0.82	(0.33, 2.06)	
Other	0.70	(0.20, 2.44)		0.69	(0.20, 2.39)	
Non-MSA	0.81	(0.47, 1.38)	0.43	0.80	(0.47, 1.37)	0.42
Seen by one's own primary care physician	3.28	(1.57, 6.86)	0.002	3.30	(1.58, 6.90)	0.002
Solo practice	0.71	(0.44, 1.13)	0.15	0.70	(0.44, 1.12)	0.14
Capitation revenue*	0.52	(0.22, 1.20)	0.12	0.65	(0.41, 1.02)	0.061

OR, odds ratio; CI, confidence interval; MSA, metropolitan statistical area

*OR for revenue from capitation 26–100% (ref. = 0–25%) or per 1-level increase of original ordered categorical scale 0–25%, 26–50%, 51–75%, 76–100%

between capitation and low-value advanced imaging. However, based on effect sizes and confidence intervals, we cannot preclude an association between capitation and low-value imaging for LBP—an issue that should be addressed in future work. Study limitations included inability to definitively determine imaging appropriateness (though we followed prior methods, excluding symptoms and diagnoses potentially reflecting appropriate use), to evaluate capitation revenue as a continuous variable, or to distinguish between forms of

capitation that could affect the strength of financial incentives (primary versus global). While more work is needed in these areas, our findings are nonetheless relevant as policymakers use different forms of capitation to engage primary care clinicians^{1, 2} and reduce low-value advanced imaging. These results suggest that if capitation prompts reductions in low-value care, it may not occur via advanced imaging. Other strategies may be needed to reduce such imaging in primary care settings.

Table 2 Association Between Capitation and Advanced Imaging for Uncomplicated, New-Onset Headache

Variable	Revenue from capitation					
	High versus low 0–25% versus 26–100%			Across quartiles 26–50%, 51–75%, 76–100%		
	OR	(95% CI)	P value	OR	(95% CI)	P value
Age, per 10-year increase	1.02	(0.88, 1.18)	0.80	1.02	(0.88, 1.17)	0.80
Male sex	1.25	(0.74, 2.12)	0.40	1.25	(0.74, 2.11)	0.40
Race/ethnicity (ref. = non-Hispanic white)			0.19			0.19
Non-Hispanic black	1.71	(0.81, 3.64)		1.71	(0.81, 3.64)	
Hispanic	0.57	(0.23, 1.37)		0.56	(0.23, 1.38)	
Non-Hispanic other	1.40	(0.47, 4.14)		1.39	(0.47, 4.12)	
Payment type (ref. = private)			0.65			0.66
Medicaid	1.02	(0.43, 2.44)		1.02	(0.43, 2.42)	
Medicare	1.10	(0.47, 2.59)		1.10	(0.47, 2.59)	
Self-pay	2.27	(0.47, 10.89)		2.27	(0.47, 10.90)	
Other	0.32	(0.05, 2.11)		0.33	(0.05, 2.11)	
Non-MSA	1.26	(0.59, 2.73)	0.55	1.27	(0.59, 2.73)	0.54
Seen by primary care physician	1.22	(0.64, 2.33)	0.54	1.22	(0.64, 2.34)	0.55
Solo practice	0.67	(0.36, 1.26)	0.22	0.67	(0.36, 1.26)	0.22
Capitation revenue*	0.92	(0.43, 1.96)	0.83	0.97	(0.64, 1.47)	0.87

OR = odds ratio; CI = confidence interval; MSA = metropolitan statistical area;

*OR for revenue from capitation 26–100% (ref. = 0–25%) or per 1-level increase of original ordered categorical scale 0–25%, 26–50%, 51–75%, 76–100%

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Compliance with ethical standards:

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