Title
Ambulatory Surgery Centers and Outpatient Procedure Use Among Medicare Beneficiaries

Journal
Medical Care, 52(10)

ISSN
0025-7079

Authors
Hollenbeck, Brent K
Dunn, Rodney L
Suskind, Anne M
et al.

Publication Date
2014-10-01

DOI
10.1097/mlr.0000000000000213

Peer reviewed

Published in final edited form as:
Med Care. 2014 October ; 52(10): 926–931. doi:10.1097/MLR.0000000000000213.

Ambulatory surgery centers and outpatient procedure use among Medicare beneficiaries

Brent K. Hollenbeck, MD[1,2], **Rodney L. Dunn, MS**[2], **Anne M. Suskind, MD**[2], **Yun Zhang, PhD**[2], **John M. Hollingsworth, MD**[1,2], and **John D. Birkmeyer, MD**[2,3]

[1]Center for Healthcare Outcomes and Policy, Bldg 16, First floor, 2800 Plymouth Rd, University of Michigan, Ann Arbor

[2]Department of Urology, Bldg 16, First floor, 2800 Plymouth Rd, University of Michigan, Ann Arbor

[3]Department of Surgery, Bldg 16, First floor, 2800 Plymouth Rd, University of Michigan, Ann Arbor

Abstract

Background—There has been a strong push to move outpatient surgery from hospital settings to ambulatory surgery centers (ASCs). Despite the efficiency advantages of ASCs, many are concerned that these facilities could increase overall utilization.

Objective—To assess the impact of ASC opening on rates of outpatient surgery.

Design—A retrospective cohort study of Medicare beneficiaries undergoing outpatient surgery between 2001 and 2010. We compared population-based rates of outpatient surgery in Hospital Service Areas (HSAs) with freestanding ASCs to those without. After adjusting for differences using multiple propensity score methods, we assessed the impact of ASC opening in a HSA previously without one on rates of outpatient surgery.

Subjects—Medicare beneficiaries with Part B eligibility.

Main outcome measure—Adjusted HSA-level rates of outpatient surgery.

Corresponding Author: Brent K. Hollenbeck, MD, MS, Associate Professor of Urology, The University of Michigan, Department of Urology, Bldg 16, First floor, 2800 Plymouth Rd, Ann Arbor, MI 48109, Tel: 734-936-0054, Fax: 734-232-2400, bhollen@med.umich.edu.

Author information: Brent K. Hollenbeck, MD, MS, Associate Professor of Urology, The University of Michigan, Department of Urology, Bldg 16, First floor, 2800 Plymouth Rd, Ann Arbor, MI 48109, Tel: 734-936-0054, Fax: 734-232-2400, bhollen@med.umich.edu
Rodney L. Dunn, MS, Statistician, The University of Michigan, Department of Urology, Bldg 16, First floor, 2800 Plymouth Rd, Ann Arbor, MI 48109, Tel: 734-936-0054, Fax: 734-232-2400, rldunn@med.umich.edu
Anne M. Suskind, MD, Research Fellow, The University of Michigan, Department of Urology, Bldg 16, First floor, 2800 Plymouth Rd, Ann Arbor, MI 48109, Tel: 734-936-0054, Fax: 734-232-2400, suskina@med.umich.edu
Yun Zhang, PhD, Assistant Research Scientist, The University of Michigan, Department of Urology, Bldg 16, First floor, 2800 Plymouth Rd, Ann Arbor, MI 48109, Tel: 734-936-0054, Fax: 734-232-2400, seanyz@med.umich.edu
John M. Hollingsworth, MD, Assistant Professor of Urology, The University of Michigan, Department of Urology, Bldg 16, First floor, 2800 Plymouth Rd, Ann Arbor, MI 48109, Tel: 734-936-0054, Fax: 734-232-2400, kinks@med.umich.edu
John D. Birkmeyer, MD, Professor of Surgery, The University of Michigan, Department of Surgery, Bldg 16, First floor, 2800 Plymouth Rd, Ann Arbor, MI 48109, Tel: 734-936-0054, Fax: 734-232-2400, jbirkmey@med.umich.edu

Results—Adjusted outpatient surgery rates increased from 2,806 to 3,940 per 10,000 and the number of ASC operating rooms grew from 7,036 to 11,223 (both $p < 0.001$ for trend). By the 4th year after opening, rates of outpatient surgery increased by 10.9% (from 3,338 to 3,701 per 10,000) in HSAs adding an ASC for the first time. In contrast, outpatient surgery rates grew by only 2.4% and 0.6% in HSAs where an ASC was always or never present, respectively ($p < 0.001$ for test between 3 slopes).

Conclusion—Rather than redistributing patients from one setting to another, the opening of ASCs increases outpatient surgery use. **However, the 10.9% increase is more modest than previously suggested by state-level data**.

Keywords

ambulatory surgery; utilization; ambulatory surgery center

Introduction

Over the last 3 decades, the volume of outpatient surgery has more than tripled to nearly 54 million procedures annually.[1] During this time period, there has been a dramatic shift in the setting where these procedures are performed, with redistribution from hospital outpatient departments to freestanding ambulatory surgery centers (ASCs).[1,2] The movement of outpatient surgery to ASCs has obvious advantages to the extent it is more efficient and associated with lower prices to payers.[2,3]

However, despite these efficiency gains, many remained concerned that inherent conflicts of interest will increase overall procedure use.[2,4] Almost all freestanding ASCs are owned, at least in part, by the surgeons who staff them.[2,5] Because physician-owners share in the profits of the facility in addition to collecting the professional fee for service, they have strong financial incentives to maximize throughput and increase overall utilization. The potential for physician-induced demand, wherein thresholds for intervention are lowered, is made possible by the discretionary nature of outpatient surgery. Previous state-level studies, although limited in clinical scope, have demonstrated that physician-owners of ASCs perform higher volumes of outpatient surgery than do non-owners.[6-9] Further, they show that rates of some procedures, such as upper gastrointestinal endoscopy, increase dramatically after a facility opens.[10]

Nonetheless, while the proliferation of ASCs has been strongly correlated with rising rates of procedures at these facilities, their net effects on outpatient surgery remain uncertain. Conceptually, the introduction of an ASC into a healthcare market could have at least three potential effects. First, ASCs have the potential to complement hospital outpatient departments and promote utilization across all settings. For instance, the introduction of a new competitor (i.e., ASC) into a local market might foster competition for market share, particularly of well-reimbursed procedures, resulting in higher rates of utilization. Alternatively, ASCs could offload procedures from the hospital without impacting overall rates of surgery, thereby serving as a substitute for the setting of care delivery. A third possibility is that ASCs might generate their own market without impacting hospital rates whatsoever. In this context, the introduction of a new ASC leads to a previously untapped

population of patients who otherwise would not have had surgery for a variety of reasons, including preference (i.e., desire to avoid hospital-based care), inadequate capacity (i.e., hospitals unable to keep up with clinical demand) or induced-demand. For these reasons, we used national Medicare data to examine the impact of ASC introduction into a local healthcare market on outpatient surgery use.

Methods

Study subjects

We performed a retrospective cohort study of fee-for-service Medicare beneficiaries with Part B coverage undergoing an outpatient surgical procedure between 2001 and 2010. For this purpose, we used a 20% national sample of claims in the Physician Carrier, Outpatient and Medicare Provider Analysis and Review files. We included only those patients aged 65 to 99 who underwent a procedure at either a hospital-based outpatient department or freestanding ASC.

Surgical procedures were enumerated using Healthcare Common Procedure Coding System codes. The type of procedure (inpatient versus outpatient) and setting (hospital versus ASC) were determined using explicit codes in the Medicare files. In addition to looking at overall rates, we also sorted patients into groups according to procedure types commonly done in ASCs (i.e., ophthalmologic, gastrointestinal and musculoskeletal).[2]

Outcome and study variables

Our objective was to assess the effects of an ASC opening in a healthcare market on rates of outpatient surgery. We chose Hospital Service Areas (HSAs), as described by the Dartmouth Atlas,[11] to reflect distinct healthcare markets (n=3,436). HSAs represent a collection of ZIP codes in which residing Medicare patients primarily receive their hospital care. For statistical stability, we limited our analysis to HSAs containing at least 1,000 beneficiaries with Part B fee-for-service enrollment. This restriction excluded a modest number of HSAs (n=412, or 12.0%) but a small number of beneficiaries (n=249,934, or 0.9%).

Our primary outcome was population rates of outpatient surgery, performed in either the hospital or ASC. For this measure, the numerator consisted of annual counts of outpatient procedures within an HSA, and the denominator was comprised of Medicare beneficiaries with Part B coverage residing in that HSA.

Information on age, race and gender of patients was obtained from the Denominator file. Comorbidity was assessed using *International Classification of Diseases, Ninth Revision, Clinical Modification* diagnoses codes submitted in the year preceding the outpatient procedure and reduced to an index using established methods.[12] To minimize confounding, additional detail on the local healthcare market was obtained from several data sources. The U.S. Department of Health and Human Services Area Resource File[13] was used to specify regional variables for education (i.e., % college educated among residents 25 years and older), socioeconomic status (i.e., % living below poverty), and population density (i.e., % urban vs. rural), in addition to two measures of healthcare capacity (i.e., surgeons per population and hospital discharges per population). The American Health Planning

Association's National Directory[14] was used to determine the applicability of state-based certificate of need regulations to ASCs. Because the unit of analysis was the healthcare market, all of the aforementioned characteristics were aggregated to the HSA level.

Statistical analysis

The unit of analysis was the HSA. Each HSA was categorized according to the presence or absence of a freestanding ASC for every year of study using the Provider of Services Extract, which is reported annually by the Centers for Medicare and Medicaid Services (CMS). This file contains 100% of Medicare approved ASCs and is reported at the ZIP code level. We first examined trends in the number of ASC operating rooms, also obtained from the Provider of Services Extract, and adjusted rates of surgery in the U.S. For each year of the study, we then compared rates of surgery in HSAs with and without ASCs using a generalized linear mixed model. In both cases, procedure rates were adjusted for HSA-level differences in the aforementioned beneficiary and regional characteristics.

Next, we sorted all HSAs into three mutually exclusive categories: 1) those with an ASC throughout the study period; 2) those without an ASC throughout the study period; and, 3) those where at least one ASC opened for the first time during the study period. A small number of HSAs (n=190, or 5.5%) had ASCs open and close during the study and were excluded from the analysis. These 3 groups of HSAs were then compared according to beneficiary and contextual characteristics using nonparametric statistics.

For HSAs where an ASC opened for the first time, ‘baseline’ was classified as the year prior to the first facility opening within its boundaries. For the other two categories of HSAs, ‘baseline’ was randomly assigned and proportionally matched to the ‘opened for the first time’ category so that the distribution of baseline years matched the distribution of baseline years in the ‘opened for the first time’ category.

To address significant differences in both population characteristics and size across HSAs, we used multiple propensity score methods.[15] For this purpose, we fit a multinomial logistic regression model in which the dependent variable was the HSA group and the independent variables were the aforementioned beneficiary and regional characteristics. The Hausman test was used to verify that the multinomial model met the Irrelevant Alternatives Assumption and overlapping of the distributions was visually confirmed. For this model, the Wald Chi-Square was 679.7 with 24 degrees of freedom ($p < 0.001$) and the pseudo R^2 was 0.35. This approach enabled us to effectively calculate the predicted probability of each HSA being assigned to one of the three market types (ASC always present, ASC never present, ASC opens for first time). **Because of the measured differences across the three market types, these probabilities were included in subsequent modeling**.

Using generalized liner mixed models, annual outpatient surgery rates from the three market types were adjusted for differences in the aforementioned HSA-level characteristics and the multiple propensity scores. The model was fit using splines with a knot at baseline to allow for different linear trends to be assessed in the pre and post introduction phases. We accounted for temporal trends by introducing the calendar year as a fixed effect and contrasted changes in rates over time both within and between HSA groups using the

appropriate interactions. An HSA-specific random effect was included to account for correlation between repeated measures within an HSA. **From this model, we estimated a percentage change in the rate of outpatient surgery using the least-squared mean for baseline versus 4 years after baseline**. These analyses were also performed separately for 3 specialty groups (i.e., ophthalmologic, gastrointestinal and musculoskeletal procedures) that account for a disproportionate share of ASC utilization according to MedPAC.[2]

Because the capacity for outpatient surgery in ASCs within a market is dynamic, we also examined the effect of additional supply on outpatient surgery rates in HSAs where these facilities were present throughout the study. For this purpose, we measured the number ASC operating rooms using the Provider of Services Extract. We then sorted these 837 HSAs in four equally sized groups (i.e., quartiles) based on the change in number of ASC operating rooms in each HSA between 2001 and 2010. We used a generalized linear model to estimate the impact of change in ASC capacity on outpatient surgery rates, adjusting for the aforementioned HSA-level characteristics and the multiple propensity scores.

All analyses were performed using SAS v9.2 (Cary, NC). The probability of a type I error was set at 0.05 and all testing was two-sided. The institutional review board at the University of Michigan approved this study.

Results

During the study, there were contemporaneous increases in both the rate of outpatient surgery and the number of operating groups in ASCs (Figure 1). Specifically, the adjusted rate of outpatient surgery increased by 40.4%, or from 2,806.3 per 10,000 in 2001 to 3,940.7 per 10,000 in 2010 ($p < 0.001$ for trend). **During this period, the proportion of all outpatient surgery delivered in ASCs increased significantly from 28.5% in 2001 to 37.4% in 2010 ($p < 0.001$)**. Concurrent with this redistribution, the number of ASC operating rooms in the U.S. grew by 59.5%, or from 7,036 to 11,223 ($p < 0.001$ for trend). As shown in Figure 2, adjusted rates of outpatient surgery were between 9.9% and 11.3% higher in HSAs where ASCs were present compared to those without ASCs for every year during the study period ($p <0.001$ for all cross-sectional comparisons). For instance, in 2001, outpatient surgery rates were 3,020.5 per 10,000 in HSAs with ASCs and 2,714.8 per 10,000 in those without, a difference of 11.3% ($p < 0.001$).

Aggregate characteristics of beneficiaries in 2010 and contextual market factors are shown in Table 1 according to HSA grouping. While statistically significant differences across markets were evident for beneficiary characteristics, these were relatively small. In contrast, we observed larger differences in market-level contextual characteristics. Specifically, markets without ASCs throughout the study period were more rural and its population had lower levels of education. The markets also were more likely to be regulated certificate of need legislation.

During the study period, at least one ASC opened for the first time in 254 HSAs, or 9.0%, previously without one. Adjusted rates of outpatient surgery were plotted over time beginning with 2 years prior to baseline (i.e., the year before an ASC opened in an HSA

previously without one) to 4 years following baseline (Figure 3). We observed no difference in the change in rates of outpatient surgery across all three market types for the period prior to baseline ($p = 0.79$ for test between slopes). However, during the 4-year period following baseline, changes in outpatient surgery rates varied significantly between the markets ($p < 0.001$ for test between slopes). Specifically, rates of outpatient surgery in HSAs that added an ASC for the first time increased by 10.9%, or from 3,338.3 to 3,701.1 per 10,000 ($p < 0.001$ for change over time relative to HSAs always with and without ASCs). In contrast, rates of surgery grew by 2.4% (from 3,748.4 to 3,839.2 per 10,000) and 0.6% (from 3,391.2 to 3,410.6 per 10,000) in HSAs where an ASC was always and never present, respectively.

Trends in adjusted rates of ophthalmologic, gastrointestinal and musculoskeletal procedures are shown in Figure 4. In all cases, the change in rates of outpatient surgery for the 4-year period after baseline was greatest in HSAs that added an ASC for the first time ($p < 0.001$ for all comparisons to HSAs always with and without ASCs). In HSAs where ASCs opened for the first time, adjusted rates of outpatient gastrointestinal procedures had the largest relative increase of 21.3%, or from 685.5 procedures per 10,000 at baseline to 870.9 procedures per 10,000 4 years later. **Output for the propensity-score adjusted models, both overall and specialty specific, is available in** Appendix 1(Supplemental Digital Content 1, http://links.lww.com/MLR/A799).

Because ASC supply within a market is not static, we also examined the impact of adding capacity (i.e., additional ASC operating rooms) over time in HSAs where these facilities were always present. Generally, rates of outpatient surgery grew over time within quartiles of change in ASC capacity. For instance, in HSAs experiencing the greatest growth in capacity (i.e., 6 or more ASC operating rooms), rates grew from 3,692.5 to 3,830.8 procedures per 10,000 ($p = 0.01$ for test for trend). However, this growth occurred independently of the change in ASC capacity. For example, over the same period, rates of surgery increased from 3,663.3 to 3,774.4 per 10,000 in HSAs that experienced a decrease in the number of ASC operating rooms ($p = 0.54$ for test between the two slopes).

Discussion

Over the last decade, the rate of outpatient surgery among Medicare Beneficiaries increased by 40%. Concurrent with this trend, the capacity for delivering these procedures grew by nearly 60% with the addition of 4,187 new operating rooms in freestanding ASCs. Rates of outpatient surgery in HSAs with ASCs were approximately 10% higher relative to those without them in every year of the study. Further, when an ASC was added to a market previously without one, rates of outpatient surgery quickly caught up to those in markets where an ASC was always present. Specifically, at four years after opening, rates grew by approximately 11% in markets where an ASC was added for the first time. Similar trends were evident in procedure groups representing specialties that commonly use ASCs.

Since the 1990's, the volume of outpatient procedures in the U.S. has nearly tripled.[1] This growth has significantly outpaced that observed for other benchmarks, such as major procedures or physician office visits.[16] Increasingly, outpatient surgery is performed in an ASC.[1,16] Compared to hospitals, ASCs have several advantages, most of which are derived

from their efficiency.[4,17] **Previous work has demonstrated that these facilities lead to modest decreases in hospital utilization**[18-20] without negatively impacting outcomes.[21-23] Perhaps most importantly, ASCs perform the same procedure at a lower cost per episode, largely due to lower facility reimbursement.[3] Thus, from the perspective of the delivery system, these facilities have the potential to lower the overall costs of surgical care in the U.S.

Despite the potential benefits of ASCs to the delivery system, concerns surrounding physician ownership and the possibility of induced-demand remain. Permitted via safe harbors to the Anti-kickback Statute,[24,25] physicians have a financial stake in 91% of all freestanding ASCs.[5] In this arrangement, physicians share in the facility's profits and are thus incentivized to ensure its profitability by maximizing throughput. Prior state-level studies demonstrating considerably higher rates of utilization among physician-owners[6-9] have amplified these concerns. **For example, rates of gastrointestinal endoscopy grew by up to 117% in Florida markets four years after ASC opening compared with those without such facilities**.[10]

However, the findings from our national study demonstrate a much more modest impact of ASC opening on outpatient surgery use. The 11% difference in growth in markets where an ASC opened for the first time relative to those without ASCs is considerably lower than suggested by prior state-level studies, most of which were limited in procedure scope and to Florida. Although less dramatic than anticipated, the underlying cause for the observed growth in outpatient surgery in markets where ASCs open for the first time cannot be fully deduced from our study. One plausible explanation is that these new facilities are responding to unmet clinical need, either due to inadequate capacity for outpatient surgery or growing patient demand. Alternatively, due to the financial incentives associated with physician ownership of ASCs, it is possible that the incremental growth in markets where ASCs are added for the first time is due to induced demand, albeit to a lesser extent than prior work had suggested.

Our findings should be interpreted in the context of three limitations. First, our study does not specifically address the appropriateness of outpatient surgery, which carries its own incentives in the fee-for-service delivery system. We observed a 40% increase in the rate outpatient surgery between 2001 and 2010. Given this growth, it is possible, and even likely, that some is due to the use of low value or unnecessary procedures. Second, we do not directly assess the effects of physician ownership in this study. However, nearly all freestanding ASCs are owned, at least in part, by the physicians who staff them.[5] Thus, the potential for perverse financial incentives exists for nearly all of these facilities. Third, ASCs likely enter a market where there is anticipation for volume growth. While using multiple propensity score methods and differencing out secular trends attempt to mitigate this concern, such selection effects are still possible.

These limitations notwithstanding, our findings have important implications with respect to outpatient surgery. The rapid proliferation of ASCs in the last decade was associated with significant growth in outpatient surgery rates, particularly in markets that added a facility where one was previously absent. However, this growth was much more modest than that

appreciated in prior state-level studies that were limited in clinical scope. **Moving forward, efforts to improve the efficiency of the delivery system for outpatient surgery should seek to align incentives for all stakeholders (i.e., physicians, payers, patients). Importantly, delivery system reforms, such as those embedded in accountable care organizations and payment bundling, have the potential to mitigate perverse incentives for surgeons, regardless of whether the motivations are due to facility ownership or simply volume based**.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding: This work was funded by the Agency for Healthcare Research and Quality (R01 HS18726) to Dr. Hollenbeck.

References

1. Cullen, KA.; Hall, MJ.; Golosinskiy, A. National Center for Health Statistics; 2009. Ambulatory surgery in the United States, 2006. Available at: http://www.cdc.gov/nchs/data/nhsr/nhsr011.pdf [Accessed November 13, 2013]
2. MedPAC. Medicare Payment Policy 2013. [Accessed November 7, 2013] Report to the Congress. Available at: http://www.medpac.gov/documents/Mar13_EntireReport.pdf
3. Centers for Medicare and Medicaid Services. [Accessed October 13, 2013] Calendar year 2008 revised ambulatory surgical center payment system. Available at: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ASCPayment/downloads/ASC_QAs_03072008.pdf
4. Shactman D. Specialty hospitals, ambulatory surgery centers, and general hospitals: charting a wise public policy course. Health Aff. 2005; 24(3):868–73.
5. Ambulatory Surgery Center Association. [Acessed June 23, 2014] Ambulatory surgery centers: A positive trend in health care, 2009. Available at: http://www.ascassociation.org/ASCA/Resources/ViewDocument/?DocumentKey=7d8441a1-82dd-47b9-b626-8563dc31930c
6. Hollingsworth JM, Ye Z, Strope SA, et al. Physician-ownership of ambulatory surgery centers linked to higher volume of surgeries. Health Aff. 2010; 29(4):683–689.
7. Strope SA, Daignault S, Hollingsworth JM, et al. Physician ownership of ambulatory surgery centers and practice patterns for urological surgery: evidence from the state of Florida. Med Care. 2009; 47(4):403–410. [PubMed: 19330889]
8. Hollingsworth JM, Ye Z, Strope SA, et al. Urologist ownership of ambulatory surgery centers and urinary stone surgery use. Health Serv Res. 2009; 44(4):1370–1384. [PubMed: 19490161]
9. Mitchell JM. Effect of physician ownership of specialty hospitals and ambulatory surgery centers on frequency of use of outpatient orthopedic surgery. Arch Surg. 2010; 145(8):732–738. [PubMed: 20713924]
10. Hollingsworth JM, Krein SL, Ye Z, et al. Opening of ambulatory surgery centers and procedure use in elderly patients: data from Florida. Arch Surg. 2011; 146(2):187–193. [PubMed: 21339431]
11. Wennberg, JE. The Dartmouth Atlas of Health Care in the United States. Chicago, IL: AHA Press; 1999.
12. Klabunde CN, Potosky AL, Legler JM, et al. Development of a comorbidity index using physician claims data. J Clin Epidemiol. 2000; 53(12):1258–67. [PubMed: 11146273]
13. U.S. Department of Health and Human Services. [Accessed March 21, 2013] Area Resource File. Available at: http://arf.hrsa.gov
14. American Health Planning Association. [Accessed November 13, 2013] National Directory. Available at: http://www.ahpanet.org/national_directory.html

15. Spreeuwenberg MD, Bartak A, Croon MA, et al. The multiple propensity score as control for bias in the comparison of more than two treatment arms: an introduction from a case study in mental health. Med Care. 2010; 48(2):166–174. [PubMed: 20068488]
16. MedPAC. [Accessed November 8, 2013] A Data Book Healthcare Spending and the Medicare Program 2013. Available at: http://www.medpac.gov/documents/Jun13DataBookEntireReport.pdf
17. Casalino LP, Devers KJ, Brewster LR. Focused factories? Physician-owned specialty facilities. Health Aff. 2003; 22(6):56–67.
18. Bian J, Morrisey MA. Free-standing ambulatory surgery centers and hospital surgery volume. Inquiry. 2007; 44(2):200–10. [PubMed: 17850045]
19. Lynk WJ, Longley CS. The effect of physician-owned surgicenters on hospital outpatient surgery. Health Aff. 2002; 21(4):215–21.
20. Courtemanche C, Plotzke M. Does competition from ambulatory surgical centers affect hospital surgical output? J Health Econ. 2010; 29(5):765–773. [PubMed: 20692060]
21. Chukmaitov AS, Menachemi N, Brown LS, Saunders C, Brooks RG. A comparative study of quality outcomes in freestanding ambulatory surgery centers and hospital-based outpatient departments: 1997-2004. Health Serv Res. 2008; 43(5 Pt 1):1485–1504. [PubMed: 22568615]
22. Grisel J, Arjmand E. Comparing quality at an ambulatory surgery center and a hospital-based facility: preliminary findings. Otolaryngol Head Neck Surg. 2009; 141(6):701–709. [PubMed: 19932841]
23. Hollingsworth JM, Saigal CS, Lai JC, et al. Surgical quality among Medicare beneficiaries undergoing outpatient urological surgery. J Urol. 2012; 188(4):1274–1278. [PubMed: 22902012]
24. U.S. Department of Health and Human Services. [Accessed July 1, 2004] Office of Inspector General. Clarification of the initial OIG safe harbor provisions and establishment of additional safe harbor provisions under the Anti-kickback Statute, 1999. Available at: http://oig.hhs.gov/fraud/docs/safeharborregulations/getdoc1.pdf
25. Becker S, Biala M. Ambulatory surgery centers--current business and legal issues. J Health Care Finance. 2000; 27(2):1–7.

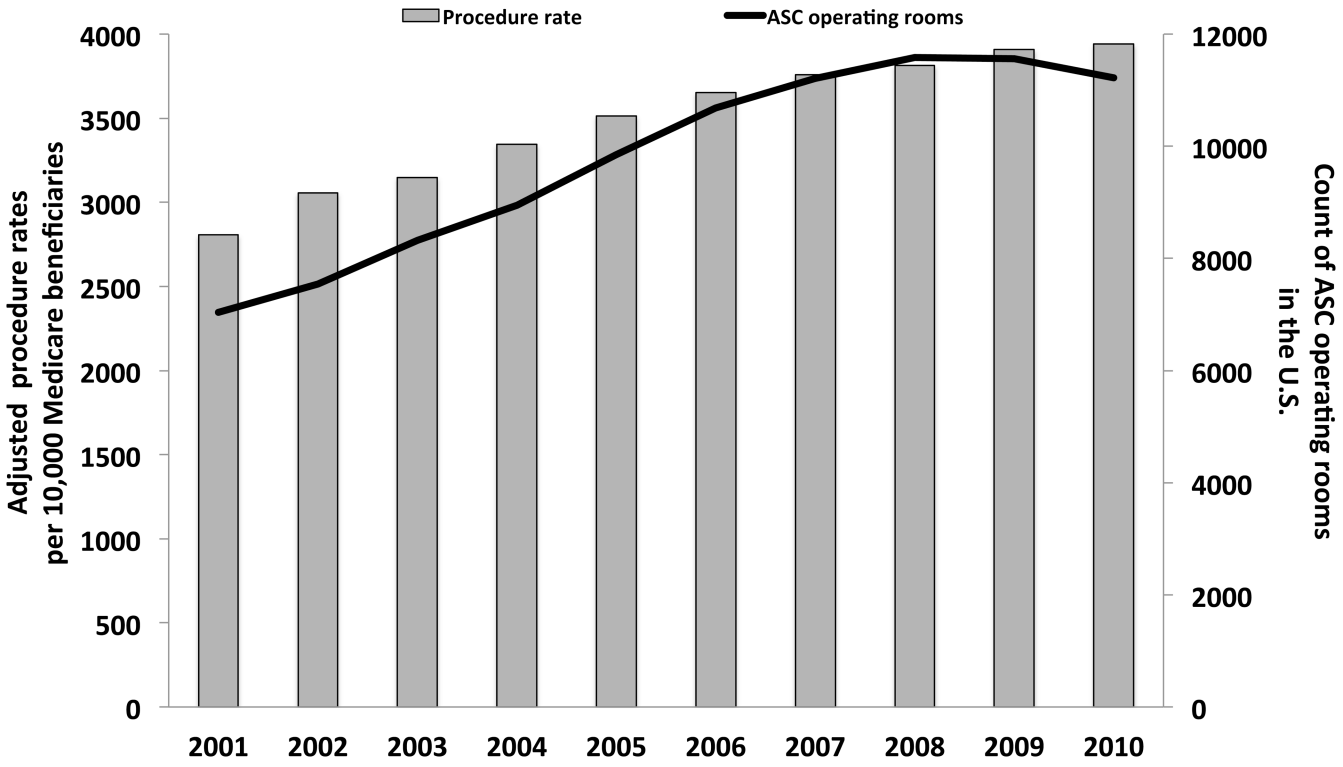


Figure 1. Trends in adjusted rates of outpatient surgery and number of ASC operating rooms in the U.S.

Adjusted rates of outpatient surgery and number of ASC operating rooms were assessed over time. ($p < 0.001$ for trend over time for both).

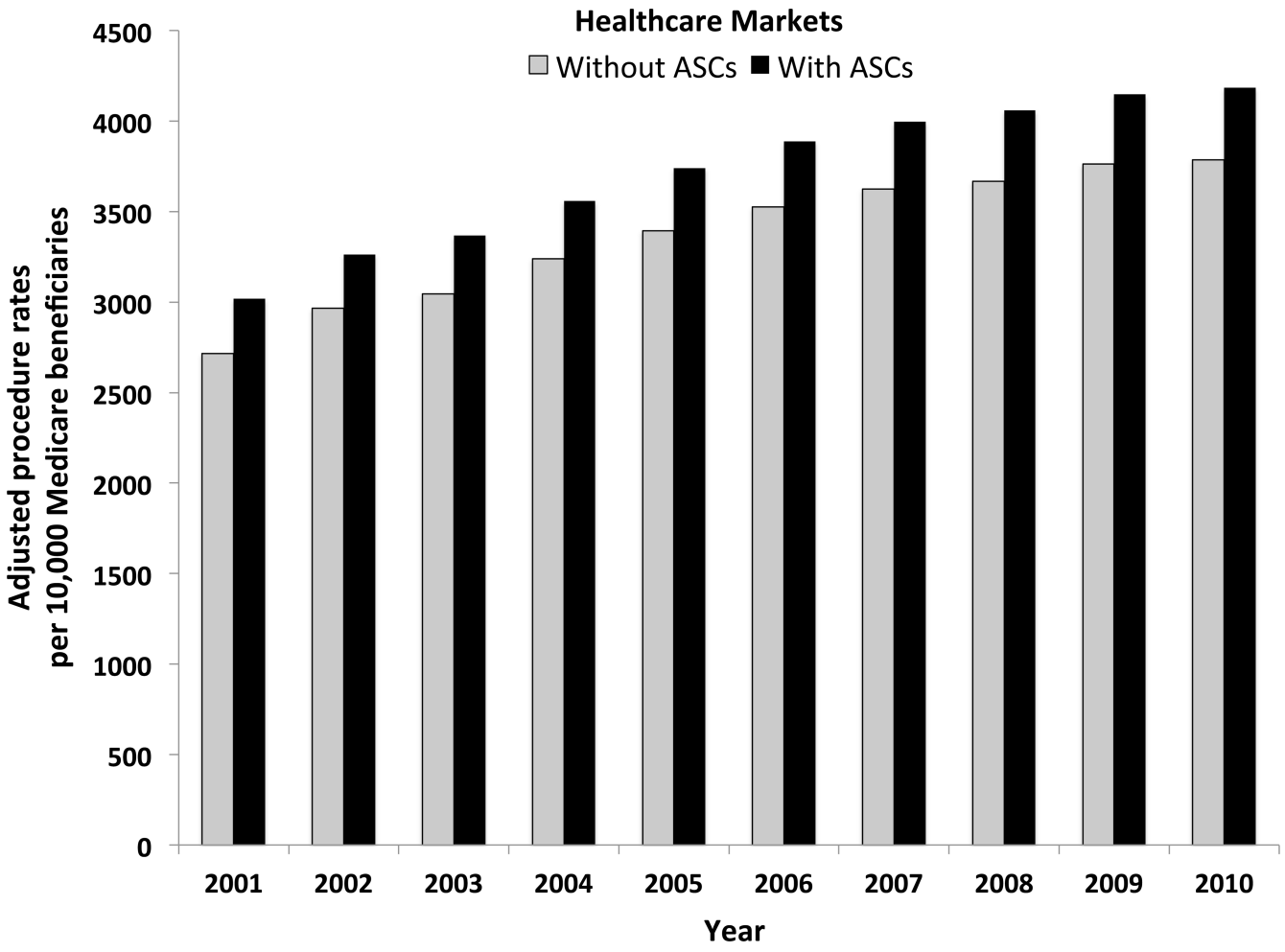


Figure 2. Annual adjusted rates of outpatient surgery in markets with and without ASCs

Adjusted rates of outpatient surgery in HSAs with and without ASCs were contrasted for each year ($p < 0.001$ for every year).

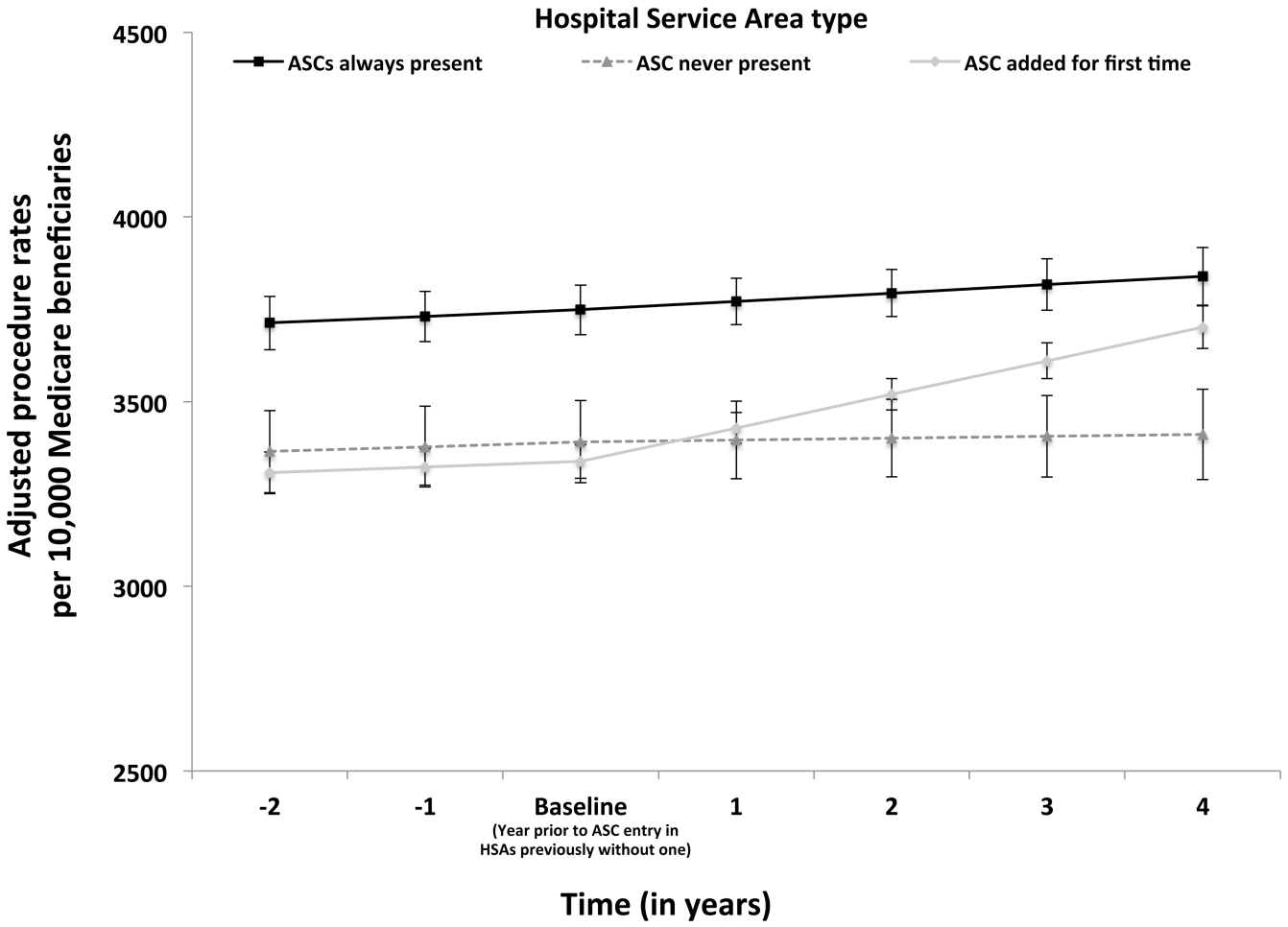
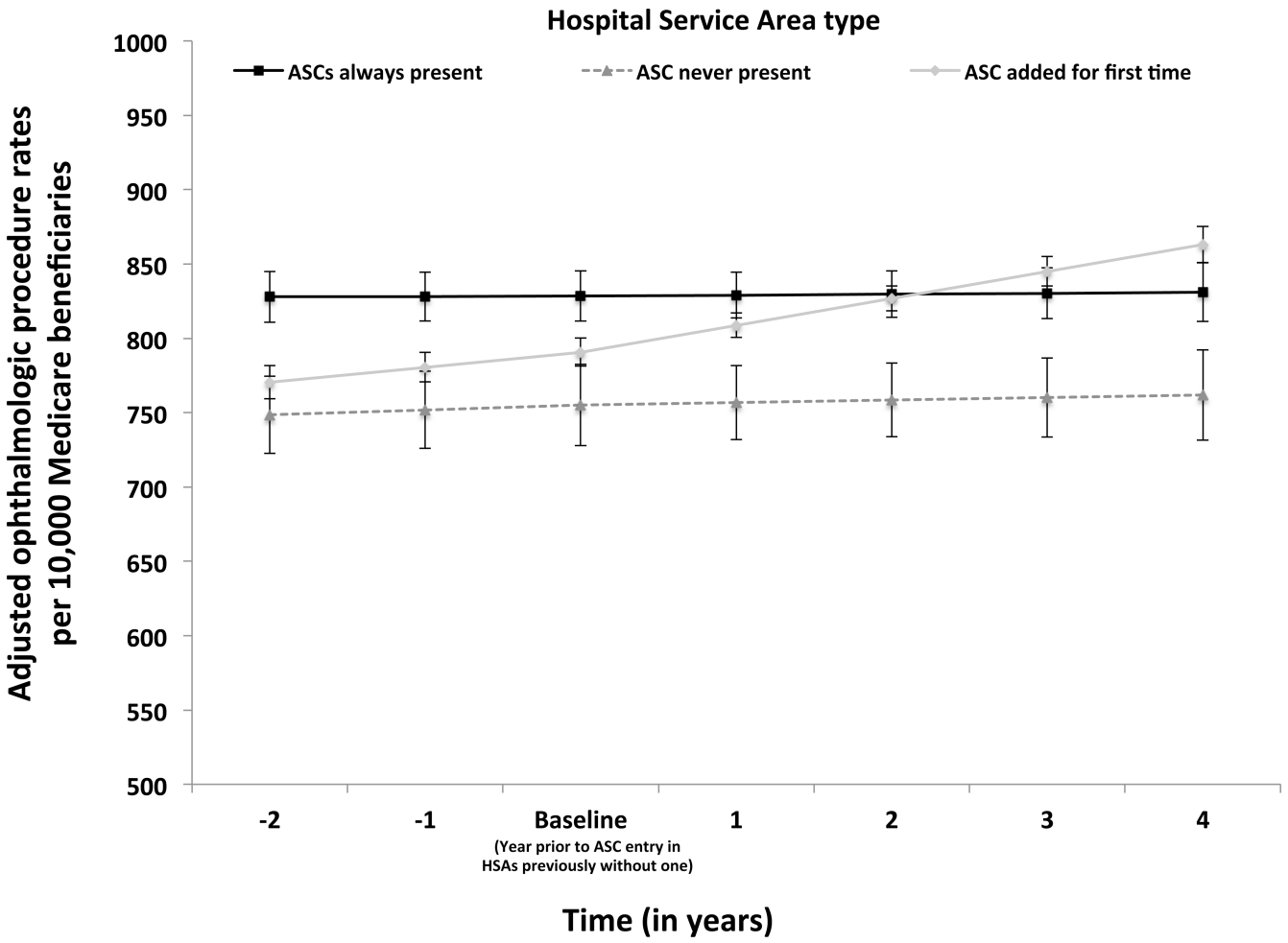
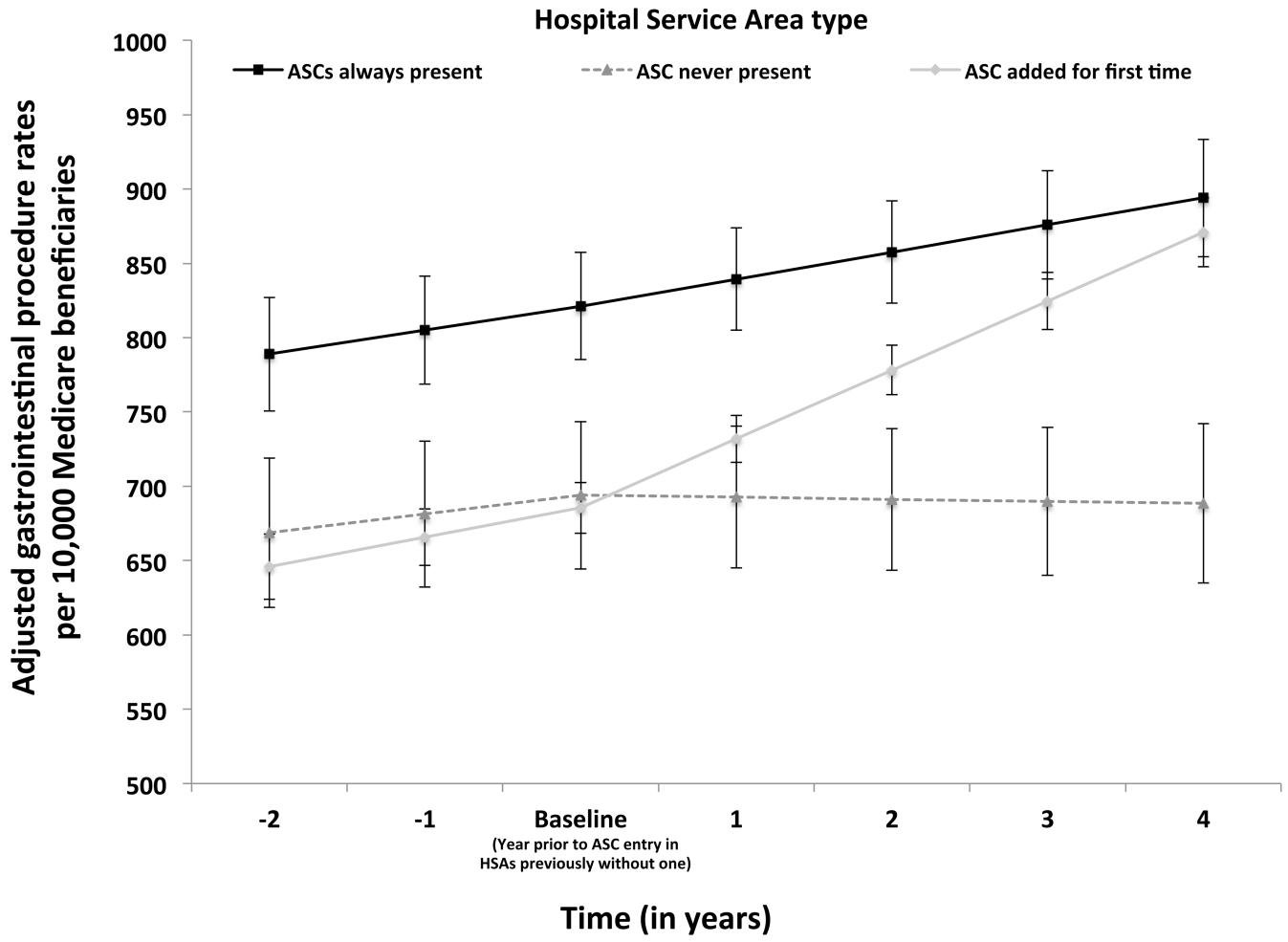


Figure 3. Adjusted rates of outpatient surgery in HSAs where ASCs were always present, never present, and in those where an ASC opened for the first time

In the period prior to baseline, the rate of change in outpatient surgery across the three HSA groups was similar ($p = 0.79$). However, for the 4-year period following baseline, rates of outpatient surgery grew more rapidly in HSAs where an ASC was added for the first time ($p < 0.001$ for change over time relative to HSAs always with and without ASCs).





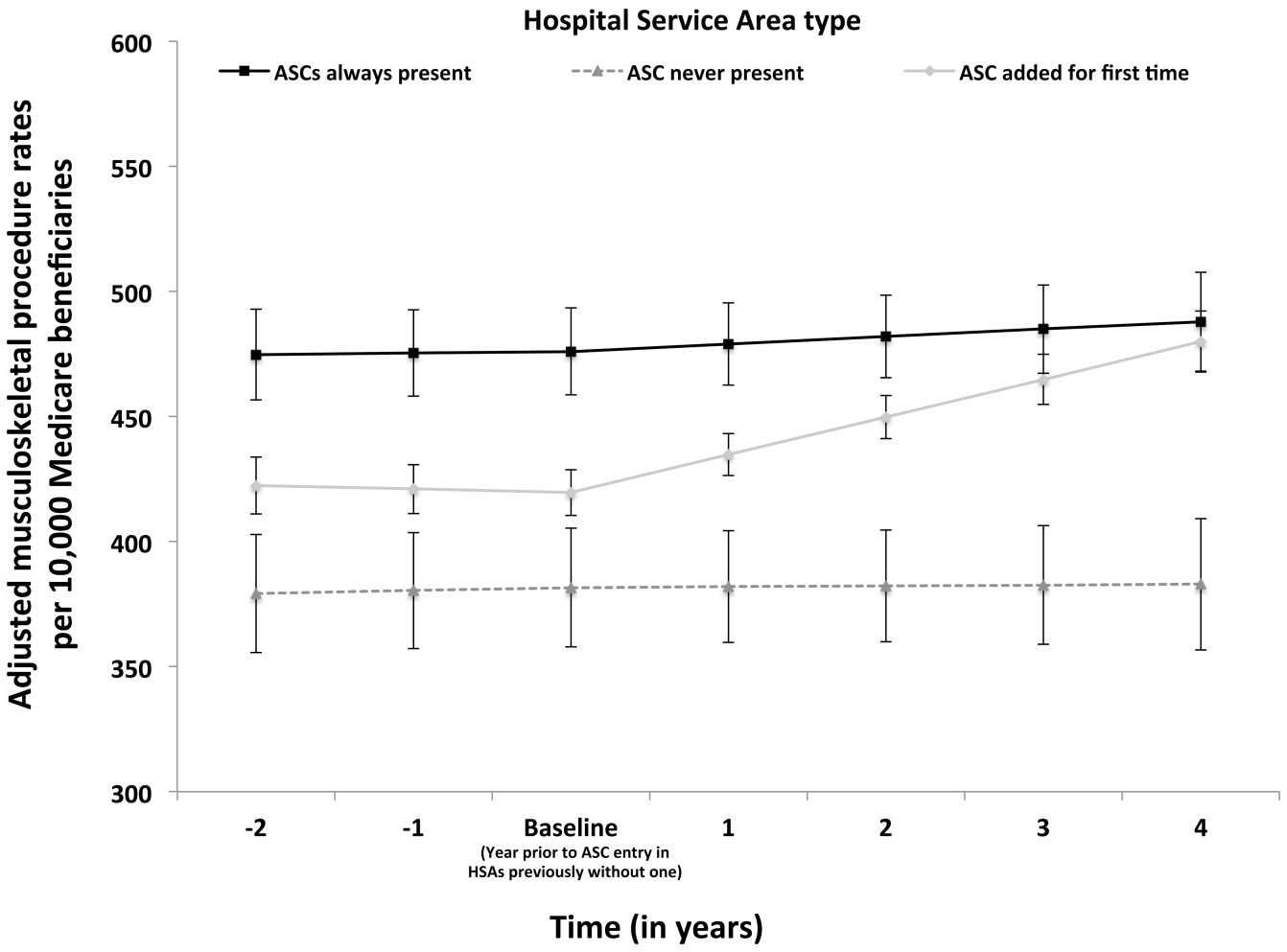


Figure 4. Adjusted rates of ophthalmologic (a), gastrointestinal (b) and musculoskeletal (c) outpatient surgery according to HSA grouping

In the period after baseline, adjusted rates of outpatient surgery experienced faster growth in HSAs where an ASC opened for the first time compared to HSAs in which an ASC was never present ($p < 0.001$ for all three specialty groups).

Table 1

Characteristics of the population undergoing outpatient surgery based on 2010 national Medicare data

	Hospital Service Area type			p-value
	ASC always present	ASC never present	ASC added for first time	
No. HSAs	837	1,743	254	-
No. patients in 2010	17,793,686	6,046,839	2,307,837	-
Age, mean	70.6	70.2	70.5	<0.001
Gender, % female	55.0	53.9	54.9	<0.001
Race, % non-white	14.8	10.1	11.4	<0.001
Charlson score 2 or more, %	25.8	23.6	25.0	<0.001
Living below poverty, %	14.0	16.1	13.7	<0.001
College education or more among those 25 years and older, %	23.5	16.4	23.0	<0.001
Urban, %	79.6	32.0	66.1	<0.001
Log of hospital discharges per 10,000 population, %	8.8	8.4	8.8	<0.001
Log of surgeons per 10,000 population, %	4.4	3.1	4.4	<0.001
Certificate of need, %	64.8	72.7	62.3	<0.001