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# Ambulatory Surgery Center Market Share and Rates of Outpatient Surgery in the Elderly

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## Abstract

Relative to outpatient surgery in hospital settings, ambulatory surgery centers (ASCs) are more efficient and associated with a lower cost per case. However, these facilities may also spur higher overall procedure utilization and thus lead to greater overall health care costs. The authors used the State Ambulatory Surgery Database from the State of Florida to identify Medicare-aged patients undergoing 4 common ambulatory procedures in 2006, including knee arthroscopy, cystoscopy, cataract removal, and colonoscopy. Hospital service areas (HSAs) were characterized according to ASC market share, that is, the proportion of residents undergoing outpatient surgery in these facilities. The authors then examined relationships between ASC market share and rates of each procedure. Age-adjusted rates of ambulatory surgery ranged from 190.5 cases per 1000 to 320.8 cases per 1000 in HSAs with low and high ASC market shares, respectively ( $P < .01$ ). For all 4 procedures, adjusted rates of procedures were significantly higher in HSAs with the highest ASC market share. The greatest difference, both in relative and absolute terms, was observed for patients undergoing cystoscopy. In areas of high ASC market share, the age-adjusted rate of cystoscopy was nearly 3-fold higher than in areas with low ASC market share (34.5 vs 11.9 per 1000 population;  $P < .01$ ). The presence of an ASC is associated with higher utilization of common outpatient procedures in the elderly. Whether ASCs are meeting unmet clinical demand or spurring overutilization is not clear.

## Keywords

ambulatory surgery centers, health care utilization, physicians' practice patterns

Approximately 40 million outpatient surgeries are performed annually, including nearly 14 million in the elderly. Although traditionally performed in hospital outpatient departments, ambulatory surgery has increasingly migrated to ambulatory surgery centers (ASCs).<sup>1,2</sup> The number of ASCs has doubled over the past decade, with 5349 facilities providing services to more than 22 million patients in 2008.<sup>3</sup> Proponents of ASC growth cite their ability to increase surgeon productivity<sup>4</sup> and reduce the episode (ie, per case) costs of ambulatory surgery.<sup>5,6</sup> Indeed, Medicare has recognized the efficiency advantage of ASCs by recently decreasing facility payments to a fraction of those provided to the hospital.<sup>7</sup>

However, many worry that ASCs could spur overall utilization of outpatient surgery. The exponential growth of ASCs has been underwritten almost entirely by the investment of physicians,<sup>8</sup> who benefit by collecting a share of the facility's profits. For this reason, physicians are incentivized to keep the facilities operating at maximal

capacity thereby ensuring the profitability of their investment. Although the added capacity for providing surgical services within a health care market may allow surgeons to meet previously unmet patient demand, the financial incentives inherent in ASCs may prompt some physicians to lower treatment thresholds for ambulatory procedures, the indications for which are often subjective. In this context, the proliferation of ASCs may result in greater overall health costs despite its advantages related to the efficiency of surgery.

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Although the growth of ASCs invariably leads to lower rates of hospital-based outpatient surgery,<sup>9</sup> the net effects of their proliferation on the overall rates of ambulatory surgery are unclear. For this reason, we performed a population-based study to understand the relationship between ASC market share and rates of common outpatient procedures among the elderly.

## Materials and Methods

### Study Population

We used data from the Healthcare Cost and Utilization Project's State Ambulatory Surgery Databases (SASD)<sup>10</sup> from the State of Florida for 2006 to identify patients undergoing ambulatory surgery. Data from Florida were used because the state captures discharges from both hospital outpatient departments and freestanding ASCs.

For the purpose of defining health care markets, we used the boundaries of the hospital service area (HSA) as described by the Dartmouth Atlas of Health Care.<sup>11</sup> The HSA represents a collection of zip codes whose residents receive the majority of their hospital care from facilities within these areas. Of the 3436 HSAs in the United States, 114 are in Florida ranging in size from 5299 to 1.7 million people. Using patient zip codes, we ascribed each discharge to their respective HSA using downloadable content from the Dartmouth Atlas Web site (available at [www.dartmouthatlas.org](http://www.dartmouthatlas.org)).

We then characterized each HSA according to ASC market share, that is, the proportion of residents undergoing outpatient surgery in ASCs. Next, we ranked HSAs based on this proportion and sorted them into 3 groups comprising equal numbers of patients (terciles). This approach yielded 3 groups of HSAs—low ( $\leq 39\%$  of ambulatory surgery performed at an ASC), medium (39.1% to  $\leq 56.5\%$  of ambulatory surgery performed at an ASC), and high ( $\geq 56.6\%$  of ambulatory surgery performed at an ASC)—that served as our exposure, representing ASC market share of ambulatory surgery.

### Rates of Ambulatory Procedures

Our outcomes were population-based rates of 4 common procedures among patients 65 years of age and older. We limited our study to Medicare-aged patients for 2 reasons. First, Medicare's significant purchasing power and close association with policy makers makes it a principal leader in health system reform.<sup>12</sup> Thus, identifying the best interests for Medicare is likely to elicit a swifter response from policy makers. Second, we wanted to homogenize our study population to minimize residual confounding by unmeasured demographic information.

Using *Current Procedure Terminology* codes,<sup>13</sup> we identified hospital and ASC discharges after arthroscopy, cystoscopy, cataract removal, and colonoscopy. For the purpose of this study, we defined these procedure categories in a broad sense in that they may also include an additional procedural component (eg, biopsy, removal of foreign body). We chose these procedure groups because they share several common attributes. They are among the most frequently performed ambulatory surgeries<sup>14</sup> among Medicare recipients and accounted for more than \$4.5 billion in Medicare spending in 2007.<sup>15</sup> Furthermore, there is a robust literature illustrating substantial variation in their use,<sup>16-18</sup> indicating a significant role for medical opinion in the decision to intervene.

We determined the numerator for our rate calculations by summing together the hospital-based and freestanding ASC volume totals within each HSA, separately for each procedure. The population at risk (denominator) was determined using the Census Bureau's population estimates for its zip code tabulation areas (ZCTAs), which are publicly available through the Census 2000 gazetteer files.<sup>19</sup> ZCTAs are generalized approximations of postal zip codes, covering all 50 states. Population estimates for each HSA were calculated by summing across each HSA's constituent ZCTAs. All rates were standardized to age using direct adjustment methods and are expressed per 1000 population.

### Statistical Analysis

For each procedure, we compared patient demographics by ASC market share using generalized linear models and Mantel-Haenszel  $\chi^2$  tests for continuous and categorical data, respectively. Next, we contrasted rates of ambulatory surgery by ASC market share (high vs low) using a series of Poisson regression models. First, we adjusted the rates for the relative competitiveness in the market in which an ASC resides using the Herfindahl-Hirschman index. Briefly, the Herfindahl-Hirschman index is a measure of competition within a given market (ie, HSAs). The index is estimated empirically by summing the squares of ASC market share, expressed as a fraction, within each HSA.<sup>20</sup> This results in a value ranging from 0 to 1 for each HSA, with lower values representing higher levels of market competition and "1" representing a monopoly. Second, we further adjusted rates for contextual factors specific to the HSA, including surgical population characteristics (in Table 1), physician density (per 100 000 US population), hospital bed density (per 100 000 US population), percentage of individuals more than 25 years old with a high school diploma, median household income, and percentage of individuals residing in an urban residence. All rates were weighted to reflect the age distribution of the US population using data from the 2000 US census.

**Table 1.** Comparing the Patient Mix Within Procedures by ASC Market Share

Procedure	Characteristic	Strata	ASC Market Share in a HSA			P Value
			Low	Medium	High	
Knee arthroscopy	Number of patients		3091	3980	5785	—
	Age, mean		71.5	71.8	72.2	<.01
	Female (%)		60.6	61.1	60.7	.99
	Nonwhite (%)		20.3	11.5	7.3	<.01
	Primary payer (%)	Private	16.6	15.7	10.6	<.01
		Medicare	82.7	84.0	89.1	
		Other	0.7	0.3	0.3	
	High socioeconomic class (%)		41.9	35.6	39.1	<.01
Cystoscopy	Charlson score $\geq 2$		2.6	2.1	1.7	.31
	Number of patients		9497	12 602	24 684	—
	Age, mean		75.4	75.5	75.8	<.01
	Female (%)		25.3	26.8	26.8	.01
	Non-white (%)		24.4	9.9	5.5	<.01
	Primary payer (%)	Private	10.6	13.9	9.3	<.01
		Medicare	87.8	85.6	90.4	
		Other	1.6	0.5	0.3	
Cataract	High socioeconomic class (%)		36.5	31.6	33.9	<.01
	Charlson score $\geq 2$		30.6	29.0	26.0	<.01
	Number of patients		60 021	74 012	105 702	—
	Age, mean		75.6	75.7	75.6	<.01
	Female (%)		61.0	59.9	58.8	<.01
	Nonwhite (%)		31.3	10.3	7.3	<.01
	Primary payer (%)	Private	14.5	14.4	9.5	<.01
		Medicare	81.9	84.0	87.1	
Colonoscopy		Other	3.6	1.6	9.4	
	High socioeconomic class (%)		34.6	29.8	35.2	<.01
	Charlson score $\geq 2$		3.2	0.7	0.3	<.01
	Number of patients		74 128	74 387	92 568	—
	Age, mean		73.5	73.7	73.6	<.01
	Female (%)		55.3	54.3	52.8	<.01
	Nonwhite (%)		36.3	14.1	10.0	<.01
	Primary payer (%)	Private	24.6	17.5	13.0	<.01
		Medicare	74.0	81.7	86.7	
		Other	1.4	0.8	0.3	
	High socioeconomic class (%)		37.1	33.1	36.3	<.01
	Charlson score $\geq 2$		3.4	2.7	2.3	<.01

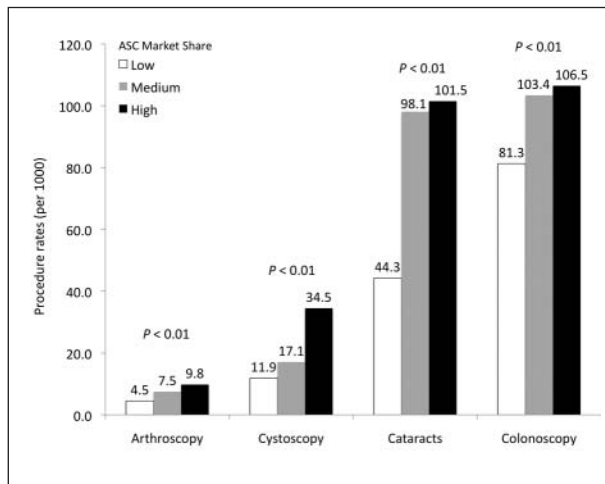
Note: ASC = ambulatory surgery center; HSA = hospital service area.

All tests were 2-tailed and performed at a significance level of .05 using the SAS system (v9.2, SAS Institute, Cary, NC). Because this study uses publicly available data, it was judged exempt by the Institutional Review Board of the University of Michigan.

## Results

Table 1 illustrates patient differences by ASC market share separately for each procedure. For each of the procedures, HSAs with high ASC market share were more

likely to have Medicare coverage compared with areas with low ASC market share. For example, for patients undergoing cataract removal, Medicare was the primary payer in 81.9% and 87.1% of patients in low and high ASC market share areas ( $P < .01$ ), respectively. Furthermore, HSAs with high ASC market share tended to treat fewer minorities. The largest absolute difference was evident for patients undergoing colonoscopy. In high ASC market share areas, 10.0% of patients were nonwhite compared with 36.3% in HSAs with low ASC market share ( $P < .01$ ). Finally, although there were significant



**Figure 1.** Age-adjusted rates of 4 common procedures among Medicare-aged patients according to ambulatory surgery center (ASC) market share

differences in comorbidity and socioeconomic class by ASC market share within procedures, the absolute differences were generally small.

Among the 114 HSAs in the State of Florida, age-adjusted rates of ambulatory surgery ranged from 190.5 cases per 1000 population in HSAs with the lowest ASC market share to 320.8 cases per 1000 population in those areas with the highest ASC market share ( $P < .01$ ). For all procedures evaluated, adjusted rates of procedures were significantly higher in HSAs with the highest ASC market share (Figure 1). The largest relative difference was evident for cystoscopy in which rates were nearly 3-fold greater in high ASC market share regions (34.5 vs 11.9 cases per 1000;  $P < .01$ ). In contrast, the largest absolute difference was evident for cataract removal (101.5 vs 44.3 cases per 1000 for high and low ASC market share areas, respectively,  $P < .01$ ).

Finally, our multivariable Poisson regression models suggest that for all procedures except colonoscopy, patients residing in HSAs with the highest ASC market share were more than twice as likely to undergo a procedure as compared with those residing in HSAs with low ASC market share. What is important is that market competition, as measured by the Herfindahl-Hirschman index, and contextual measures of the HSA environment had little effect on the rate ratios (Table 2). In line with our other findings, the strongest effects were evident for cystoscopy. Patients residing in HSAs with high ASC market share were 2.42 times more likely to undergo cystoscopy than those residing in areas with low ASC market share.

## Discussion

For each of the common procedures evaluated in this study, higher ASC market share was associated with higher procedure rates among the elderly. The most striking differences in utilization were evident for cystoscopy and cataract removal, where rates were more than 2-fold higher in HSAs with the highest ASC market share. Although patient case mix varied across HSAs according to ASC market share, these differences were relatively small relative to the differences in procedure rates. Indeed, market competition and contextual measures of the HSA environment played a relatively minor role in explaining the dramatic relative rate differences.

Despite these dramatic differences in utilization, it remains unclear whether ASCs are spurring higher utilization or simply responding to clinical demand. On one hand, areas with high ASC market share might have greater demand for surgical procedures. In this context, greater utilization in these areas would reflect aligning capacity with demand. Freestanding ASCs typically provide limited services (ie, focused factories), either within a single specialty or small group of specialties. Because of this specialization, ASCs can facilitate procedure standardization,<sup>21,22</sup> increase surgeon productivity,<sup>4</sup> and provide surgery at lower cost per episode.<sup>5,6</sup> Thus, to the extent that the rate differences in areas with high ASC market share are a result of eliminating surgical backlogs, the proliferation of these facilities may be beneficial to society.

On the other hand, the ASCs themselves may be fueling higher rates of utilization in areas. Surgeons who operate in ASCs invariably hold an ownership stake in these facilities<sup>8</sup> and therefore are financially committed to ensuring the success of their investment. In the fee-for-service payment system, physicians are incentivized to provide more health care and as owners, they share in the facility's profits in addition to collecting professional fees. Because indications for ambulatory surgery are discretionary, inherent financial incentives afforded by ownership could result in lower treatment thresholds and ultimately higher overall procedure volumes.<sup>23,24</sup> In this context, the proliferation of ASCs may be contributing to the growth in overall health expenditures to the extent that costs associated with unnecessary surgery outpace those reductions ascribed to greater efficiency. Unfortunately, the right rates of discretionary procedures such as these are difficult, if not impossible, to ascertain and are determined by complex interactions between the medical evidence supporting their use and patient preference. Furthermore, even though considerable differences exist across all levels of ASC market share, the largest contrasts were evident between the low and moderate categories,



**Table 2.** Comparing HSA-Level Rates of Procedure Use as a Function of ASC Market Share

	High Versus Low ASC Market Share Rate Ratio (95% CI) <sup>a</sup>		
	Unadjusted	Adjusted for HI	Adjusted for HI and HSA-Level Characteristics <sup>b</sup>
Cataract	2.29 (1.52, 3.46)	2.25 (1.49, 3.39)	2.06 (1.36, 3.10)
Colonoscopy	1.31 (1.00, 1.71)	1.30 (1.00, 1.70)	1.24 (0.92, 1.66)
Knee arthroscopy	2.16 (1.46, 3.19)	2.14 (1.45, 3.14)	2.11 (1.43, 3.11)
Cystoscopy	2.91 (1.56, 5.41)	2.58 (1.40, 4.76)	2.42 (1.39, 4.24)

Note: HSA = hospital service area; ASC = ambulatory surgery center; CI = confidence interval; HI = Herfindahl-Hirschman index.

<sup>a</sup>Interpretation: For example, the rate of cataract surgery in an HSA with a high ASC market share is more than 2 times greater than in one with a low ASC market share after adjusting for HSA characteristics and market competition.

<sup>b</sup>HSA-level characteristics include demographics from Table 1, physician density (per 100 000 US population), hospital bed density (per 100 000 US population), percentage of individuals older than 25 years with a high school diploma, median household income, and percentage of individuals residing in an urban residence.

implying a threshold. However, the possibility of induced demand is supported by the innumerable studies documenting relationships between physician ownership and utilization, including those for specialty hospitals,<sup>25</sup> physical therapy services,<sup>26</sup> and imaging facilities.<sup>27</sup>

A principal limitation of this study is the cross-sectional study design and our inability to track the opening and closing of facilities within health care markets. Longitudinal data that track such trends would be helpful in distinguishing whether the individual markets or facilities are the primary drivers of higher utilization. Second, the SASD does not track office procedures and, thus, the extent to which our findings represent procedure redistribution (eg, from the office to other settings) is unclear. However, for all but cystoscopy, in which approximately 60% of procedures are performed in the office, the vast majority of these procedures is typically performed in the hospital or ASC.<sup>4</sup> A third limitation relates to the generalizability of our findings. Because our study is limited to Medicare-aged patients, we would not expect our findings to hold true for markets with high rates of uninsured. Moreover, our study is restricted to the State of Florida, which has its unique regulatory requirements<sup>28</sup> and the findings have uncertain generalizability to other states. In many states, the opening of a new ASCs is governed by regulatory requirements (ie, certificate of need laws), which vary in stringency and breadth of coverage from state to state. In Florida in 2006, ASCs were not subject to regulatory review. Finally, the data do not capture actual payment information and, thus, we cannot judge the extent to which the lower costs per case relative to the hospital setting are offset by the costs of higher procedure use.

## Conclusion

Ultimately, the value of ASCs to the US health care system is a trade-off between their ability to lower the

episode costs of surgery and any costs associated with overutilization. Among common procedures in Medicare-aged patients, we demonstrated significantly higher rates of use in areas where ASCs have a high market share of ambulatory surgery. Whether these findings represent induced demand or alignment of capacity with patient demand is unclear. Using national longitudinal data to assess more directly the implications of ASCs opening and regulatory restrictions (eg, certificate of need) on outpatient surgery rates will lend further insight into the underpinnings of its growth. From a policy perspective, understanding the right rates of ambulatory surgery would invariably inform this debate.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

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