


# Do accountable care organizations differ according to physician-hospital integration?

## A retrospective observational study

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### Abstract

Physician-hospital integration among accountable care organizations (ACOs) has raised concern over impacts on prices and spending. However, characteristics of ACOs with greater integration between physicians and hospitals are unknown. We examined whether ACOs systematically differ by physician-hospital integration among 16 commercial ACOs operating in Massachusetts.

Using claims data linked to information on physician affiliation, we measured hospital integration with primary care physicians for each ACO and categorized them into high-, medium-, and low-integrated ACOs. We conducted cross-sectional descriptive analysis to compare differences in patient population, organizational characteristics, and healthcare spending between the three groups. In addition, using multivariate generalized linear models, we compared ACO spending by integration level, adjusting for organization and patient characteristics. We identified non-elderly adults (aged 18–64) served by 16 Massachusetts ACOs over the period 2009 to 2013.

High- and medium-integrated ACOs were more likely to be an integrated delivery system or an organization with a large number of providers. Compared to low-integrated ACOs, higher-integrated ACOs had larger inpatient care capacity, smaller composition of primary care physicians, and were more likely to employ physicians directly or through an affiliated hospital or physician group. A greater proportion of high-/medium-integrated ACO patients lived in affluent neighborhoods or areas with a larger minority population. Healthcare spending per enrollee in high-integrated ACOs was higher, which was mainly driven by a higher spending on outpatient facility services.

This study shows that higher-integrated ACOs differ from their counterparts with low integration in many respects including higher healthcare spending, which persisted after adjusting for organizational characteristics and patient mix. Further investigation into the effects of integration on expenditures will inform the ongoing development of ACOs.

**Abbreviations:** ACO = accountable care organization, CI = confidence interval, HMO = Health Maintenance Organization, HOPD = Hospital Outpatient Department, IDS = integrated delivery system, OOP = out-of-pocket, PCP = primary care physician, POS = point-of-service, SES = socioeconomic status.

**Keywords:** accountable care organizations, healthcare spending, physician-hospital integration

### 1. Introduction

Ten years after passage of the Affordable Care Act, the U.S. healthcare system continues to face the challenge of simultaneously improving quality of care and containing costs. Accountable Care Organizations (ACOs) that hold providers

collectively responsible for the quality and costs of care for their patients are a key approach to addressing that dual goal. By the third quarter of 2019, there were nearly 1000 ACO contracts, many organizations contracted with both public and private payers, covering around 44 million lives.<sup>[1]</sup>

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The data that support the findings of this study are available from a third party, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are available from the authors upon reasonable request and with permission of the third party.

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Despite rapid development of ACOs, many have expressed concerns about potential unintended consequences of ACOs: provider consolidation encouraged by ACO contracts may lead to higher health care prices.<sup>[2–5]</sup> A closer tie between physicians and hospitals has been postulated to better equip ACOs for care coordination and management across settings. Yet tighter integration may grant ACOs enhanced bargaining power to negotiate higher prices, undermining the potential for cost containment. Several recent studies have documented a growing trend of hospital employment of physicians and acquisition of practices.<sup>[6–9]</sup> Evidence regarding the association between provider consolidation and ACO participation is inconclusive.<sup>[10,11]</sup>

Moreover, little is known about whether more or less integrated ACOs differ systematically. A basic understanding of the heterogeneity across ACOs by extent of integration is important to inform research evaluating their impact on ACO performance and patient outcomes. To that end, we analyzed 16 commercial ACOs operating in Massachusetts,<sup>[12]</sup> comparing three groups of ACOs demonstrating varying degrees of physician-hospital integration according to organizational characteristics, patient population, and healthcare spending.

## 2. Methods

### 2.1. Study sample

This was a cross-sectional observational study conducted in Massachusetts. We identified 16 provider organizations that entered a commercial ACO contract with the same major private payer in Massachusetts during the period 2009 to 2013. The ACO contract only applied to members of a health maintenance organization (HMO) or point-of-service (POS) plan because those were the only plan types which required patients to designate a Primary Care Physician (PCP) through whom they can be attributed to an ACO. We defined the study sample as non-elderly adults (aged 18–64) who met the following criteria:

- (1) continuous enrolment in an HMO or POS plan for at least one year and
- (2) designation of a PCP affiliated with an ACO under study during the enrollment period.
- (3) The Institutional Review Board at Boston University Medical Campus reviewed and approved this study (IRB Number: H-34063).

### 2.2. Data

The primary data sources were the Massachusetts All-Payer Claims Database and the Massachusetts Registration of Provider Organizations (MA-RPO) Program.<sup>[13]</sup> Using MA-RPO data, we first identified physicians affiliated with the 16 ACOs. We then abstracted individuals from the Massachusetts All-Payer Claims Database who met both inclusion criteria. Individuals were attributed to an ACO through their designated PCPs. Among the sample of 950,505 individuals, we excluded 3.6% subjects selecting a PCP affiliated with multiple ACOs because of ambiguity in attribution.

### 2.3. Physician-hospital integration measure

To measure physician-hospital integration of each ACO, we calculated the proportion of PCPs billing predominantly in a

Hospital Outpatient Department (HOPD) setting.<sup>[10,14]</sup> The rationale behind this approach is that Medicare reimburses services provided by a hospital-owned physician practice at a reduced professional fee and an additional facility fee. The total payment usually exceeds what a physician would receive for rendering the same service in an office setting. Physicians of practices owned by hospitals could legally bill Medicare at the higher HOPD rate even if the practice is off the hospital campus. In addition to hospital's ownership of physician practices, another arrangement suggesting a high level of physician-hospital integration is hospital-based physician. Given that they practice in a hospital setting, physicians directly employed by or contracted with a hospital almost exclusively bill outpatient claims with an HOPD code. Therefore, for an ACO, the share of physicians billing outpatient claims predominantly with an HOPD code reflects its overall level of physician-hospital integration. In this study, we specifically measured integration between PCPs and hospitals because PCPs are essential providers of ACOs.

The ACO-level measure of integration was composed based on each PCP's share of outpatient care billed with an HOPD code. First, for each ACO in each year, we calculated each PCP's share of medical claims for outpatient care that was billed with an HOPD code. Then, we considered PCPs to be practicing in a highly integrated setting if they billed 100% (or 95%, 75% as sensitivity analysis) of their outpatient care with an HOPD code. From the physician-level measure, we then calculated the share of PCPs in each ACO who displayed billing patterns implying a high level of integration. We excluded PCPs with small numbers of claims defined as physicians in the bottom decile (or quintile, quartile as sensitivity analysis) by annual professional claims count. Physicians' billing pattern was consistent over time and was not sensitive to the number of physicians excluded from the analysis due to lack of sufficient claims (Figure S1, <http://links.lww.com/MD/F943> and S2, <http://links.lww.com/MD/F944>, Supplemental Material 1). We then divided ACOs into two groups according to whether their 5-year average was above or below the mean of all 16 organizations. ACOs with a below-average integration measure were defined as low-integration. Those with an above-average measure were further divided into high-integrated and medium-integrated ACOs. The classification was not sensitive to the threshold used to determine physicians' close tie to a hospital (Figure S3, <http://links.lww.com/MD/F945> and S4, <http://links.lww.com/MD/F946>, Supplemental Material 1).

### 2.4. Outcomes

For each ACO, we obtained information on whether it belonged to an integrated delivery system (IDS, a health system linking various providers through common ownership), number and size of affiliated physician practices, number of hospitals and hospital beds, and number of PCPs and employed physicians from the Massachusetts Registration of Provider Organizations Program. We also calculated average medical spending per member per quarter, combining payer spending and member cost sharing. In addition to total spending, we distinguished outpatient care from inpatient care and grouped spending by Berenson-Eggers Type of Service categories.<sup>[15]</sup> Spending was measured according to site of service (inpatient or outpatient), type of claim (institutional or professional), and category of care defined by Berenson-Eggers Type of Service, following previous studies evaluating ACOs.<sup>[16–18]</sup> Medical spending was adjusted for inflation and

presented in 2013 dollars using the Producer Price Index for medical care services.<sup>[19]</sup>

Patient characteristics of interest included age, gender, socioeconomic status (SES), disease burden, and out-of-pocket (OOP) costs. We obtained information on area SES (zip-code-level median household income, poverty rate, unemployment rate, and racial/ethnic minority population) from the 2009–2013 American Community Survey. Zip codes were stratified into three groups by tertile of each SES measure. For each member in each year, we measured disease burden by HHS-Hierarchical Condition Categories (HHS-HCC) Risk Score<sup>[20,21]</sup> and Elixhauser Comorbidity index<sup>[22]</sup> using diagnoses listed in both inpatient and outpatient claims. We measured OOP costs incurred by each member in each year based on their total cost sharing for office visits (Current Procedural Terminology codes: 99201–5, 99211–5, and 99241–55) and the 100 most common Diagnostic Related Groups.<sup>[14]</sup>

### 2.5. Statistical analyses

To assess differences among ACOs with varying degrees of integration, we conducted bivariate analysis comparing organizational characteristics and patient populations among the three groups. For categorical variables, we examined differences across groups using a Mantel-Haenszel Chi-square test. For continuous variables, we examined distributions for normality using a Kolmogorov-Smirnov test and used a 2-tail ANOVA for normally distributed variables. If non-normality was detected, we used the Kruskal-Wallis test.

We further conducted multivariate analysis to compare ACO spending by integration level. For each spending measure, we specified a generalized linear model with gamma distribution and log link, adjusting for organization (IDS status, number of medical practices, and number of physicians) and patient characteristics (age, sex, HHS-HCC health risk score, comorbidity, and zip code-level income). The model also controlled for seasonality and temporal trend using a quarter and year fixed effect.

### 3. Results

There were 915,835 unique HMO/POS members receiving care from one of the 16 ACOs between 2009 and 2013 (Figure S5, <http://links.lww.com/MD/F947>, Supplemental Material 1). The study includes a total of 1,001,544 subjects, because a small proportion of members shifted from one ACO to another during the study period and therefore contributed the study sample multiple times. Table 1 summarizes characteristics of the sample. The mean age was 39, approximately half the sample was female, and health status of the sample varied widely (health and human services-hierarchical condition categories risk score ranged from 0.22 to 194.76). The distribution of OOP cost sharing was positively skewed (mean=12.6%, median=7.5%).

Among the 16 ACOs, the proportion of PCPs with billing patterns indicating financial integration with hospitals ranged from 0.8% to 44.7%, with a mean of 13.6% (Fig. 1). Six entities with an above-average integration measure were divided into two groups, with three high-integrated and three medium-integrated ACOs. The remaining ten were classified as low-integrated ACOs. Table 2 summarizes organizational characteristics of the 16 ACOs according to integration level. Two-thirds of high- and medium-integrated ACOs were IDSs. These ACOs had lower

**Table 1**  
Description of study sample.

|  |             |
|--|-------------|
| No. of ACOs                            | 16          |
| No. of PCPs                            | 4032        |
| No. of specialists/both                | 16,612      |
| No. of affiliated acute-care hospitals | 32          |
| No. of ACO members                     | 1,001,544   |
| Age (yr), means ± SD                   | 39.0 ± 13.2 |
| Female                                 | 53.5%       |
| Health risk score*                     |             |
| Mean                                   | 1.48        |
| Median                                 | 0.74        |
| IQR                                    | 0.41–1.03   |
| OOP cost sharing†                      |             |
| Mean                                   | 12.6%       |
| Median                                 | 7.5%        |
| IQR                                    | 3.2%–16.3%  |

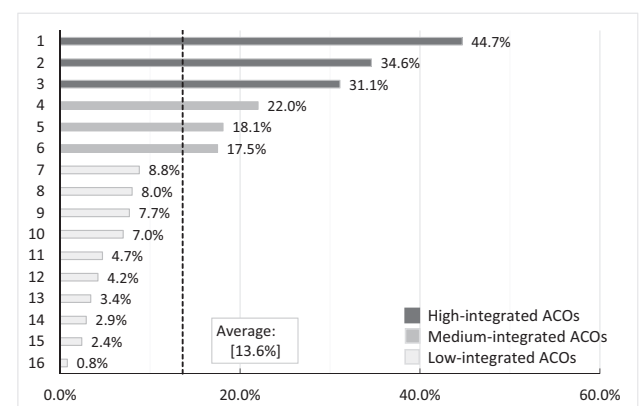
IQR = inter-quarter range, OOP = out-of-pocket, PCP = primary care physician, SD = standard deviation.

\* Calculated using the HHS-HCC risk adjustment modeling software. The health risk score takes into account health status of the member and expected spending; a higher value indicates poorer health status and higher expected spending.

† Proportion of spending paid by ACO members annually, pooled across all members during 2009–2013.

composition of PCPs but a higher proportion of employed physicians. These differences, however, were not statistically significant. Medium and large practices collectively accounted for a higher proportion of physician practices among high- and medium-integrated ACOs, compared to low-integrated counterparts (27% and 20.3% vs. 18.7%,  $P=.002$ ). Participating physicians in large medical groups was more prominent among ACOs with higher integration level. Practices of 20 or more clinicians covered 82.6%, 82.7%, and 59% of physicians participating in high-, medium-, and low-integrated ACOs, respectively ( $P<.0001$ ).

Table 3 presents patient characteristics of ACOs by integration level. Around 52% of the study sample were served by a high- or medium-integrated organization sometime during the study period. They were, on average, slightly older (39.3 and 39.5 vs 38.5 years), more likely to be female (54.0% and 54.8% vs.



**Figure 1.** Level of physician-hospital integration for each accountable care organization. Integration level was measured by share of primary care physicians who exclusively billed outpatient services with a hospital outpatient department code. We excluded physicians in the bottom decile by annual professional claim count.

**Table 2**  
**Differences in organizational characteristics by physician-hospital integration.**

|   | High-integrated ACOs (n = 3) | Medium-integrated ACOs (n = 3) | Low-integrated ACOs (n = 10) | P-value |
|---|------------------------------|--------------------------------|------------------------------|---------|
| Integrated delivery system                    | 66.7%                        | 66.7%                          | 40.0%                        | .648    |
| No. acute care hospitals                      | 3                            | 12                             | 17                           |         |
| No. of disproportionate share hospital        | 1                            | 6                              | 9                            |         |
| No. of acute hospital beds/1000 members, mean | 12.8                         | 9.8                            | 13.2                         | .853    |
| Share of PCPs, mean                           | 20.0%                        | 19.3%                          | 23.2%                        | .679    |
| Share of employed physicians, mean            | 60.6%                        | 61.4%                          | 43.8%                        | .521    |
| No. of physician practices*                   | 281                          | 599                            | 1,318                        |         |
| solo  | 51.3%                        | 51.8%                          | 54.7%                        | .002    |
| small   | 21.7%                        | 27.9%                          | 26.6%                        |         |
| medium  | 13.5%                        | 13.5%                          | 12.8%                        |         |
| large   | 13.5%                        | 6.8%                           | 5.9%                         |         |
| No. of physicians                             | 4,114                        | 8,399                          | 8,131                        |         |
| PCPs  | 847                          | 1,355                          | 1,830                        |         |
| Specialists                                   | 3,267                        | 7,044                          | 6,301                        |         |
| Practice size*                                |                              |                                |                              |         |
| solo  | 3.5%                         | 3.7%                           | 9.2%                         | <.0001  |
| small   | 4.0%                         | 5.6%                           | 13.0%                        |         |
| medium  | 9.9%                         | 8.0%                           | 19.9%                        |         |
| large   | 82.6%                        | 82.7%                          | 57.9%                        |         |

PCP = primary care physician.

\* Small: 2–5 physicians, Medium: 6–20 physicians, Large: > 20 physicians.

52.5%), and lived in high-SES areas (high-income zip codes: 55.4% and 56.3% vs 50.5%, low-unemployment zip codes: 30.1% and 35.4% vs 24.0%) compared to those served by a less integrated ACO. In addition, greater integration was associated with higher OOP cost and less favorable patient mix. Mean annual OOP cost decreased from \$366 for high-integrated ACO patients to \$331 for low-integrated ACO patients. Patients served by ACOs with higher integration level were relatively sicker (health and human services-hierarchical condition categories risk scores were 1.57, 1.49, and 1.45 for high-, medium-, and low-integrated ACOs, respectively). These observed differences in demographic characteristics, health risk, and annual OOP payment across the three groups were statistically significant ( $P < .0001$ ).

Table 4 shows that average medical spending per member was significantly higher among ACOs with high- or medium-level integration overall and across clinical categories. Total expenditure per quarter per member was \$1179, \$1261, and \$1075 for high-, medium-, and low-integrated ACOs, respectively ( $P < 0.0001$ ). More integrated ACOs spent more in inpatient settings. On average, high- and medium-integrated ACOs spent \$256.6 and \$255.1 per quarter per member on inpatient professional services, compared to \$ 241.8 at low-integrated ACOs ( $P < .0001$ ). We observed a similar trend for spending on inpatient facility services. The association between integration level and outpatient spending differed by type of care. Spending on outpatient professional services was lowest at high-integrated ACOs (\$398.4 compared to around \$425 for medium- and low-integrated ACOs,  $P < .0001$ ). In contrast, low-integrated ACOs spent less on outpatient facility services (\$316.3 vs \$430.5 for high-integrated ACOs and \$485.0 for medium-integrated ACOs,  $P < .0001$ ). Spending on ancillary services also varied by integration level but differences were marginal.

After adjusting for organization and patient characteristics, average medical spending was still higher at high-integrated ACOs, compared to low-integrated entities (\$25.8 per patient per quarter, 95% confidence interval [CI]: \$11.9, \$39.8) (Table 5).

The observed difference was mainly driven by spending in outpatient settings. Though high-integrated ACOs spent less on outpatient professional services (-\$64.8, 95% CI: -\$67.2, -\$62.4), their spending on outpatient facility services was much higher (\$144.7, 95% CI: \$136.3, \$153.2). We observed a similar pattern among medium-integrated ACOs: a lower spending on professional services (-\$67, 95% CI: -\$70.0, -\$63.9) but a higher spending on facility services (\$107.6, 95% CI: \$97.6, \$117.8). Analyses by clinical categories suggested that the relationship between spending and integration level differed by service types. Integration was associated with a higher spending on evaluation & management services but a low spending on imaging, test, and durable medical equipment.

#### 4. Discussion

There is considerable heterogeneity in the organizational structure, patient mix, and magnitude and composition of healthcare spending between more and less integrated ACOs. *High- and medium-integrated* ACOs are typically IDSs and of large size, have a slightly higher inpatient care capacity but a lower share of PCPs, and employ physicians directly or through an affiliated hospital or physician group. These attributes are similar to the characteristics of “larger IDS ACOs” categorized by earlier studies.<sup>[23,24]</sup> In general, ACOs self-identified as an IDS have more physicians and hospital beds but a relatively low percent of PCPs. Additionally, they are less likely to be led by physician groups, as IDSs usually employ physicians directly or through their subsidiary hospitals. Given this is a cross-sectional observational study, the statistical analysis presented is not causal, and the findings should be interpreted as associations.

*ACOs with higher integration* also differ from their low-integrated counterparts in the demographic composition of patient populations; the majority of patients in *high- and medium-integrated* ACOs lived in affluent areas and more lived in neighborhoods with a larger minority population. The observed differences may be due to their locations and

**Table 3**  
**Differences in patient population by physician-hospital integration.**

|   | High-integrated ACOs | Medium-integrated ACOs | Low-integrated ACOs  | P-value | Test statistics <sup>  </sup> |
|---|----------------------|------------------------|----------------------|---------|-------------------------------|
| No. of members                          | 163,892              | 359,157                | 478,495              |         |                               |
| Age (yr), means ± SD                    | 39.3 ± 12.6          | 39.5 ± 13.0            | 38.5 ± 13.5          | <.0001  | 739                           |
| Female (95% CI)                         | 54.0% (53.7%, 54.2%) | 54.8% (54.6%, 54.9%)   | 52.5% (52.4%, 52.6%) | <.0001  | 237                           |
| Area SES* (95% CI)                      |                      |                        |                      |         |                               |
| Income                                  |                      |                        |                      | <.0001  | 1706                          |
| Low                                     | 16.4% (16.2%, 16.6%) | 14.4% (14.3%, 14.6%)   | 17.4% (17.2%, 17.5%) |         |                               |
| Middle                                  | 28.1% (27.9%, 28.3%) | 29.1% (29.0%, 29.3%)   | 32.1% (32.0%, 32.3%) |         |                               |
| High                                    | 55.4% (55.2%, 55.7%) | 56.3% (56.1%, 56.5%)   | 50.4% (50.3%, 50.5%) |         |                               |
| Poverty rate                            |                      |                        |                      | <.0001  | 659                           |
| Low                                     | 47.2% (46.9%, 47.4%) | 53.1% (53.0%, 53.3%)   | 49.4% (49.2%, 49.5%) |         |                               |
| Middle                                  | 22.6% (22.4%, 22.8%) | 22.1% (22.0%, 22.3%)   | 27.0% (26.8%, 27.1%) |         |                               |
| High                                    | 30.2% (30.0%, 30.4%) | 24.7% (24.5%, 24.8%)   | 23.6% (23.5%, 23.8%) |         |                               |
| Unemployment rate                       |                      |                        |                      | <.0001  | 6086                          |
| Low                                     | 30.1% (29.9%, 30.3%) | 35.4% (35.2%, 35.5%)   | 24.0% (23.9%, 24.2%) |         |                               |
| Middle                                  | 45.4% (45.1%, 45.6%) | 40.8% (40.6%, 41.0%)   | 46.5% (46.3%, 46.6%) |         |                               |
| High                                    | 24.4% (24.2%, 24.7%) | 23.8% (23.6%, 23.9%)   | 29.4% (29.3%, 29.5%) |         |                               |
| Share of minority population            |                      |                        |                      | <.0001  | 15161                         |
| Low                                     | 28.0% (27.8%, 28.2%) | 35.6% (35.5%, 35.8%)   | 43.5% (43.3%, 43.6%) |         |                               |
| Middle                                  | 46.2% (46.0%, 46.5%) | 45.6% (45.4%, 45.7%)   | 40.4% (40.3%, 40.5%) |         |                               |
| High                                    | 25.8% (25.6%, 26.0%) | 18.8% (18.7%, 18.9%)   | 16.1% (16.0%, 16.2%) |         |                               |
| OOP Cost <sup>†</sup> (\$)              |                      |                        |                      | <.0001  | 709                           |
| Mean (95% CI)                           | 366.4 (363.9, 368.9) | 358.7 (357.1, 360.3)   | 331.0 (329.7, 332.3) |         |                               |
| Median (IQR)                            | 149.1 (46.4–440.0)   | 138.1 (42.9–417.9)     | 129.2 (44.2–380.4)   |         |                               |
| Disease Burden                          |                      |                        |                      |         |                               |
| Health risk score <sup>‡</sup>          |                      |                        |                      | <.0001  | 811                           |
| Mean (95% CI)                           | 1.57 (1.55, 1.59)    | 1.49 (1.48, 1.50)      | 1.45 (1.44, 1.46)    |         |                               |
| Median (IQR)                            | 0.74 (0.43–1.05)     | 0.74 (0.43–1.03)       | 0.74 (0.41–1.03)     |         |                               |
| No. of comorbid conditions <sup>§</sup> |                      |                        |                      | <.0001  | 259                           |
| 0                                       | 87.8% (87.7%, 88.0%) | 89.0% (88.9%, 89.1%)   | 89.4% (89.3%, 89.5%) |         |                               |
| 1                                       | 10.0% (9.9%, 10.2%)  | 9.1% (9.0%, 9.2%)      | 8.8% (8.7%, 8.9%)    |         |                               |
| 2+                                      | 2.1% (2.0%, 2.2%)    | 1.9% (1.8%, 1.9%)      | 1.8% (1.7%, 1.8%)    |         |                               |

IQR = inter-quarter range, OOP = out-of-pocket, SES = socioeconomic status.

\* Area SES includes zip-code median household income, % of population whose income in the past 12 months below poverty level, unemployment rate among population 20 to 64 years, and proportion of non-white population.

† Proportion of spending paid by ACO members annually, pooled across all the members during 2009–2013.

‡ Average health and human services-hierarchical condition categories risk score during the study period.

§ Elixhauser comorbid conditions captured during the study period.

|| For age, F-statistics from ANOVA was reported. For OOP cost and health risk score,  $\chi^2$  statistics from Kruskal-Wallis tests were reported. For categorical variables,  $\chi^2$  statistics from Mantel-Haenszel Chi-square tests were reported.

geographical coverage of their provider networks. Five of the six higher-integrated providers are located in the greater Boston area, which has a relatively dense minority population. However, their provider networks also cover wealthy suburbs in adjacent counties. Our result is consistent with findings from an early study documenting that ACO presence is associated with lower poverty rates and urban location.<sup>[2,5]</sup> Though patients of high-integrated ACOs did not appear to be more socially disadvantaged compared to their low-integrated counterparts, they assumed a greater health burden and encountered higher OOP payments. In general, patients' choice of PCP reflects their underlying health needs. As all high-integrated ACOs have a teaching hospital in their network, they may be more attractive to patients with chronic conditions or poor health status.

Medical expenditure of patients served by high-integrated ACOs was higher overall and consistently higher across clinical categories. The observed differences in spending concentrated mostly in inpatient care and outpatient facility services. Higher total and inpatient spending may result from the clinical burdens of high-integrated ACOs by providing care to sicker patients. However, the much higher outpatient facility expenditures may

merely reflect the nature of how integration was measured. Findings from multivariate analyses support this hypothesis. The difference in inpatient spending by integration level vanished after adjusting for organization characteristics and patient mix. However, the corresponding difference in outpatient spending persisted. Specifically, ACOs with greater integration had higher outpatient facility spending. By definition, a larger share of PCPs at higher-integrated ACOs practiced in a hospital setting or a hospital-owned practice and therefore was eligible to bill ambulatory care services at the higher HOPD rate. The association between physician-hospital integration and higher medical spending has been widely documented in non-ACO settings.<sup>[5,26–28]</sup> Moreover, the vertical integration was found to change referral patterns by shifting more patients to the owner hospital or health system.<sup>[26,29,30]</sup> Because integrated providers can exercise enhanced bargaining power to gain higher reimbursement rates, the inflated prices may consequently lead to higher medical spending if physicians tend to refer patients to their employer or owner.

This study has limitations. First, physician affiliation with an ACO was determined in 2015 due to lack of earlier year data.

**Table 4**  
**Differences in medical spending by physician-hospital integration, mean (95% confident interval).**

|                                      | High-integrated ACOs    | Medium-integrated ACOs  | Low-integrated ACOs     | P-value | Test statistics <sup>†</sup> |
|--------------------------------------|-------------------------|-------------------------|-------------------------|---------|------------------------------|
| No. of members                       | 163,892                 | 359,157                 | 478,495                 |         |                              |
| Total medical spending* (\$)         | 1178.9 (1168.1, 1189.8) | 1260.6 (1253.0, 1268.3) | 1075.1 (1069.0, 1081.2) | <.0001  | 6991                         |
| Spending by BETOS category (\$)      |                         |                         |                         |         |                              |
| Evaluation & management              | 260.3 (259.1, 261.5)    | 263.7 (262.9, 264.5)    | 238.3 (237.7, 238.9)    | <.0001  | 2778                         |
| Procedure                            | 273.7 (270.7, 276.7)    | 297.6 (295.3, 299.9)    | 250.0 (248.4, 251.7)    | <.0001  | 1120                         |
| Imaging                              | 140.7 (139.6, 141.8)    | 153.3 (152.5, 154.1)    | 119.2 (118.6, 119.8)    | <.0001  | 1229                         |
| Test                                 | 109.8 (109.1, 110.6)    | 135.4 (134.9, 136.0)    | 98.7 (98.2, 99.1)       | <.0001  | 3951                         |
| Durable medical equipment            | 12.0 (11.7, 12.3)       | 14.4 (14.2, 14.7)       | 11.5 (11.3, 11.7)       | <.0001  | 584                          |
| Other                                | 81.2 (78.0, 84.4)       | 94.1 (91.7, 96.5)       | 75.7 (74.0, 77.3)       | <.0001  | 230                          |
| Exceptions or unclassified           | 301.2 (293.8, 308.7)    | 302.0 (297.0, 307.1)    | 281.7 (277.5, 285.9)    | <.0001  | 950                          |
| Spending by site & type of care (\$) |                         |                         |                         |         |                              |
| Inpatient                            |                         |                         |                         |         |                              |
| Professional services                | 52.3 (51.1, 53.5)       | 54.8 (54.0, 55.7)       | 49.1 (48.4, 49.8)       | <.0001  | 24                           |
| Facility services                    | 256.6 (249.4, 263.9)    | 255.1 (250.2, 260.0)    | 241.8 (237.7, 245.9)    | <.0001  | 47                           |
| Outpatient                           |                         |                         |                         |         |                              |
| Professional services                | 398.4 (395.9, 400.9)    | 425.2 (423.4, 427.0)    | 425.7 (424.2, 427.2)    | <.0001  | 593                          |
| Facility services                    | 430.5 (425.9, 435.0)    | 485.0 (481.5, 488.6)    | 316.3 (313.9, 318.6)    | <.0001  | 107224                       |
| Ancillary                            | 41.1 (40.4, 41.7)       | 40.5 (40.0, 41.0)       | 42.2 (41.7, 42.6)       | <.0001  | 10527                        |

BETOS = Berenson-Eggers Type of Service classification.

\* Average medical spending per member per quarter, combining payer spending and member cost sharing. Spending is inflation-adjusted to 2013 dollars.

†  $\chi^2$  statistics from Kruskal-Wallis tests were reported.

Practically, physician organizations could join or leave a payment contract with payers over time. However, the ACO contract was launched by the largest private payer in Massachusetts, which has been historically successful in retaining physicians in its network. Second, physicians of a hospital-owned practice may not bill with a HOPD code regardless of their eligibility. Yet evidence suggests that Medicare payment for common evaluation and management services could be up to 80 percent higher for an HOPD, indicating

a strong financial incentive to do so.<sup>[31]</sup> Third, this study uses a small sample of 16 ACOs from a single state. Though they might not be representative, these ACOs form a valuable sample for a number of reasons. The ACO contract was launched by a major private payer in Massachusetts, offering sufficient sample size of patients for meaningful comparisons of healthcare spending. In addition, under the ACO contract, physician organizations participated as either solo entities or partners of hospitals or other

**Table 5**  
**Adjusted\* differences in medical spending between ACOs with higher versus low integration.**

|  | Average at Low-integrated ACOs | Difference between Medium- vs Low- integrated ACOs (95% CI) | Difference between High- vs Low- integrated ACOs (95% CI) |
|--|--------------------------------|---|---|
| Total medical spending <sup>†</sup> (\$) | 1075.1                         | -15.0 (-33.0, 3.1)  | 25.8 (11.9, 39.8) <sup>***</sup>                          |
| Spending by BETOS category (\$)          |                                |   |   |
| Evaluation & management                  | 238.3                          | -23.7 (-25.5, -22.0) <sup>***</sup>                         | -2.7 (-4.1, -1.2) <sup>***</sup>                          |
| Procedure                                | 250.0                          | -13.2 (-18.3, -8.0) <sup>***</sup>                          | 2.9 (-1.1, 6.9)   |
| Imaging                                  | 119.2                          | 8.4 (6.1, 10.7) <sup>***</sup>                              | 14.0 (12.2, 15.8) <sup>***</sup>                          |
| Test                                     | 98.7                           | 12.9 (11.4, 14.5) <sup>***</sup>                            | 6.5 (5.4, 7.6) <sup>***</sup>                             |
| Durable medical equipment                | 11.5                           | 4.8 (3.8, 5.8) <sup>***</sup>                               | 0.8 (0.2, 1.3) <sup>**</sup>                              |
| Other                                    | 75.7                           | 0.7 (-4.6, 6.4)   | 4.1 (-0.7, 9.2)   |
| Exceptions or unclassified               | 281.7                          | 0.5 (-12.5, 14.0)   | 5.0 (-4.9, 15.3)  |
| Spending by site & type of care (\$)     |                                |   |   |
| Inpatient                                |                                |   |   |
| Professional services                    | 49.1                           | -2.2 (-4.6, 0.3)  | -1.2 (-3.0, 0.7)  |
| Facility services                        | 241.8                          | -6.3 (-19.0, 7.0)   | 2.4 (-7.4, 12.5)  |
| Outpatient                               |                                |   |   |
| Professional services                    | 425.7                          | -67.0 (-70.0, -63.9) <sup>***</sup>                         | -64.8 (-67.2, -62.4) <sup>***</sup>                       |
| Facility services                        | 316.3                          | 107.6 (97.6, 117.8) <sup>***</sup>                          | 144.7 (136.3, 153.2) <sup>***</sup>                       |
| Ancillary                                | 42.2                           | 15.7 (14.1, 17.4) <sup>***</sup>                            | 6.1 (5.1, 7.2) <sup>***</sup>                             |

BETOS = Berenson-Eggers Type of Service classification.

\* Models adjusted for organization characteristics (integrated delivery system, number of medical practices, and number of physicians), patient mix (age, sex, health risk score, comorbidity, zip code-level income), quarter indicators, and year indicators.

† Average medical spending per member per quarter, combining payer spending and member cost sharing. Spending is inflation-adjusted to 2013 dollars.

\*\*\* P < .001.

\*\* P < .01.

\* P < .05.

medical groups, exhibiting varying degrees of physician-hospital integration. Finally, these ACOs operated in the same state and under a similar contract, strengthening comparability according to factors other than extent of integration.

In conclusion, we note that higher-integrated ACOs in Massachusetts differed from low-integrated ACOs in many respects. Of particular interest is that physician integration with hospitals was associated with higher *outpatient* spending that did not appear to be warranted by the observed differences in disease burden. Specifically, average outpatient facility spending was 34% (\$107.6/\$316.3) and 46% (\$144.7/\$316.3) higher at medium- and high-integrated ACOs, after adjusting for organization characteristics and patient mix. However, the association between integration and inpatient spending vanished after such adjustment. This finding has implications for potential harms from increased hospital market power spurred by consolidation with physicians under ACO formation. Further investigation into the relative importance of utilization and prices of services in driving spending under ACOs will be valuable for informing ongoing development of the ACO model.

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