Supplementary Online Content

Gray B, Vandergrift J, Johnston M, Reschovsky J, Lynn M, Holmboe E, et al. Association between imposition of a maintenance of certification requirement and ambulatory care sensitive hospitalizations and health care costs. *JAMA*. doi:10.1001/jama.2014.12716.

This supplementary material has been provided by the authors to give readers additional information about their work.

eMethods 1. Methods for creation of the Physician-Patient Sample

The beneficiary sample was created using a finder file of unique physician identification numbers (UPINs) and drew all beneficiaries with any billing contact with the physicians in the finder file during the year 2001. We then obtained claims files for this group of beneficiaries going forward to 2005 and backwards to 1999.

Physicians in the finder file were American Board of Internal Medicine (ABIM) certified general internal medicine physicians (ABIM generalists) who initially board certified in 1989 or 1991 and who did not further specialize (n=4,419). Those who initially certified in 1989 are referred to as MOC-grandfathered generalists, while those who initially certified in 1991 are referred to as MOC-required generalists. Physician UPINs were obtained from the AMA Masterfile, after being matched with ABIM administrative data. Because we had no information about practice type before attempting to match with Medicare claims files, we could not eliminate from the sample generalists who were not in an active practice or were unlikely to treat Medicare beneficiaries. Because of this, it was expected that some physicians who were in the initial sample would have no Medicare billing contacts and that some in our initial sample of generalists were likely in positions where they did not provide ongoing patient management (e.g., hospitalists). While reasons for having no Medicare bills are unknown, it is likely that most of these physicians did not treat Medicare patients or were clinically inactive. Given these factors, it was our expectation that some physicians and beneficiaries would be excluded in the final attributed sample.

Because we relied on the AMA data for obtaining UPIN linkages with Medicare claims data, 536 generalists were excluded from the sample because we either could not find a match in the AMA database or because of missing UPINs in the AMA database. Another 642 generalists were excluded because they did not generate any Medicare bills in 2001. Similar data reductions have been observed in prior studies.[1]

The remaining 3,241 ABIM generalists had a billing contact with 1,084,481 Medicare beneficiaries. For 328 physicians and 432,226 beneficiaries, these billing contacts do not include any office visits between the beneficiary and the ABIM generalist. Examining the billing contacts for these beneficiaries reveals that 57% (n=247,859) had an inpatient hospital visit and/or emergency department visit with an ABIM generalist. We suspect that most of the physicians excluded at this step were working primarily in hospitals and that these physicians generated a large number of patient contacts during the "finder" year (2001). Since our attribution criteria focused on visits in ambulatory settings, these generalists and the beneficiaries with whom they had billing contacts were likely excluded from our analysis. After these exclusions, our sample numbered 652,255 beneficiaries who had a visit with 2,913 ABIM generalists in an ambulatory setting in 2001.

We then excluded beneficiaries covered by Medicare Advantage at any time between 1999 and 2005, were <65 years old at the start of the study in 1999, or resided outside the United States during our study period (1999-2005). These exclusions were designed to eliminate beneficiaries for whom Medicare claims did not completely capture healthcare utilization during the study period. After these additional exclusions, 543,801 eligible beneficiaries had an office visit with 2,699 ABIM generalists from our MOC-required or MOC-grandfathered cohorts and at least one office visit with 238,525 other potential responsible providers between 1999 and 2005. These beneficiaries and providers were then entered into the attribution algorithm described in the next section to identify the beneficiaries for whom we should assign responsibility to a physician in the MOC-required or MOC-grandfathered physician cohorts.

eMethods 2. Description of Contact Specialty Type and Visit Type Criteria for Attribution

There is no single method used to identify a beneficiary's responsible provider (i.e., the provider most responsible for a beneficiary's ongoing care) using Medicare claims data. When applying algorithms to attribute a patient to a provider we considered three factors. First, we defined which physician specialties could plausibly provide primary care services and so act as the responsible provider (including both generalists and subspecialists).[2,3] Second, we identified the settings where primary care services are plausibly delivered (i.e., not in inpatient settings). Third, we defined a contact count (evaluation and management (E&M) patient visits). Applying these E&M visits as a basis for contacts, a patient was attributed to a provider (MOC-required physician, MOC-grandfathered physician, or another physician not include in these two cohorts) if that provider had a plurality of applicable contacts for a specified time period.

Specialty type. We used a two-step approach to determine which physician specialties could plausibly act as the beneficiary's responsible provider. First, we identified four primary care services we would expect a responsible provider to perform. Namely, that they (a) provide primary preventative care services, (b) diagnose and treat acute conditions (e.g., flu), (c) diagnose and treat chronic conditions (e.g., management of diabetes), and (d) coordinate patient care across multiple providers. Second, we conducted a survey among three ABIM staff physicians to identify physician specialties that were most likely to provide these services. Specifically, we provided those physicians with a list of 55 specialties and asked each to indicate whether a specialty should or should not be included in our responsible provider definition based on the service criteria. Specialties were included in our responsible provider definition if at least two of the three physician experts indicated they should be included. 23 specialties were included and were identified using HCFA provider specialty codes: 1 (General Practice), 3 (Allergy/Immunology), 6 (Cardiology), 8 (Family Practice), 10 (Gastroenterology), 11 (Internal Medicine), 12 (Osteopathic Manipulative Therapy), 16 (OB-Gynecology), 29 (Pulmonary Disease), 37 (Pediatric Medicine), 38 (Geriatric Medicine), 39 (Nephrology), 44 (Infectious Disease), 46 (Endocrinology), 50 (Nurse Practitioner), 66 (Rheumatology), 79 (Addiction Medicine), 83 (Hematology/Oncology), 84 (Preventative Medicine), 89 (Certified Clinical Nurse Specialist), 90 (Medical Oncology), 93 (Emergency Medicine), and 97 (Physician Assistant).

We also conducted an attribution sensitivity in which we restricted this definition to physician specialties that are oriented towards providing all four primary care services. These specialties include HCFA provider specialty codes: 1 (General Practice), 8 (Family Practice), 11 (Internal Medicine), 12 (Osteopathic Manipulative Therapy), 37 (Pediatric Medicine), 38 (Geriatric Medicine), and 84 (Preventative Medicine).

Contact count/Care setting. We applied Berenson-Eggers types of service (BETOS) codes to measure contact counts and care setting. For contact count, we applied BETOS codes that indicated evaluation and management (E&M) visits. For care setting, we added the criteria that the visit occurred in an ambulatory care setting. The BETOS codes that fit these criteria were M1A (office visits, established patients), M1B (office visits, new patient), M4A (home visits), M4B (nursing homes), and M6 (consultations).

eMethods 3. Ambulatory care sensitive hospitalizations

In our study we apply ambulatory care sensitive hospitalizations (ACSHs) as our measure of quality. The basis for these measures is the Agency for Healthcare Research and Quality's (AHRQ) prevention quality indicators (PQI). PQIs are a set of measures drawn from hospital inpatient discharge data to identify quality of care for "ambulatory care sensitive conditions".[4] These are conditions for which good outpatient care can potentially prevent the need for hospitalization or early intervention can prevent complications or more severe disease. For example, patients with diabetes may be hospitalized for diabetic complications if their condition is not adequately monitored or if they do not receive the patient education needed for appropriate self-management.

eTable 1. Conditions that comprise ambulatory care sensitive hospitalizations

Ambulatory care sensitive hospitalizations [a]	
Chronic	
	Diabetes Short-Term Complications Admission Rate
	Diabetes Long-Term Complications Admission Rate
	Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate
	Hypertension Admission Rate
	Heart Failure Admission Rate
	Angina Without Procedure Admission Rate
	Uncontrolled Diabetes Admission Rate
	Asthma in Younger Adults Admission Rate
	Lower-Extremity Amputation among Patients with Diabetes Rate
Acute	
	Dehydration Admission Rate
	Bacterial Pneumonia Admission Rate
	Urinary Tract Infection Admission Rate

[a] Ambulatory Care Sensitive Condition Hospitalizations are based on prevention quality indicators drawn from the Agency for Healthcare Research and Quality website.

eMethods 4. Median values and incidence for each dependent measure the pre-MOC (from 1999 to 2000) and post-MOC (from 2002 to 2005) periods

eTable 2 displays the medians value and interquartile range for each dependent measure in the pre-MOC period (from 1999 to 2000) and in the post-MOC period (from 2002 to 2005) for beneficiaries attributed to either a MOC-required or MOC-grandfathered physician. Notably, for all the incidence measures and two of the cost measures (inpatient and major procedures) the median values are zero. This is because we observed that fewer than half of all beneficiaries experienced an incident or had either inpatient or major procedure in either the pre-MOC or post-MOC period.

eTable 3 displays the frequency with which we observed an incidence or non-zero cost across our beneficiary panel. One important note to these data is that they are compiled at the beneficiary-year level to account for the fact that we are repeatedly observed beneficiaries across years in the study period. For example, we included 84,215 beneficiaries in the MOC-required cohort. Given the we observe these beneficiaries two times in the pre-MOC period (once in 1999 and once in 2000), this produces 168,430 beneficiary-year observations over which we can observe an incident or non-zero cost.

eTable 2. Median values for dependent measures in the Pre MOC (1999-2000) and post-MOC (2002-2005) periods for the MOC-required and MOC-grandfathered beneficiary cohorts

	Pre MOC-period (1999 to 2000)		Post MOC-period 2002 to 2005)	
	MOC-required (n=84,215)	MOC-grandfathered (n=69,830)	MOC-required (n=84,215)	MOC-grandfathered (n=69,830)
Annual incidence of an ambulatory care sensitive Hospitalization by condition type (per 1,000 beneficiaries), median (IQR)				
Any ambulatory sensitive hospitalization	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
Acute ambulatory sensitive hospitalization	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
Chronic ambulatory sensitive hospitalization	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
Other incidence measures (per 1,000 beneficiaries) , median (IQR)				
Annual incidence of a hospitalization	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
Annual incidence of an emergency department visit	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 1,000.0)	0.0 (0.0 to 1,000.0)
Annual cost per beneficiary by care setting ($2013) , median (IQR)				
Total costs	1,729.5 (745.3 to 4,828.8)	1,745.6 (751.4 to 4,870.5)	2,691.1 (1,098.1 to 7,925.2)	2,771.1 (1,122.7 to 8,083.3)
Ambulatory costs	1,666.0 (741.7 to 3,655.1)	1,676.4 (748.9 to 3,715.7)	2,444.3 (1,083.2 to 5,089.2)	2,503.2 (1,107.3 to 5,202.1)
Inpatient costs	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)
Annual costs per beneficiary by BETOS category ($2013) , median (IQR)				
Major procedures	0.0 (0.0 to 0.0)	0.0 (0.0 to 0.0)	0.0 (0.0 to 157.1)	0.0 (0.0 to 167.3)
Minor/Ambulatory procedures and endoscopy	85.9 (0.0 to 383.9)	89.7 (0.0 to 400.7)	140.8 (0.0 to 513.8)	148.4 (0.0 to 539.7)
Imaging	108.8 (15.3 to 315.5)	109.7 (15.1 to 323.7)	166.6 (38.3 to 501.4)	173.8 (39.0 to 539.8)
Laboratory tests	88.8 (12.1 to 194.3)	96.4 (19.1 to 204.6)	112.0 (20.9 to 240.3)	122.2 (34.2 to 258.2)
Testing (laboratory and imaging)	239.0 (92.7 to 524.4)	248.3 (99.8 to 547.7)	325.1 (130.0 to 760.2)	345.4 (141.2 to 817.4)
Specialty visits	243.6 (89.6 to 504.1)	252.2 (95.3 to 514.4)	339.5 (131.0 to 677.2)	354.7 (142.2 to 701.5)
Non-specialty visits	250.6 (141.8 to 403.1)	245.0 (137.9 to 393.5)	287.0 (159.7 to 462.7)	280.5 (156.7 to 454.0)

eTable 3. Number of beneficiary-year observations were we observed any event or cost greater than zero in the pre-MOC (1999-2000) and post-MOC (2002-2005) periods for the MOC-required and MOC-grandfathered beneficiary cohorts

	Pre MOC-period (1999 to 2000)		Post MOC-period 2002 to 2005)	
	MOC-Required beneficiary-year observations[a] (n=168,430)	MOC-Grandfathered beneficiary-year observations[a] (n=139,660)	MOC-Required beneficiary-year observations[a] (n=314,761)	MOC-Grandfathered beneficiary-year observations[a] (n=259,903)
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries), No. (%)				
Any ambulatory sensitive hospitalization	6,381 (3.8)	5,170 (3.7)	19,459 (6.2)	16,043 (6.1)
Acute ambulatory sensitive hospitalization	3,045 (1.8)	2,499 (1.8)	10,342 (3.3)	8,535 (3.3)
Chronic ambulatory sensitive hospitalization	3,671 (2.2)	2,938 (2.1)	10,617 (3.4)	8,743 (3.3)
Other incidence measures (per 1,000 beneficiaries) , No. (%)				
Annual incidence of a hospitalization	29,417 (17.5)	24,468 (17.5)	73,830 (23.5)	61,767 (23.6)
Annual incidence of an emergency department visit	40,314 (23.9)	32,718 (23.4)	97,914 (31.1)	80,972 (31.0)
Annual cost per beneficiary by care setting ($2013), No. (%)				
Total costs	166,685 (99.0)	138,308 (99.0)	313,097 (99.5)	259,903 (99.5)
Ambulatory costs	166,664 (99.0)	138,293 (99.0)	313,089 (99.5)	259,896 (99.5)
Inpatient costs	29,417 (17.5)	24,468 (17.5)	73,830 (23.5)	61,767 (23.6)
Annual costs per beneficiary by BETOS category ($2013), No. (%)				
Major procedures	39,730 (23.6)	33,654 (24.1)	89,425 (28.4)	76,218 (29.2)
Minor/Ambulatory procedures and endoscopy	98,727 (58.6)	82,601 (59.1)	205,635 (65.3)	172,147 (65.9)
Imaging	129,354 (76.8)	106,703 (76.4)	253,622 (80.6)	210,827 (80.7)
Laboratory tests	137,754 (81.8)	116,478 (83.4)	259,643 (82.5)	221,585 (84.8)
Testing (laboratory and imaging)	156,222 (92.8)	129,946 (93.0)	296,616 (94.2)	247,951 (94.9)
Specialty visits	141,942 (84.3)	118,771 (85.0)	275,543 (87.5)	229,969 (88.0)
Non-specialty visits	156,240 (92.8)	129,158 (92.5)	290,858 (92.4)	240,571 (92.1)

[a]beneficiary-year observations include repeated observations of the same beneficiary in multiple years in either the pre-MOC or post-MOC period

eMethods 5. Demographic characteristics of the MOC-required and MOC-grandfathered physician cohorts

In this section, we include demographic characteristics for the physicians to which beneficiaries were attributed in the MOC-required and MOC-grandfathered beneficiary cohorts.

eTable 4. Demographic characteristics of the MOC-required and MOC-grandfathered physicians in the attributed beneficiary cohorts

	MOC-Required Physicians (n=956)	MOC-Grandfathered Physicians (n=974)
Female physicians, No. (%)	318 (33.3)	253 (26.0)
International medical school graduate physicians, No. (%)	211 (22.1)	188 (19.3)
Physicians age in 2001, mean (SD)	42.8 (4.4)	44.3 (3.9)
Initial internal medicine exam failure, No. (%)	218 (22.8)	241 (24.7)
Initial internal medicine exam score, mean (SD)	476.8 (91.4)	485.5 (88.7)
MOC Completion, No. (%)	822 (86.0)	6 (0.6)
Study year, No. (%)		
1999	956 (100.0)	974 (100.0)
2000	956 (100.0)	974 (100.0)
2001 (MOC year)	956 (100.0)	974 (100.0)
2002	956 (100.0)	974 (100.0)
2003	954 (99.8)	971 (99.7)
2004	952 (99.6)	970 (99.6)
2005	950 (99.4)	963 (98.9)

eMethods 6. Beneficiary Attribution Methods and Sensitivities

Because we are trying to identify changes in practice due to MOC, our attribution methodology was designed to identify beneficiaries who had an ongoing relationship with an ABIM generalist *before* and *after* the 2001 MOC period. Within the attribution algorithm, we assume that the physician with whom a particular beneficiary has a plurality of office visits is the responsible provider in any given year. Therefore, we attributed a beneficiary to a physician during the entire study period (1999 to 2005) if the physician was the plurality provider during the three-year period from 1999 to 2001 and for at least two individual years during this period, and was the plurality provider during the three-year period from 2001 to 2003 and for at least two individual years during this period. The three-year attribution window accounted for the possibility that shorter acute periods when a specialist might be providing the most care would result in inappropriate attribution, and the two-year criteria ensured generalists had at least one individual year before and after the MOC period (2001) when they were the patient's primary physician. By excluding post 2003, our attribution criteria prevented reductions in the beneficiary sample due to referrals to specialists or death in the out years. This attribution method resulted in 192,923 beneficiaries being attributed to 1,960 ABIM generalists. (Some further reduction in sample sizes took place during propensity score matching, but are not considered in this section.)

Selection of any attribution algorithm involves tradeoffs. More stringent attribution criterion, which required a continued and active relationship between the patient and primary care physician over the course of the study, enhances the likelihood that changes in patient care and outcomes are attributable to the MOC intervention being tested since we are attempting to measure changes over time in our outcome variables. However, more stringent criteria may omit sicker patients who die or whose care management is transferred to a specialist at some point, particularly during the post-MOC period. In contrast, a less stringent attribution criteria (e.g., based only on the relationship between the physician and patient during the pre-MOC period), would omit fewer beneficiaries from the analysis. To the extent that decisions to transfer care to a specialist are influenced by the MOC requirement, this would enhance the comparability of the MOC-required and MOC-grandfathered beneficiary cohort. However, to the extent that MOC does not influence transfers in patient care, applying a looser attribution would introduce a major source of random variation during the post-MOC period. This is due to a significant portion of patient care for many beneficiaries being attributed to an MOC-required or MOC-grandfathered generalist, which instead should be attributed to another physician who was not subject to the MOC requirement in 2001. This error introduced by the looser attribution reduces the power of the evaluation to draw reliable conclusions regarding the associations with MOC.

With these tradeoffs in mind, we conducted an attribution criteria sensitivity analysis. The results of this analysis are shown in eTable 5. In the Attribution Sensitivity Test 1, we loosened the attribution criteria so a beneficiary would be attributed to an ABIM generalist if that physician was the plurality provider during either the year 1999, 2000, or 2001. This nearly doubled the number of beneficiaries (to 380,342 beneficiaries before propensity matching) and also increased the number of ABIM generalists to 2,487. The advantage of this attribution criterion was that it eliminated censoring due to post-MOC attribution requirements. For example, this attribution allowed us to capture the possibility that care quality changed because some patients switched providers as a result of MOC (which we do not consider a likely result) or because MOC influenced physician decisions to pass management of patients to specialists. Notably, previous research has found a considerable rate of change in attributed physicians among Medicare patients.[5] Consequently, the disadvantage was that it allowed beneficiaries to be included in the sample who had no contact with an ABIM generalist after the MOC requirement period. It would be impossible for these beneficiaries to be affected by changes in practice that occurred after the MOC requirement. Another problem with this attribution criterion is that it allowed beneficiaries to be included in the sample who received a substantial amount of their care from physicians who were not in either the MOC-required or MOC-grandfathered physician cohorts.

In Attribution Sensitivity Test 2, we restricted the group of potential responsible providers to a narrow group who are most likely to deliver all four primary care services (e.g., family practice physicians but not endocrinologists; see definition in section 1). That said, the specialty types included in the base definition but excluded from the restricted provider definition often supply primary care services. In particular, they are often responsible for the ongoing management of patients with specific chronic conditions (e.g., endocrinologists who provide ongoing principal care for patients with diabetes).[2,3] Applying this restricted provider definition increased the number of beneficiaries attributed to ABIM generalists in the MOC-required and MOC-grandfathered groups to 220,896 beneficiaries and 1,981 ABIM generalists. The benefit of the sensitivity is that it is not subject to bias that may result from either the

MOC-required or MOC-grandfathered physicians transferring the primary care responsibility for more complex beneficiaries to specialists as a result of MOC. However, the beneficiaries who were added by the restricted definition include beneficiaries who received most of their care from a physician not in the MOC-required or MOC-grandfathered cohorts. Therefore, it is unlikely that any benefit a physician receives as a result of being subject to the MOC requirement will have a sizable impact on the quality or efficiency of care for these beneficiaries.

The next two sensitivity tests were designed to attribute beneficiary samples with tighter connections with either an MOC-required or MOC-grandfathered generalist. In Sensitivity Test 3, we applied a majority of visit criterion (versus plurality of visit) which only attributed beneficiaries to a physician if the physicians comprised >50% of eligible contacts. This attribution resulted in a reduction in the number of attributed beneficiaries (to 162,124 beneficiaries and 1,923 physicians). In Sensitivity Test 4, we added a 25% minimum visit criterion to the plurality criteria. This was also designed to create samples with a stronger physician-beneficiary connection compared with the base attribution. This resulted in a small reduction in the number of attributed beneficiaries (to 192,183 beneficiaries and 1,959 physicians). Both these sensitivities yield a beneficiary sample with a strong connection to their attributed physician, potentially yielding a greater association with the MOC requirement. As described above, these attribution criteria were more susceptible to biases due to censoring as compared with the base case method used in the article.

As shown on eTable 5, our base case results were preserved in terms of clinical and statistical significance (*P*s<.05) across all these attribution sensitivities (e.g. MOC requirement associations with total costs ranged from $106 to $167 (Ps<.001) and were always within the 95% confidence interval of our base case), with the exception of inpatient costs and non-specialty visits. Associations with inpatient costs and the MOC requirement were statistically insignificant across all these sensitivities (*P*s>.07). The association with non-specialty costs was not statistically significant (*P*=0.10) in Sensitivity Test 1 where beneficiaries were attributed to a physician if they were the plurality provider in any year between 1999 and 2001.

eTable 5. Attribution method sensitivity test results

Base Attribution: plurality provider in any two years between 1999 and 2001 and overall plurality provider from 1999 and 2001 as well as plurality provider for any two years between 2001 and 2003 and overall plurality provider from 2001 and 2003 (Beneficiaries= 154,045, ABIM generalists= 1,930).

Attribution definitions (N's are reported post propensity score matching):

(1) Plurality provider for any one year in either1999, 2000, or 2001 (Beneficiaries= 322,566; ABIM generalists= 2,463).
(2) Same as base attribution but with a restricted potential provider definition (See Supplement Section 1 for definition, Beneficiaries= 177,047; ABIM generalists= 1,955).
(3) Same as base attribution but with a majority visit criteria (Beneficiaries= 127,933; ABIM generalists= 1,887).
(4) Same as base attribution but with a plurality plus 25% of visits minimum criteria (Beneficiaries= 153,386; ABIM generalists= 1,934).

	Plurality Attribution (Base Case)				(1) Attributed in any year 1999, 2000, or 2001				(2) Restricted Potential Provider Definition			
Dependent measure	Coef	*SE*	*95% CI*	P	Coef	*SE*	*95% CI*	P	Coef	*SE*	*95% CI*	P
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries)												
Any	0.1	0.9	-1.7 to 1.9	0.92	0.0	0.7	-1.4 to 1.3	0.97	0.0	0.9	-1.8 to 1.7	0.97
Acute	0.3	0.7	-1.1 to 1.6	0.70	0.4	0.5	-0.6 to 1.5	0.42	-0.1	0.7	-1.4 to 1.2	0.90
Chronic	-0.2	0.7	-1.5 to 1.2	0.80	-0.7	0.5	-1.7 to 0.4	0.21	0.0	0.7	-1.3 to 1.3	0.97
Other incidence measures (per 1,000 beneficiaries)												
Annual incidence of a hospitalization	-0.5	1.7	-3.8 to 2.8	0.78	0.0	1.2	-2.4 to 2.4	1.00	0.1	1.6	-3.0 to 3.2	0.97
Annual incidence of an emergency department visit	-3.2	1.8	-6.8 to 0.3	0.07	-1.3	1.3	-3.8 to 1.3	0.32	-2.0	1.7	-5.3 to 1.4	0.25
Annual cost per beneficiary by care setting ($2013)												
Total costs	-167.0	52.8	-270.5 to -63.5	0.002	-106.1	40.7	-186.0 to -26.3	0.009	-131.4	52.2	-233.8 to -29.0	0.01
Ambulatory costs	-84.1	19.1	-121.6 to -46.6	<.001	-70.5	15.6	-101.1 to -40.0	<.001	-75.5	20.4	-115.5 to -35.4	<.001

Inpatient costs	-81.9	40.9	-162.1 to -1.7	0.05	-35.5	31.2	-96.7 to 25.7	0.26	-54.7	39.8	-132.8 to 23.3	0.17
Annual costs per beneficiary by BETOS category ($2013)												
Major procedures	-3.5	4.8	-13.0 to 6.0	0.47	-4.9	3.5	-11.6 to 1.9	0.16	0.0	4.6	-9.1 to 9.1	1.00
Minor/Ambulatory procedures and endoscopy	0.7	3.2	-5.5 to 6.9	0.82	-3.0	2.4	-7.6 to 1.7	0.21	-4.0	3.1	-10.1 to 2.0	0.19
Imaging	-12.9	2.4	-17.7 to -8.2	<.001	-10.8	1.8	-14.4 to -7.3	<.001	-10.2	2.4	-14.9 to -5.5	<.001
Laboratory tests	-5.9	1.0	-7.8 to -3.9	<.001	-5.7	0.7	-7.2 to -4.2	<.001	-6.3	1.0	-8.3 to -4.4	<.001
Testing (laboratory and imaging)	-18.8	2.8	-24.3 to -13.3	<.001	-16.5	2.1	-20.7 to -12.4	<.001	-16.5	2.8	-22.0 to -11.1	<.001
Specialty visits	-11.2	1.9	-15.0 to -7.5	<.001	-8.9	1.5	-11.9 to -6.0	<.001	-11.2	1.9	-14.9 to -7.5	<.001
Non-specialty visits	-2.7	0.9	-4.5 to -0.9	0.003	-1.2	0.7	-2.5 to 0.2	0.10	-2.1	0.9	-3.8 to -0.4	0.02

eTable 5 (con't)

Dependent measure	(3) Majority Criteria Coef	*SE*	*95% CI*	P	(4) Plurality & 25% minimum Criteria Coef	*SE*	*95% CI*	P
Annual incidence of an Ambulatory Care Sensitive Hospitalization by condition type (per 1,000 beneficiaries)								
Any	-0.3	1.0	-2.2 to 1.6	0.73	0.1	0.9	-1.7 to 1.9	0.91
Acute	0.2	0.7	-1.3 to 1.6	0.82	0.1	0.7	-1.2 to 1.5	0.84
Chronic	-0.4	0.7	-1.8 to 1.0	0.58	0.0	0.7	-1.4 to 1.3	0.96
Other incidence measures (per 1,000 beneficiaries)								
Annual incidence of a hospitalization	-3.1	1.8	-6.7 to 0.4	0.08	-0.1	1.7	-3.4 to 3.2	0.96
Annual incidence of an emergency department visit	-4.9	2.0	-8.8 to -1.1	0.01	-2.1	1.8	-5.7 to 1.4	0.24
Annual cost per beneficiary by care setting ($2013)								
Total costs	-132.4	52.9	-236.1 to -28.8	0.01	-152.5	52.5	-255.3 to -49.7	0.004
Ambulatory costs	-68.0	19.5	-106.3 to -29.8	<.001	-77.0	19.1	-114.4 to -39.6	<.001
Inpatient costs	-64.2	40.7	-144.1 to 15.6	0.11	-74.6	40.6	-154.2 to 5.0	0.07
Annual costs per beneficiary by BETOS category ($2013)								
Major procedures	-3.0	5.1	-13.0 to 7.0	0.56	-1.6	4.9	-11.1 to 7.9	0.75
Minor/Ambulatory procedures and endoscopy	-0.9	3.3	-7.4 to 5.6	0.78	-0.9	3.2	-7.2 to 5.3	0.77
Imaging	-15.0	2.5	-20.0 to -10.1	<.001	-13.7	2.4	-18.5 to -8.9	<.001
Laboratory tests	-5.6	1.0	-7.6 to -3.6	<.001	-6.0	1.0	-8.0 to -4.1	<.001
Testing (laboratory and imaging)	-20.6	2.9	-26.3 to -15.0	<.001	-19.7	2.8	-25.3 to -14.2	<.001
Specialty visits	-12.0	1.9	-15.8 to -8.2	<.001	-11.6	1.9	-15.3 to -7.9	<.001
Non-specialty visits	-3.7	1.0	-5.6 to -1.8	<.001	-3.3	0.9	-5.1 to -1.5	<.001

eMethod 7. Estimation Specification Sensitivities

The estimation specification used in the article is a linear hierarchical random effects model that includes beneficiary and physicians random effects Stata's MIXED model with physician and beneficiary random effects.[6] We refer to this as the base case. As described in the main text, we applied several estimation specification sensitivity tests.

In the estimation specification sensitivity test #1, we applied a fixed effect panel regression model (Stata's XTREG with beneficiary fixed effects).[6] This model is equivalent to a standard regression model that includes indicators for each beneficiary in our sample. Since each beneficiary was attributed to one physician, this approach implicitly included physician fixed effects. Fixed effects in a panel context account for all non-time varying characteristics of subjects (e.g., generalist residency program training, beneficiary race). The random effects model only controls for observed covariates. However, the exclusion of beneficiary and physicians random effects limits our ability to generalize to beneficiaries not included in the analytic sample.[6]

In estimation specification sensitivity test #2, we used our base linear hierarchical random effects model, but included 2001 as a post-MOC period to allow for the impact of practice changes during the period generalists were engaged in the MOC process. During 2001, physicians were completing ABIM self-evaluation of medical knowledge modules and preparing for the MOC exam. Including 2001 allows us to consider the early or transient effects of these activities on care quality or efficiency. These could include either positive effects on quality that result from physicians increasing their clinical knowledge and subsequently changing practice, or negative effects due to the possibility that activities associated with engaging in MOC compete with a physician's patients for their attention and time. However, the year 2001 also includes time prior to a physician's engagement in MOC and so it is contaminated by the pre-MOC period.

In estimation specification sensitivity test #3, we applied a non-linear version of our base case hierarchal random effects models (Stata's MEGLM with physician and beneficiary random effects).[6] For this model we assumed a gamma distribution with a log link for cost measures and a logistic hierarchal model for binary dependent measures. Unfortunately, the non-linear hierarchical models often failed to converge. Because of this difficulty, we had to limit most control variable covariates, although we were able to maintain the interactions that allowed us to construct our difference-in-differences estimates. In some cases, we also had to randomly sample a subset of the data. Considering these exclusions, we re-estimated the base case linear hierarchal model applying the same covariates and sample as we applied for non-linear estimation to test the validity of the comparison of these results to the base case model. Results of this suggest that our comparisons in most case were valid (see eTable 6, sensitivity 3a and 3b). Another disadvantage of non-linear models in general is their ability to eliminate additive errors that might bias the associations we report. We overcame this to a degree by applying a non-linear difference-in-differences simulation methodology described by Puhani.[7]

In estimation specification sensitivity test #4, we applied quarterly data, including quarter indicators to account for seasonality, as a sensitivity for ambulatory and total health care costs. Although we investigated applying quarterly data to other outcome measures, we only report quarterly data results for these two outcomes because quarterly observations failed to add much information for other outcome measures. This is because events (such as Ambulatory Care Sensitive Hospitalizations [ACSH]) or types of expenditures (e.g., minor or major procedures) only occurred sporadically in few quarters and beneficiaries were generally unlikely to have multiple occurrences within a calendar year. For example, ambulatory costs were incurred in multiple quarters per year for 96% of beneficiary years, but inpatient costs were incurred multiple quarters in a year only 5% of the time. For ACSH's this figure is just 0.2%. Models with quarterly total and ambulatory costs are only presented in eTable 6.

Overall, as with attribution sensitivities, the general pattern of our base case results was preserved across alternative estimation specifications (e.g. MOC requirement associations with total costs ranged from \$85 to \$172 (Ps<.002) and were within the 95% confidence interval of our base case). The exceptions to this general pattern occurred in models of inpatient costs and non-specialist costs. Associations between the MOC requirement and both inpatient costs and non-specialist visit costs were statistically insignificant ($P>.1$) for the non-linear hierarchal sensitivity.

eTable 6. Estimation specification sensitivity tests results

Base Specification: Linear Mixed Model including beneficiary and physician random effects. Fixed effects in the model include an indicator for MOC-required; an interaction between MOC-required and post-MOC period indicators; year indicators; indicators for beneficiary race, gender, HCC chronic conditions, and regions as well as beneficiary age and age squared; and indicators for the beneficiary's physician's gender and failing the IM exam on first attempt as well as initial IM exam score.

(1) Same as base specification except replacing beneficiary and physician random effects with beneficiary and physician fixed effects
(2) Same as base specification except year 2001 data was included in the post-MOC period
(3a) Same as base specification except using a multilevel log-gamma regression for cost data and multilevel logistic regression for binary data
(3b) Same as base specification except applying the same covariates and sample as was applied in sensitivity 3a
(4) Same as base case except data compiled quarterly instead of yearly and quarter indicators were added to the model to account for seasonality

Dependent measure, mean (SD)	Base Case: Linear Mixed Model with Beneficiary and Physician Random Effects				(1) Panel Regression Including Beneficiary and Physician Fixed Effects				(2) Including 2001 in the Post-MOC Period			
	Coef	*SE*	*95% CI*	*P*	Coef	*SE*	*95% CI*	*P*	Coef	*SE*	*95% CI*	*P*
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries)												
Any	0.1	0.9	-1.7 to 1.9	0.92	0.4	0.9	-1.4 to 2.3	0.63	0.1	0.9	-1.6 to 1.9	0.87
Acute	0.3	0.7	-1.1 to 1.6	0.70	0.5	0.7	-0.8 to 1.9	0.46	0.2	0.7	-1.1 to 1.5	0.74
Chronic	-0.2	0.7	-1.5 to 1.2	0.80	0.0	0.7	-1.4 to 1.4	0.96	-0.2	0.7	-1.5 to 1.1	0.79
Other incidence measures (per 1,000 beneficiaries)												
Annual incidence of a hospitalization	-0.5	1.7	-3.8 to 2.8	0.78	-0.1	1.7	-3.5 to 3.3	0.97	-0.9	1.6	-4.0 to 2.3	0.58
Annual incidence of an emergency department visit	-3.2	1.8	-6.8 to 0.3	0.07	-3.1	1.9	-6.8 to 0.5	0.09	-3.6	1.7	-7.0 to -0.2	0.04
Annual cost per beneficiary by care setting ($2013)												
Total costs	-167.0	52.8	-270.5 to -63.5	0.002	-172.1	55.3	-280.4 to -63.7	0.002	-153.9	49.5	-251.0 to -56.8	0.002
Ambulatory costs	-84.1	19.1	-121.6 to -46.6	<.001	-84.8	20.8	-125.6 to -44.0	<.001	-73.9	17.8	-108.8 to -39.0	<.001
Inpatient costs	-81.9	40.9	-162.1 to -1.7	0.05	-87.3	41.6	-168.8 to -5.8	0.04	-79.6	38.4	-154.9 to -4.3	0.04
Annual costs per beneficiary by BETOS category ($2013)												
Major procedures	-3.5	4.8	-13.0 to 6.0	0.47	-5.1	5.2	-15.2 to 5.0	0.33	-2.2	4.7	-11.3 to 7.0	0.64
Minor/Ambulatory procedures and endoscopy	0.7	3.2	-5.5 to 6.9	0.82	0.6	3.3	-5.9 to 7.2	0.85	0.9	3.0	-5.0 to 6.7	0.77
Imaging	-12.9	2.4	-17.7 to -8.2	<.001	-12.9	2.5	-17.8 to -8.1	<.001	-10.1	2.3	-14.6 to -5.6	<.001
Laboratory tests	-5.9	1.0	-7.8 to -3.9	<.001	-6.0	1.0	-8.0 to -4.0	<.001	-4.6	0.9	-6.4 to -2.8	<.001
Testing (laboratory and imaging)	-18.8	2.8	-24.3 to -13.3	<.001	-18.9	2.9	-24.6 to -13.2	<.001	-14.7	2.7	-19.9 to -9.5	<.001

Specialty visits	-11.2	1.9	-15.0 to -7.5	<.001	-11.4	2.3	-15.8 to -6.9	<.001	-9.5	1.8	-13.0 to -6.0	<.001
Non-specialty visits	-2.7	0.9	-4.5 to -0.9	0.003	-2.9	1.1	-5.0 to -0.8	0.008	-1.8	0.9	-3.6 to -0.1	0.03

eTable 6 (con't)

Dependent measure, mean (SD)	(3a) Non-linear Mixed Model with Beneficiary and Physician Random Effects[a]				(3b) Linear Mixed Model with Beneficiary and Physician Random Effects that applied the same sample and covariates the linear model				(5) Cost Data Compiled Quarterly			
	Coef	*SE*	*95% CI*	*P*	Coef	*SE*	*95% CI*	*P*	Coef	*SE*	*95% CI*	*P*
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries)												
Any	-0.1[b]	0.5	-1.2 to 0.9	0.80	-0.1[b]	0.9	-1.9 to 1.7	0.92	na			
Acute	0.0[b]	0.4	-0.8 to 0.9	0.94	0.1[b]	0.7	-1.2 to 1.5	0.84	na			
Chronic	-0.1[b]	0.2	-0.5 to 0.2	0.54	-0.3[b]	0.7	-1.6 to 1.1	0.69	na			
Other incidence measures (per 1,000 beneficiaries)												
Annual incidence of a hospitalization	-0.6[b]	1.8	-4.1 to 2.9	0.75	-0.8[b]	1.7	-4.1 to 2.5	0.63	na			
Annual incidence of an emergency department visit	-4.7[b]	2.1	-8.8 to -0.6	0.03	-3.6[b]	1.8	-7.2 to -0.1	0.05	na			
Annual cost per beneficiary by care setting ($2013)												
Total costs	-84.6[b]	27.8	-139.1 to -30.1	0.002	-173.3[b]	52.8	-276.9 to -69.7	0.001	-156.2	45.2	-244.7 to -67.7	0.001
Ambulatory costs	-40.9[b]	13.6	-67.5 to -14.4	0.003	-83.4[b]	19.2	-120.9 to -45.9	<.001	-82.1	14.8	-111.1 to -53.1	<.001
Inpatient costs	-80.9[cd]	73.8	-225.6 to 63.8	0.27	-102.4[cd]	65.3	-230.2	0.12	na			

						2	to 25.3		
Annual costs per beneficiary by BETOS category ($2013)									
Major procedures	-14.4[bd]	8.0	-30.0 to 1.2	0.07	-14.6[bd]	7.7	-29.6 to 0.4	0.06	na
Minor/Ambulatory procedures and endoscopy	2.6[b]	2.7	-2.7 to 7.9	0.34	1.1[b]	3.2	-5.1 to 7.2	0.74	na
Imaging	-10.5[be]	3.1	-16.7 to -4.3	0.001	-12.3[be]	3.4	-19.1 to -5.6	<.001	na
Laboratory tests	-1.5[ce]	0.8	-3.1 to 0.0	0.05	-6.3[ce]	1.4	-9.0 to -3.6	<.001	na
Testing (laboratory and imaging)	-8.7[b]	2.2	-13.0 to -4.4	<.001	-18.4[b]	2.8	-23.9 to -12.8	<.001	na
Specialty visits	-6.4[b]	2.4	-11.0 to -1.7	0.008	-10.9[b]	1.9	-14.6 to -7.2	<.001	na
Non-specialty visits	-2.1[bd]	2.1	-6.2 to 2.0	0.32	-1.6[bd]	1.5	-4.5 to 1.3	0.29	na

[a] Multilevel log-gamma regression for cost data and multilevel logistic regression for binary data
[b] Model only includes year fixed effects, an indicator for MOC-required, an interaction between pre-MOC and post-MOC period as well as beneficiary and physician random effects
[c] Model only includes a post-MOC period indicator, an indicator for MOC-required, an interaction between pre-MOC and post-MOC period as well as beneficiary and physician random effects
[d] Model estimated using a 40% random sampling of beneficiaries
[e] Model estimated using a 50% random sampling of beneficiaries

eMethods 8. Inclusion of Post-Acute Care Costs

Our health care cost measure did not include post-acute care because we did not have cost measures related to hospice care, and we thought primary care might have its greatest impacts on regular ambulatory and inpatient care. As a sensitivity, we included post-acute costs for skilled nursing facilities and home-health. After including these post-acute care costs in our dependent measures, our original estimate of the association with total costs increased from -$167 (p=0.002) to -$194 (p=0.002).

eMethods 9. Test of Pre-MOC Period Trend Differences

While average characteristics and outcomes of the MOC-required and MOC-grandfathered cohorts of beneficiaries during the pre-MOC years (1999 and 2000) were essentially identical after propensity score matching, this does not absolutely guarantee that the trend in outcomes are consistent between the two groups. In this set of specificity tests, we tested whether trend differ between the two cohorts of beneficiaries. Results are shown in eTable 7. To test for pre-MOC trend differences we included an MOC-required indicator, year indicators and interaction terms between a measure of trend (using exponential or linear trend terms) and an MOC-required indictor. This last term measures whether there is a difference in outcome trend between the MOC-required and MOC-grandfathered cohorts of beneficiaries. For total costs and ambulatory costs we also tested pre-MOC period trend difference at the quarterly level. Results of this test are shown in eTable 8. The exponential trend term specification was tested because health care expenses increase with age generally following an exponential pattern. Consistently, after propensity score matching, we found no evidence of a pre-MOC period trend difference across all of our outcome measures.

eTable 7. Test of pre-MOC period trends across dependent measures.

	Exponential Trend * MOC interaction[a]			Linear Trend * MOC interaction[a]		
	Coef	95% CI	P[b]	Coef	95% CI	P[b]
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries)						
Any	-0.4	-1.0 to 0.1	0.14	-1.9	-4.5 to 0.6	0.14
Acute	-0.2	-0.6 to 0.2	0.29	-1.0	-2.9 to 0.9	0.29
Chronic	-0.2	-0.6 to 0.2	0.39	-0.8	-2.7 to 1.1	0.39
Other incidence measures (per 1,000 beneficiaries)						
Annual incidence of a hospitalization	-0.5	-1.6 to 0.5	0.30	-2.5	-7.3 to 2.3	0.30
Annual incidence of an emergency department visit	0.5	-0.7 to 1.8	0.39	2.5	-3.2 to 8.2	0.39
Annual cost per beneficiary by care setting ($2013)						
Total costs	1.7	-25.6 to 29.0	0.90	8.0	-119.7 to 135.6	0.90
Ambulatory costs	3.2	-6.3 to 12.6	0.51	14.9	-29.2 to 59.1	0.51
Inpatient costs	-1.5	-22.8 to 19.8	0.89	-6.9	-106.5 to 92.6	0.89
Annual costs per beneficiary by BETOS category ($2013)						
Major procedures	1.6	-1.8 to 5.0	0.35	7.5	-8.2 to 23.2	0.35
Minor/Ambulatory procedures and endoscopy	-1.0	-2.8 to 0.8	0.27	-4.7	-13.2 to 3.7	0.27
Imaging	1.2	-0.6 to 3.0	0.20	5.5	-3.0 to 14.0	0.20
Laboratory tests	0.3	-0.4 to 1.0	0.41	1.4	-1.9 to 4.6	0.41
Testing (laboratory and imaging)	1.5	-0.6 to 3.6	0.17	6.9	-2.9 to 16.7	0.17
Specialty visits	0.7	-0.6 to 2.0	0.29	3.4	-2.8 to 9.5	0.29
Non-specialty visits	0.9	-0.2 to 2.0	0.11	4.2	-1.0 to 9.5	0.11

[a]MOC-required indicator * trend term (linear or exponential) assessed in 1999 and 2000
[b]Huber-White Sandwich estimator used to account for correlated errors of beneficiaries within physicians

eTable 8. Test of pre period trends across total costs and ambulatory costs utilizing data compiled quarterly

	Exponential Trend * MOC interaction[a]			Linear Trend * MOC interaction[a]		
	Coef	95% CI	P[b]	Coef	95% CI	P[b]
Annual cost per beneficiary by care setting ($2013)						
Total costs[c]	-5.9	-21.4 to 9.6	0.46	-7.8	-36.5 to 20.9	0.60
Ambulatory costs[c]	-0.8	-6.1 to 4.5	0.76	0.3	-9.6 to 10.1	0.96

[a]MOC-required indicator * trend term (linear or exponential) assessed between 1999 Q1 and 2000 Q4
[b]Huber-White Sandwich estimator used to account for correlated errors of beneficiaries within physicians

eMethods 10. Test of differential changes in trend between the MOC-required and MOC-grandfathered cohorts in the post-MOC period across dependent measures

Difference-in-differences designs often test whether the intervention affected trajectory of the outcome measures over time, apart from any discontinuity at the time of intervention. This is done by adding a trend term as well as a triple interaction term between the trend term, the treatment group, and the post intervention period (in our case, the MOC-required group in the post-MOC period). As shown on eTables 9 and 10, we generally found no evidence that the MOC requirement resulted in a change in the trajectory of beneficiary outcomes. The one exception to this was for non-specialty visit costs. For this outcome measure, we observed a significant downward shift in the yearly trend with both the exponential and linear interaction terms. In a few cases (laboratory tests for the yearly regressions and total and ambulatory costs for the quarterly regressions with an exponential trend) we did find that the intercept shift alone resulting from the MOC-requirement was statistically significant and negative predictor (*P*s<.05).

We further tested the degree to which the association between the MOC requirement and our dependent measures changes across the post-MOC period by replacing the MOC-requirement/post-MOC period indicator with interaction terms between each post-MOC year and the MOC requirement. To test whether associations changed over the post-MOC year, we measured the degree to which coefficients for these interactions differed. Results of this investigation are shown on eTable 11. Notably, the year-by-year effects appear to be fairly stable with no apparent increasing or decreasing pattern observed across years, and generally no significant differences between yearly estimates. The two exceptions to this latter point were for laboratory costs and major procedures. For laboratory costs, the association in year 4 of the post MOC period was significantly smaller than in years 1 through 3 although all associations were negatively signed and statistically different from zero (Ps<0.04). For major procedures, the association in year 1 of the post-MOC period were significantly smaller than the association in year 4 of the post-MOC period (P=0.02). However, none of the yearly associations or the overall post-MOC period association for major procedures were significantly different from zero (Ps>0.14).

eTable 9. Test of differential changes in trend and intercept between the MOC-required and MOC-grandfathered cohorts in the post-MOC period across dependent measures

	Slope (Exponential): Exponential Trend * MOC interaction * Post-MOC Period Interaction [a]			Intercept (Exponential): MOC * Post-MOC period Interaction [a]		
	Coef	95% CI	*P*	Coef	95% CI	*P*
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries)						
Any	0.4	-0.2 to 1.0	0.20	-1.7	-5.5 to 2.1	0.38
Acute	0.2	-0.3 to 0.7	0.38	-0.8	3.7 to 2.1	0.59
Chronic	0.2	-0.3 to 0.6	0.47	-0.7	-3.6 to 2.1	0.61
Other incidence measures (per 1,000 beneficiaries)						
Annual incidence of a hospitalization	0.5	-0.6 to 1.7	0.35	-4.4	-11.3 to 2.5	0.21
Annual incidence of an emergency department visit	-0.5	-1.8 to 0.7	0.39	-1.8	-9.2 to 5.7	0.64
Annual cost per beneficiary by care setting ($2013)						
Total costs	-1.5	-37.2 to 34.2	0.93	-181.9	-398.8 to 34.9	0.10
Ambulatory costs	-3.0	-16.0 to 9.9	0.64	-73.9	-152.4 to 4.5	0.06
Inpatient costs	1.6	-26.1 to 29.2	0.91	-108	-276.1 to 60.1	0.21
Annual costs per beneficiary by BETOS category ($2013)						
Major procedures	-1.5	-4.8 to 1.7	0.36	-2.3	-22.2 to 17.7	0.82
Minor/Ambulatory procedures and endoscopy	1.0	-1.1 to 3.2	0.34	-4.5	-17.4 to 8.4	0.50
Imaging	-1.2	-2.8 to 0.5	0.17	-7.4	-17.4 to 2.6	0.15
Laboratory tests	-0.3	-0.9 to 0.4	0.40	-5.9	-9.9 to -1.9	0.004
Testing (laboratory and imaging)	-1.4	-3.3 to 0.5	0.14	-13.3	-24.8 to -1.7	0.02
Specialty visits	-0.7	-2.0 to 0.6	0.28	-7.6	-15.3 to 0.2	0.06
Non-specialty visits	-0.9	-1.5 to -0.3	0.005	1.3	-2.5 to 5.0	0.51

[a]Models include two-way interactions; MOC-required indicators, exponential trend term, and year dummies; beneficiary and physician demographics; chronic condition indicators; HHS region indicators; and beneficiary and physician random effects

eTable 9 (con't)

	Slope (Linear): Linear Trend * MOC interaction * Post-MOC Period Interaction [a]			Intercept (Linear): MOC * Post-MOC period Interaction [a]		
	Coef	95% CI	*P*	Coef	95% CI	*P*
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries)						
Any	1.9	-1.1 to 5.0	0.21	-2.9	-10.0 to 4.1	0.41
Acute	1.2	-1.1 to 3.6	0.30	-2.5	-7.9 to 2.9	0.36
Chronic	0.6	-1.7 to 2.9	0.59	-0.4	-5.7 to 4.9	0.87
Other incidence measures (per 1,000 beneficiaries)						
Annual incidence of a hospitalization	3.8	-1.8 to 9.4	0.18	-11.3	-24.1 to 1.5	0.08
Annual incidence of an emergency department visit	-1.5	-7.6 to 4.5	0.62	-4.9	-18.7 to 8.9	0.49
Annual cost per beneficiary by care setting ($2013)						
Total costs	10.2	-165.4 to 185.7	0.91	-251.1	-653.6 to151.4	0.22
Ambulatory costs	-17	-80.5 to 46.5	0.60	-48.1	-193.8 to 97.7	0.52
Inpatient costs	28	-108.0 to 164.1	0.69	-206.7	-518.7 to 105.3	0.19
Annual costs per beneficiary by BETOS category ($2013)						
Major procedures	-1.9	-18.0 to 14.2	0.82	-22.0	-59.0 to 14.9	0.24
Minor/Ambulatory procedures and endoscopy	4.4	-6.1 to 14.9	0.41	-4.1	-28.1 to 20.0	0.74
Imaging	-5.5	-13.6 to 2.6	0.18	-4.2	-22.8 to 14.4	0.66
Laboratory tests	-0.4	-3.6 to 2.9	0.83	-9.1	-16.6 to -1.7	0.02
Testing (laboratory and imaging)	-5.9	-15.2 to 3.5	0.22	-13.4	-34.8 to 8.1	0.22
Specialty visits	-4.0	-10.3 to 2.2	0.21	-2.1	-16.5 to 12.3	0.77
Non-specialty visits	-3.8	-6.9 to -0.08	0.01	1.7	-5.3 to 8.7	0.64

[a]Models include two-way interactions; MOC-required indicators, linear trend term, and year dummies; beneficiary and physician demographics; chronic condition indicators; HHS region indicators; and beneficiary and physician random effects

eTable 10. Test of differential changes in trend and intercept between the MOC-required and MOC-grandfathered cohorts in the post-MOC period across dependent measures utilizing data compiled quarterly

Regression results that apply exponential trend	Slope (Exponential): Exponential Trend * MOC interaction * Post-MOC Period Interaction [a]			Intercept (Exponential): MOC * Post-MOC period Interaction [a]		
	Coef	95% CI	P	Coef	95% CI	P
Annual cost per beneficiary by care setting ($2013)						
Total Costs[c]	6.0	-10.7 to 22.8	0.48	-235.9	-399.0 to -72.7	0.005
Ambulatory Costs[c]	0.9	-4.6 to 6.4	0.75	-98.3	-151.5 to -45.0	<.001
Regression results that apply exponential trend	Slope (Linear): Linear Trend * MOC interaction * Post-MOC Period Interaction [a]			Intercept (Linear): MOC * Post-MOC period Interaction [a]		
	Coef	95% CI	P	Coef	95% CI	P
Annual cost per beneficiary by care setting ($2013)						
Total Costs[c]	11.0	-22.0 to 44.0	0.51	-253.9	-537.5 to 29.8	0.08
Ambulatory Costs[c]	-1.5	-12.3 to 9.3	0.79	-53.9	-146.6 to 38.7	0.25

[a]Models include two-way interactions; MOC-required indicators, linear trend term, year dummies and quarter dummies; beneficiary and physician demographics; chronic condition indicators; HHS region indicators; and beneficiary and physician random effects.

eTable 11. Yearly differential change associated with MOC for each year in the post-MOC period versus the pre-MOC period

Dependent measure	Differential change for the MOC-required group compared with the MOC-grandfathered group			Differential change significantly different from another year (P<0.05)[b]
	Differential Change[a]	95% CI[a]	P[a]	
Annual incidence of an ambulatory care sensitive hospitalization by condition type (per 1,000 beneficiaries)				
Any ambulatory sensitive hospitalization				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	0.1	-1.7 to 1.9	0.92	--
Year 1 Post-MOC v. Pre-MOC	-0.5	-3.1 to 2.0	0.68	None
Year 2 Post-MOC v. Pre-MOC	0.4	-2.1 to 3.0	0.75	None
Year 3 Post-MOC v. Pre-MOC	1.3	-1.3 to 3.9	0.32	None
Year 4 Post-MOC v. Pre-MOC	-0.8	-3.5 to 1.8	0.54	None
Acute ambulatory sensitive hospitalization				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	0.3	-1.1 to 1.6	0.70	--
Year 1 Post-MOC v. Pre-MOC	-0.4	-2.3 to 1.5	0.69	None
Year 2 Post-MOC v. Pre-MOC	0.1	-1.9 to 2.0	0.94	None
Year 3 Post-MOC v. Pre-MOC	1.7	-0.3 to 3.7	0.10	None
Year 4 Post-MOC v. Pre-MOC	-0.2	-2.3 to 1.8	0.83	None
Chronic ambulatory sensitive hospitalization				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-0.2	-1.5 to 1.2	0.80	--
Year 1 Post-MOC v. Pre-MOC	-0.1	-2.0 to 1.8	0.88	None
Year 2 Post-MOC v. Pre-MOC	0.0	-1.9 to 1.9	0.99	None
Year 3 Post-MOC v. Pre-MOC	0.2	-1.7 to 2.2	0.81	None
Year 4 Post-MOC v. Pre-MOC	-0.9	-2.9 to 1.2	0.40	None
Other incidence measures (per 1,000 beneficiaries)				
Annual incidence of a hospitalization				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-0.5	-3.8 to 2.8	0.78	--
Year 1 Post-MOC v. Pre-MOC	-3.4	-8.0 to 1.2	0.15	None
Year 2 Post-MOC v. Pre-MOC	1.2	-3.5 to 5.8	0.62	None
Year 3 Post-MOC v. Pre-MOC	-0.9	-5.7 to 3.8	0.71	None
Year 4 Post-MOC v. Pre-MOC	1.6	-3.3 to 6.4	0.52	None
Annual incidence of an emergency department visit				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-3.2	-6.8 to 0.3	0.07	--
Year 1 Post-MOC v. Pre-MOC	-5.6	-10.5 to -0.6	0.03	None
Year 2 Post-MOC v. Pre-MOC	-0.6	-5.7 to 4.4	0.80	None
Year 3 Post-MOC v. Pre-MOC	-6.2	-11.3 to -1.0	0.02	None
Year 4 Post-MOC v. Pre-MOC	-0.3	-5.6 to 4.9	0.90	None

[a]Differential change, 95% CIs, and P values reflect the difference between each post-MOC year and pre-MOC period (1999-2000) between the MOC-required and MOC-grandfathered beneficiary cohorts

[b] Denotes where the coefficient reported in the differential change column for an individual post-year is significantly different from another post-year coefficient

eTable 11 (con't)

Dependent measure	Differential change for the MOC-required group compared with the MOC-grandfathered group			Differential change significantly different from another year (P<0.05)[b]
	Differential Change[a]	95% CI[a]	P[a]	
Annual cost per beneficiary by care setting ($2013)				
Total Costs				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-167.0	-270.5 to -63.5	0.002	--
Year 1 Post-MOC v. Pre-MOC	-190.9	-335.3 to -46.5	0.01	None
Year 2 Post-MOC v. Pre-MOC	-160.4	-306.8 to -14.0	0.03	None
Year 3 Post-MOC v. Pre-MOC	-190.5	-339.7 to -41.2	0.01	None
Year 4 Post-MOC v. Pre-MOC	-121.0	-273.5 to 31.4	0.12	None
Ambulatory Costs				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-84.1	-121.6 to -46.6	<.001	--
Year 1 Post-MOC v. Pre-MOC	-65.5	-117.8 to -13.3	0.01	None
Year 2 Post-MOC v. Pre-MOC	-90.9	-143.9 to -37.9	0.001	None
Year 3 Post-MOC v. Pre-MOC	-117.7	-171.8 to -63.6	<.001	None
Year 4 Post-MOC v. Pre-MOC	-62.9	-118.2 to -7.7	0.03	None
Inpatient Costs				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-81.9	-162.1 to -1.7	0.05	--
Year 1 Post-MOC v. Pre-MOC	-125.5	-237.4 to -13.5	0.03	None
Year 2 Post-MOC v. Pre-MOC	-69.5	-182.9 to 44.0	0.23	None
Year 3 Post-MOC v. Pre-MOC	-71.1	-186.7 to 44.5	0.23	None
Year 4 Post-MOC v. Pre-MOC	-56.1	-174.2 to 61.9	0.35	None
Annual costs per beneficiary by BETOS category ($2013)				
Major Procedures				
Overall post-MOC (years: 1 - 4) v. Pre-MOC	-3.5	-13.0 to 6.0	0.47	--
Year 1 post MOC v. Pre-MOC	-10.0	-23.3 to 3.2	0.14	Year 4
Year 2 post MOC v. Pre-MOC	-5.4	-18.9 to 8.0	0.43	None
Year 3 post MOC v. Pre-MOC	-5.6	-19.3 to 8.1	0.42	None
Year 4 post MOC v. Pre-MOC	8.4	-5.5 to 22.4	0.24	Year 1
Minor/Ambulatory Procedures and Endoscopy				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	0.7	-5.5 to 6.9	0.82	--
Year 1 Post-MOC v. Pre-MOC	2.5	-6.1 to 11.2	0.56	None
Year 2 Post-MOC v. Pre-MOC	-0.3	-9.1 to 8.4	0.94	None
Year 3 Post-MOC v. Pre-MOC	-0.8	-9.7 to 8.2	0.87	None
Year 4 Post-MOC v. Pre-MOC	1.3	-7.8 to 10.5	0.77	None
Imaging				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-12.9	-17.7 to -8.2	<.001	--
Year 1 Post-MOC v. Pre-MOC	-12.2	-18.9 to -5.6	<.001	None
Year 2 Post-MOC v. Pre-MOC	-12.7	-19.4 to -5.9	<.001	None
Year 3 Post-MOC v. Pre-MOC	-15.3	-22.2 to -8.4	<.001	None
Year 4 Post-MOC v. Pre-MOC	-11.6	-18.7 to -4.5	0.001	None

[a]Differential change, 95% CIs, and P values reflect the difference between each post-MOC year and pre-MOC period (1999-2000) between the MOC-required and MOC-grandfathered beneficiary cohorts
[b] Denotes where the coefficient reported in the differential change column for an individual post-year is significantly different from another post-year coefficient

eTable 11 (con't)

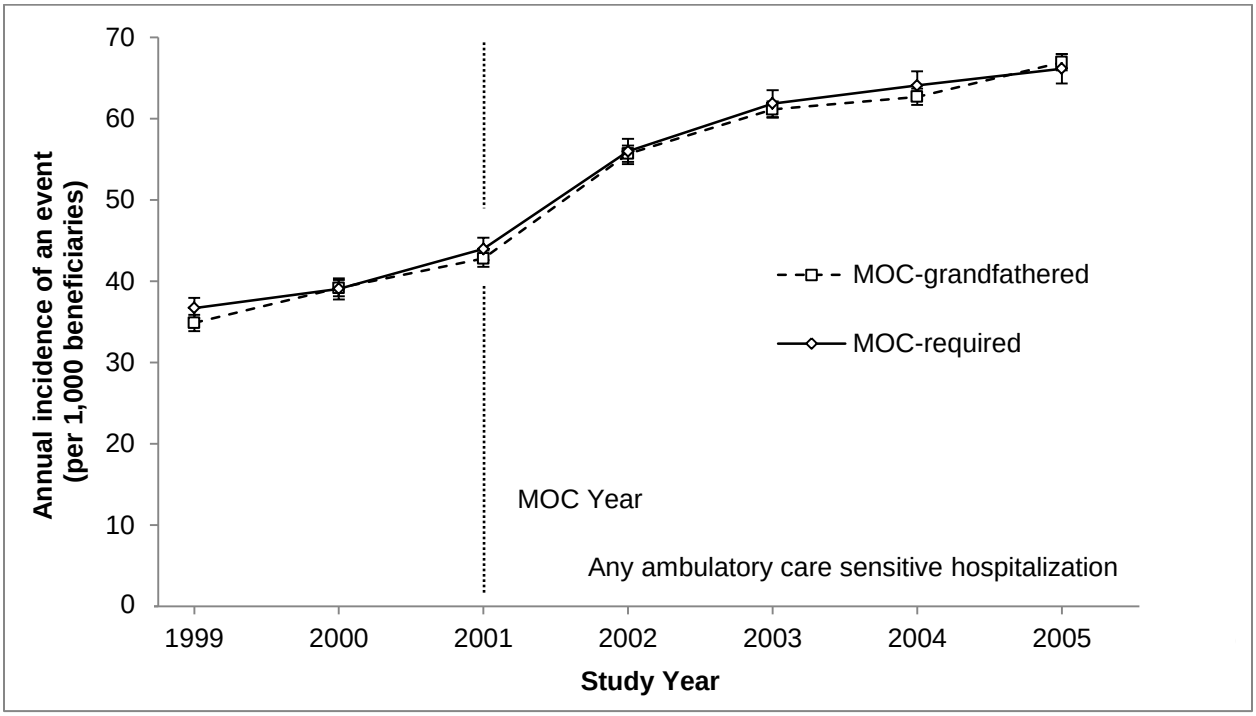
Dependent measure	Differential change for the MOC-required group compared with the MOC-grandfathered group			Differential change significantly different from another year (P<0.05)[b]
	Differential Change[a]	95% CI[a]	P[a]	
Laboratory Tests				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-5.9	-7.8 to -3.9	<.001	--
Year 1 Post-MOC v. Pre-MOC	-6.2	-8.9 to -3.6	<.001	Year 4
Year 2 Post-MOC v. Pre-MOC	-7.2	-9.9 to -4.5	<.001	Year 4
Year 3 Post-MOC v. Pre-MOC	-6.7	-9.4 to -3.9	<.001	Year 4
Year 4 Post-MOC v. Pre-MOC	-3.0	-5.8 to -0.2	0.04	Years 1-3
Testing Aggregate				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-18.8	-24.3 to -13.3	<.001	--
Year 1 Post-MOC v. Pre-MOC	-18.5	-26.2 to -10.8	<.001	None
Year 2 Post-MOC v. Pre-MOC	-19.9	-27.7 to -12.1	<.001	None
Year 3 Post-MOC v. Pre-MOC	-21.9	-29.9 to -14.0	<.001	None
Year 4 Post-MOC v. Pre-MOC	-14.6	-22.7 to -6.4	<.001	None
Specialty Ambulatory Visits/Consults				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-11.2	-15.0 to -7.5	<.001	--
Year 1 Post-MOC v. Pre-MOC	-8.2	-13.4 to -3.1	0.002	None
Year 2 Post-MOC v. Pre-MOC	-13.4	-18.6 to -8.1	<.001	None
Year 3 Post-MOC v. Pre-MOC	-12.8	-18.2 to -7.5	<.001	None
Year 4 Post-MOC v. Pre-MOC	-10.8	-16.3 to -5.3	<.001	None
Non-Specialty Ambulatory Visits/Consults				
Overall Post-MOC (years: 1 - 4) v. Pre-MOC	-2.7	-4.5 to -0.9	0.003	--
Year 1 Post-MOC v. Pre-MOC	-3.1	-5.6 to -0.6	0.02	None
Year 2 Post-MOC v. Pre-MOC	-2.6	-5.2 to -0.1	0.04	None
Year 3 Post-MOC v. Pre-MOC	-3.4	-6.0 to -0.8	0.01	None
Year 4 Post-MOC v. Pre-MOC	-1.7	-4.3 to 1.0	0.22	None

[a] Differential change, 95% CIs, and P values reflect the difference between each post-MOC year and pre-MOC period (1999-2000) between the MOC-required and MOC-grandfathered beneficiary cohorts
[b] Denotes where the coefficient reported in the differential change column for an individual post-year is significantly different from another post-year coefficient

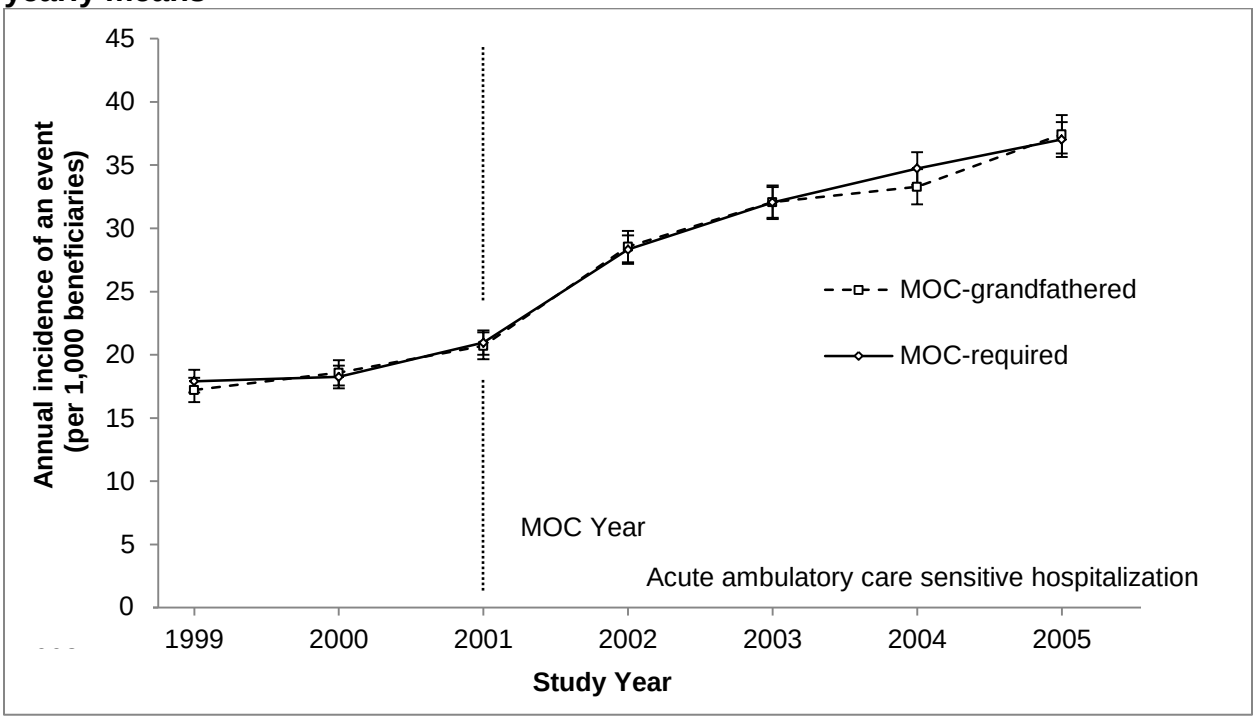
eMethods 11. Unadjusted Dependent Measures by Year and MOC Group

In this section, we provide graphs, for propensity score matched unadjusted mean outcome measure across years and or quarters, for the MOC-grandfathered and MOC-required cohorts of beneficiaries, 1999-2005.

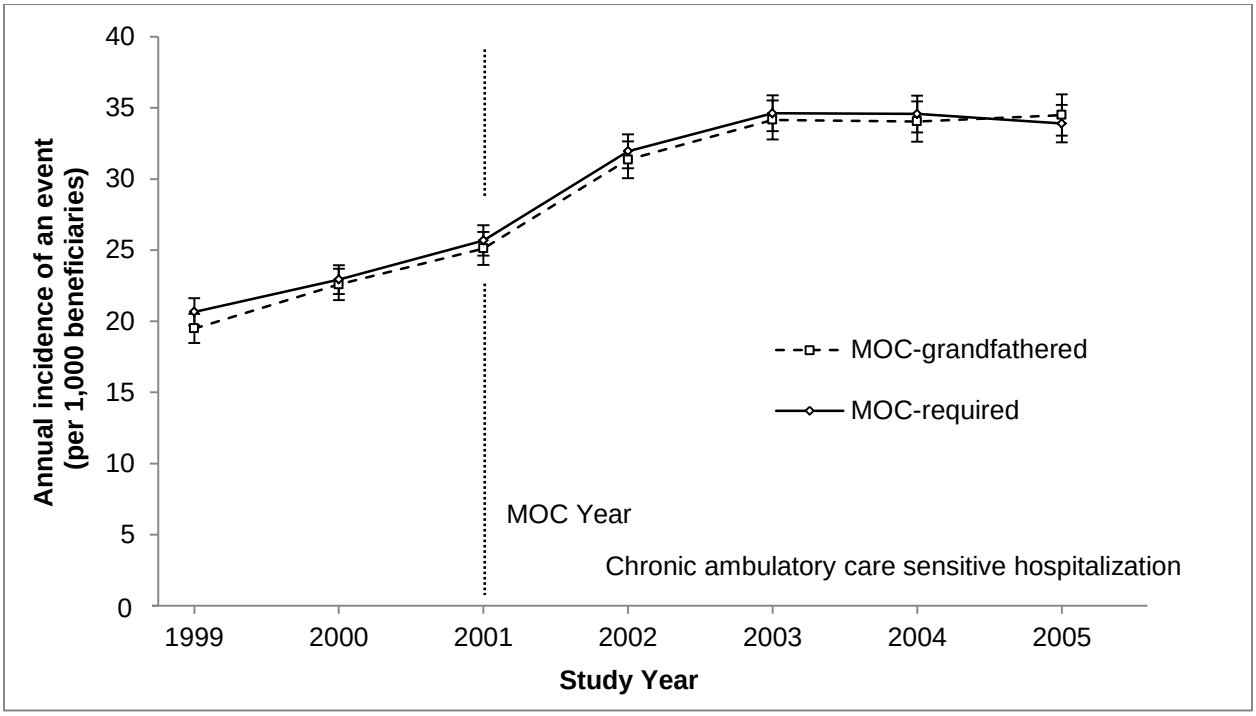
eFigure 1. Any ambulatory care sensitive hospitalization unadjusted yearly means



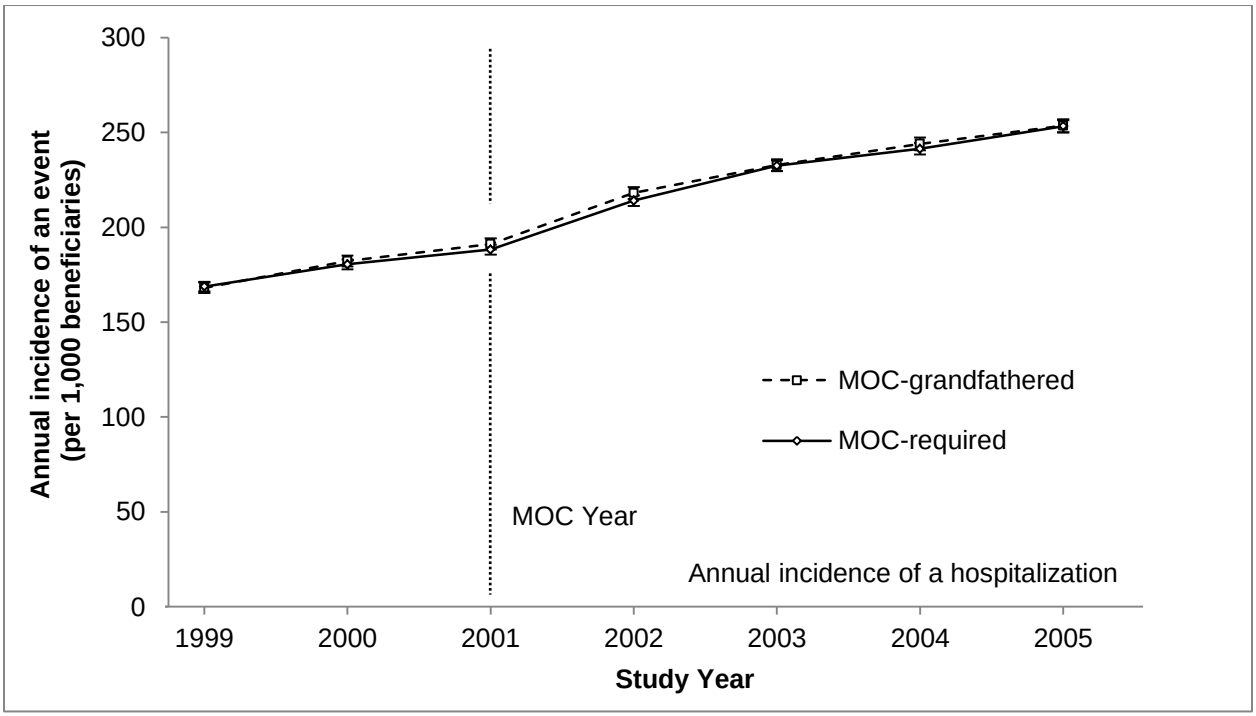
eFigure 2. Acute ambulatory care sensitive hospitalization unadjusted yearly means



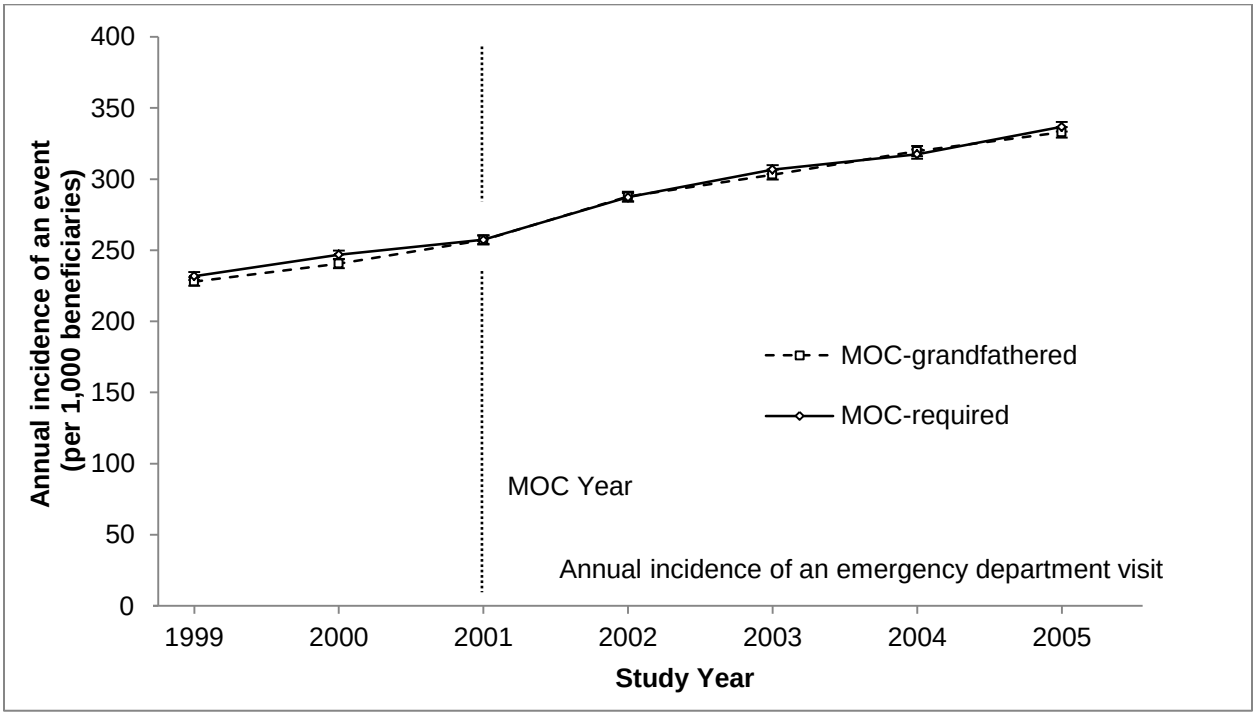
eFigure 3. Chronic ambulatory care sensitive hospitalization unadjusted yearly means



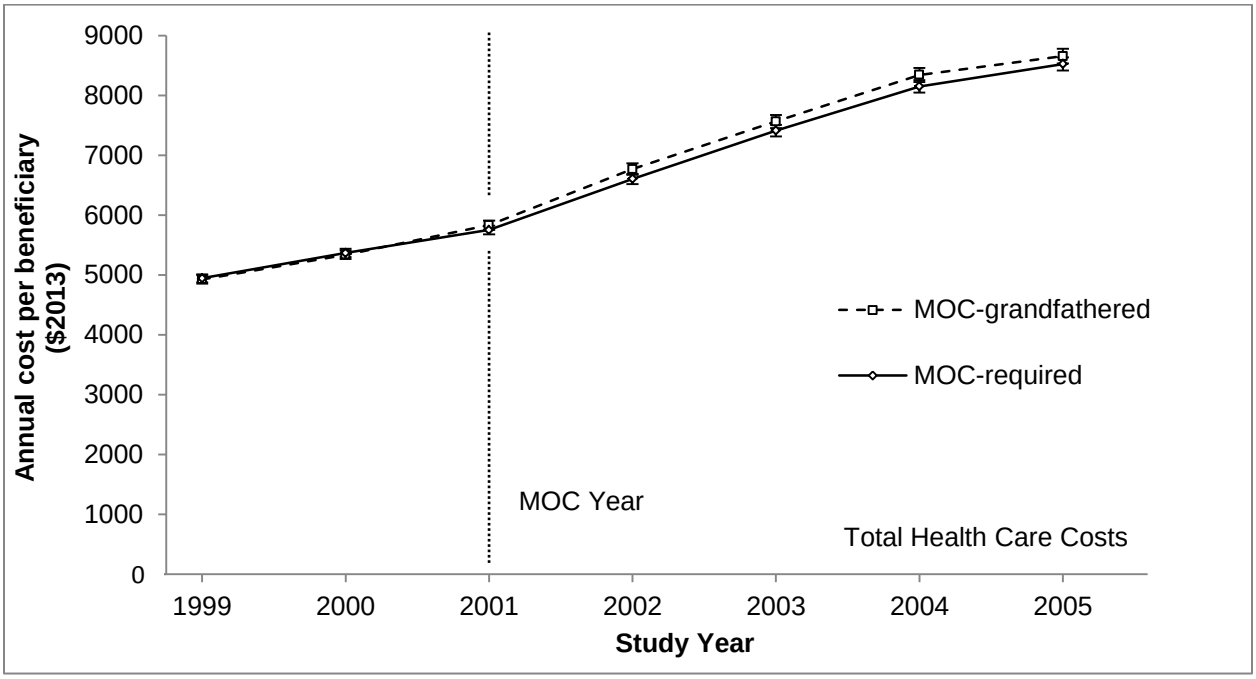
eFigure 4. Annual incidence of a hospitalization unadjusted yearly means



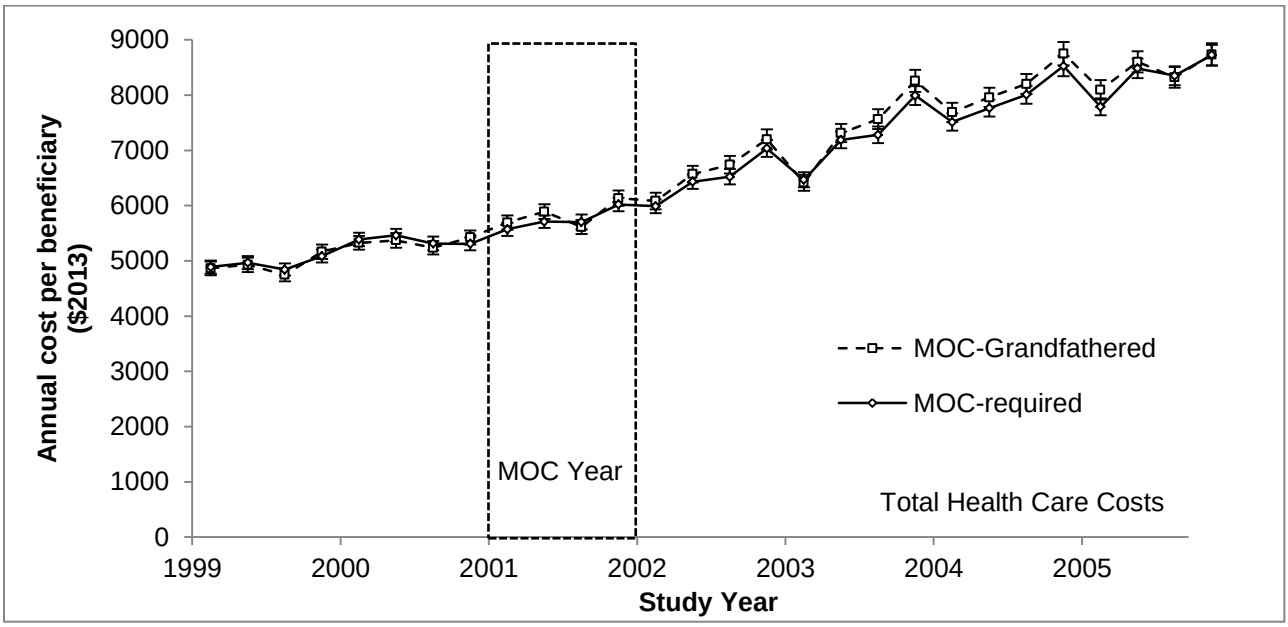
eFigure 5. Annual incidence of an emergency department visit unadjusted yearly means



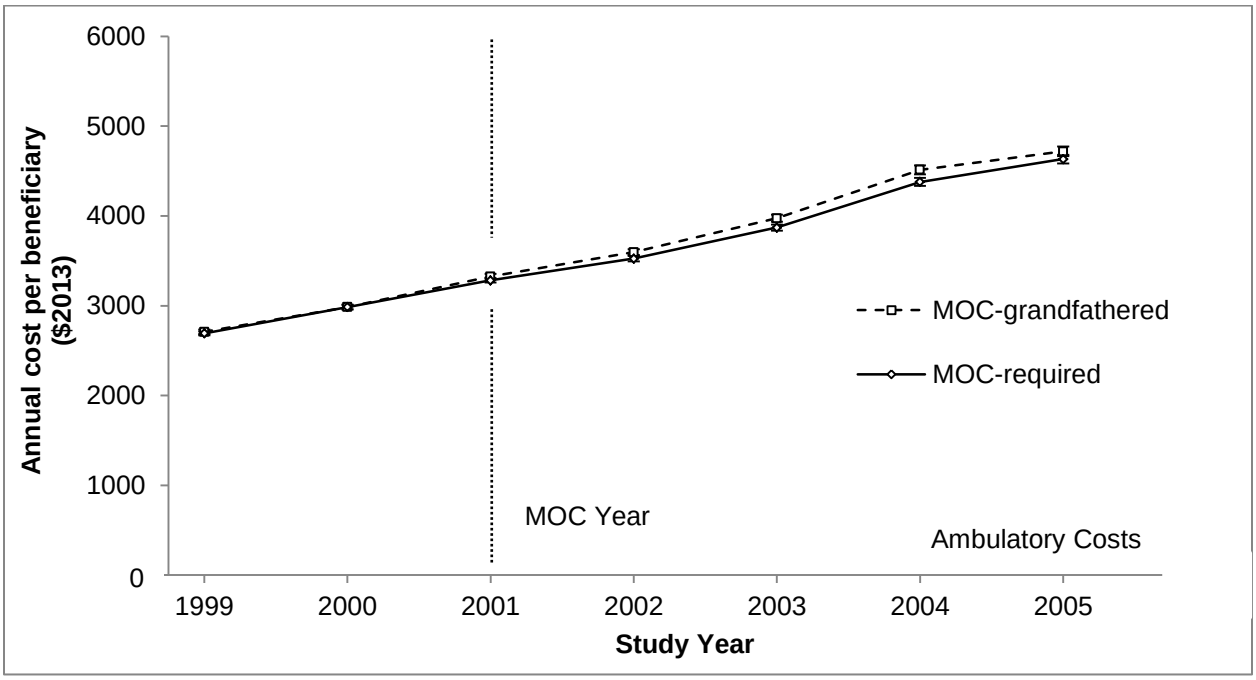
eFigure 6a. Total costs unadjusted yearly means



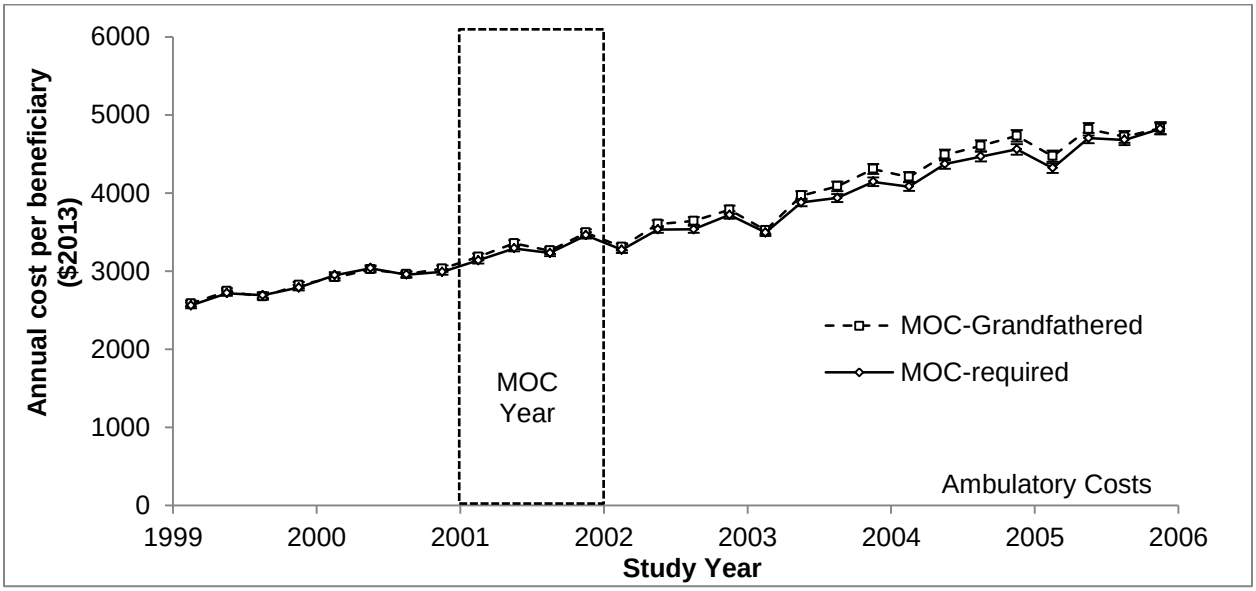
eFigure 6b. Total costs unadjusted quarterly means



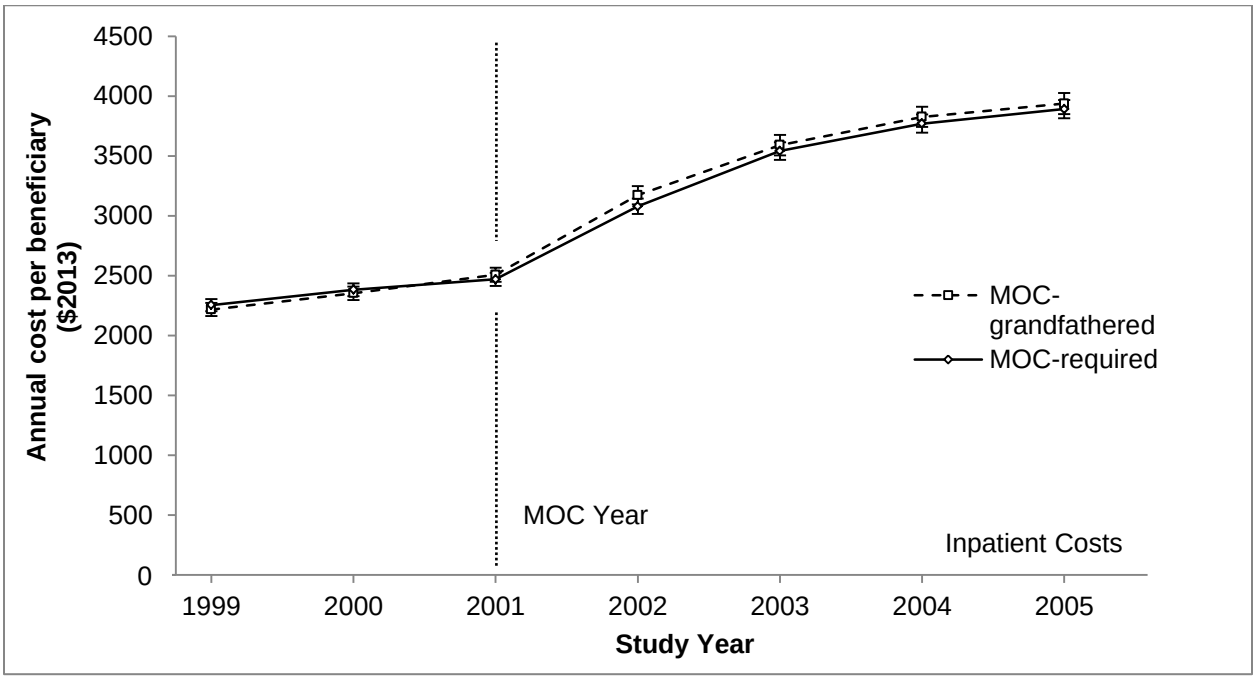
eFigure 7a. Ambulatory costs unadjusted yearly means



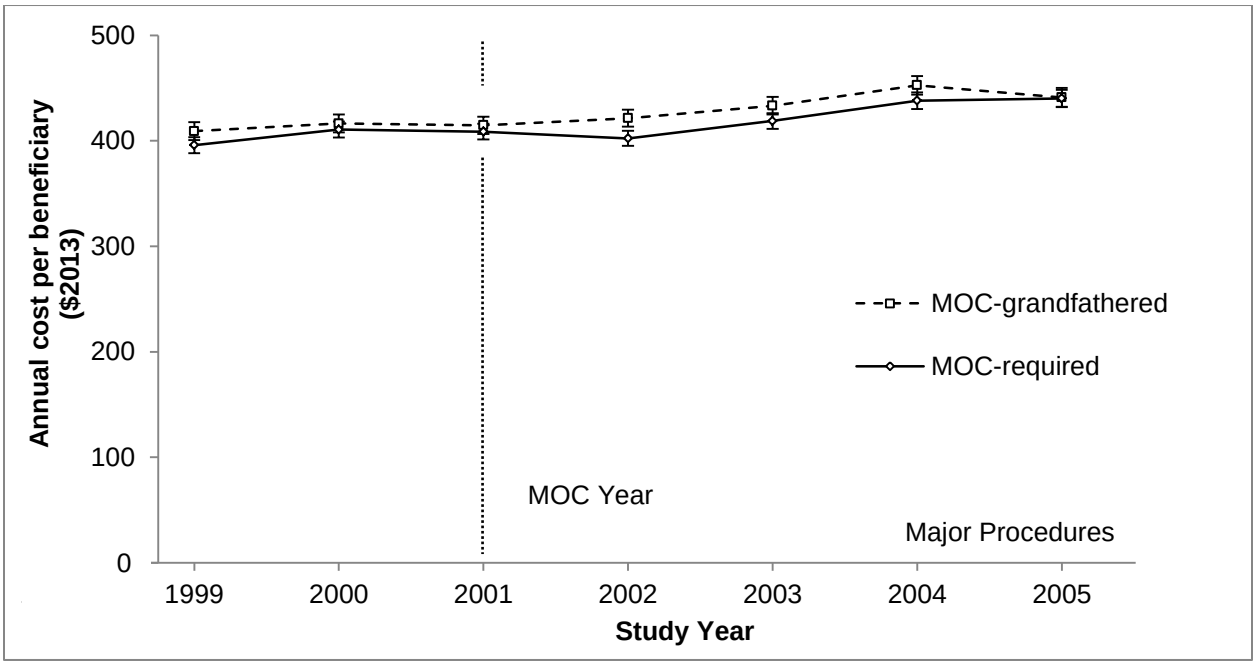
eFigure 7b.Ambulatory costs unadjusted quarterly means



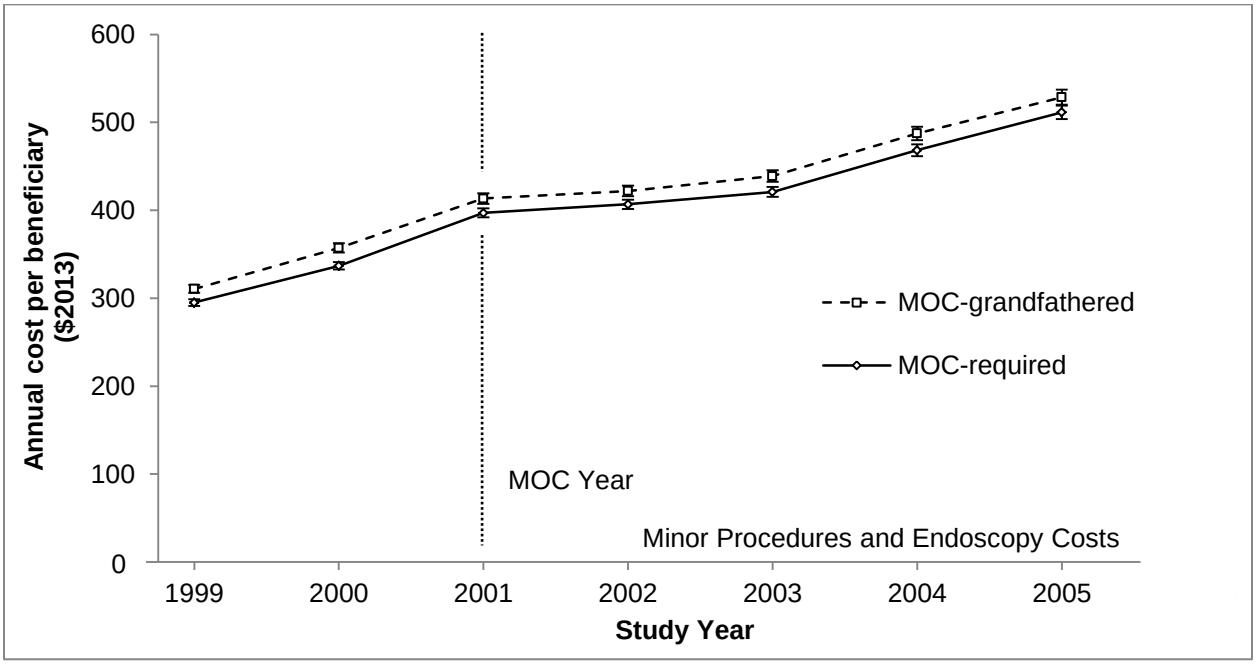
eFigure 8. Inpatient costs unadjusted yearly means



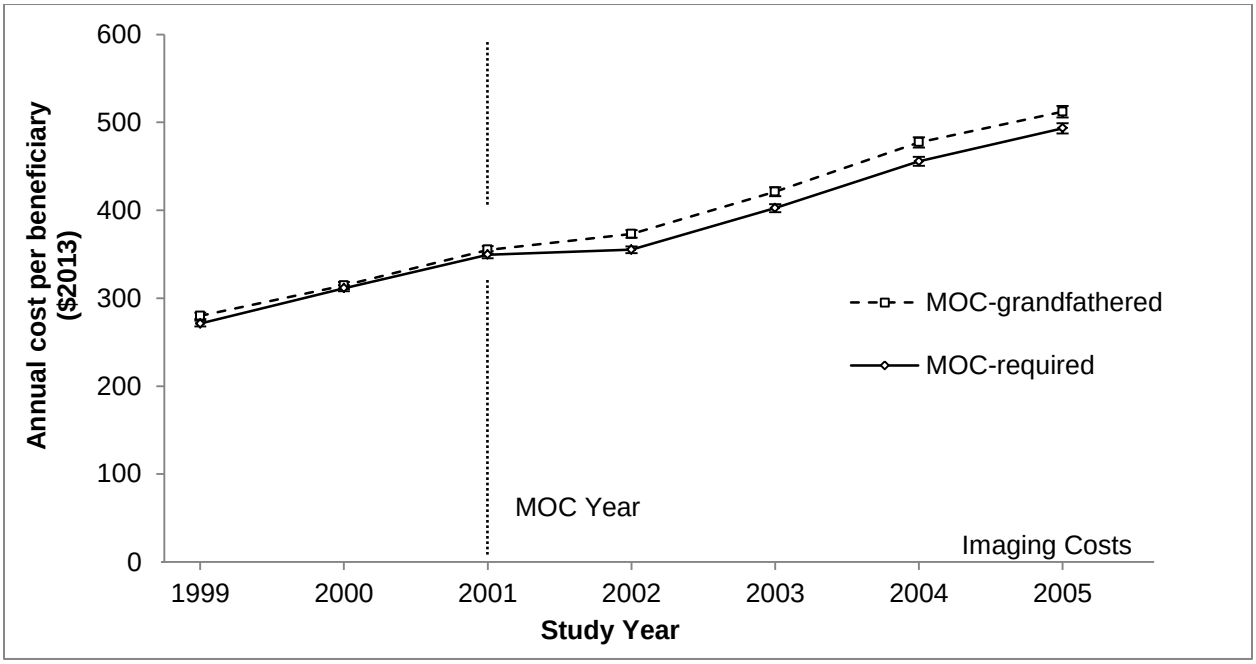
eFigure 9. Major procedure costs unadjusted yearly means



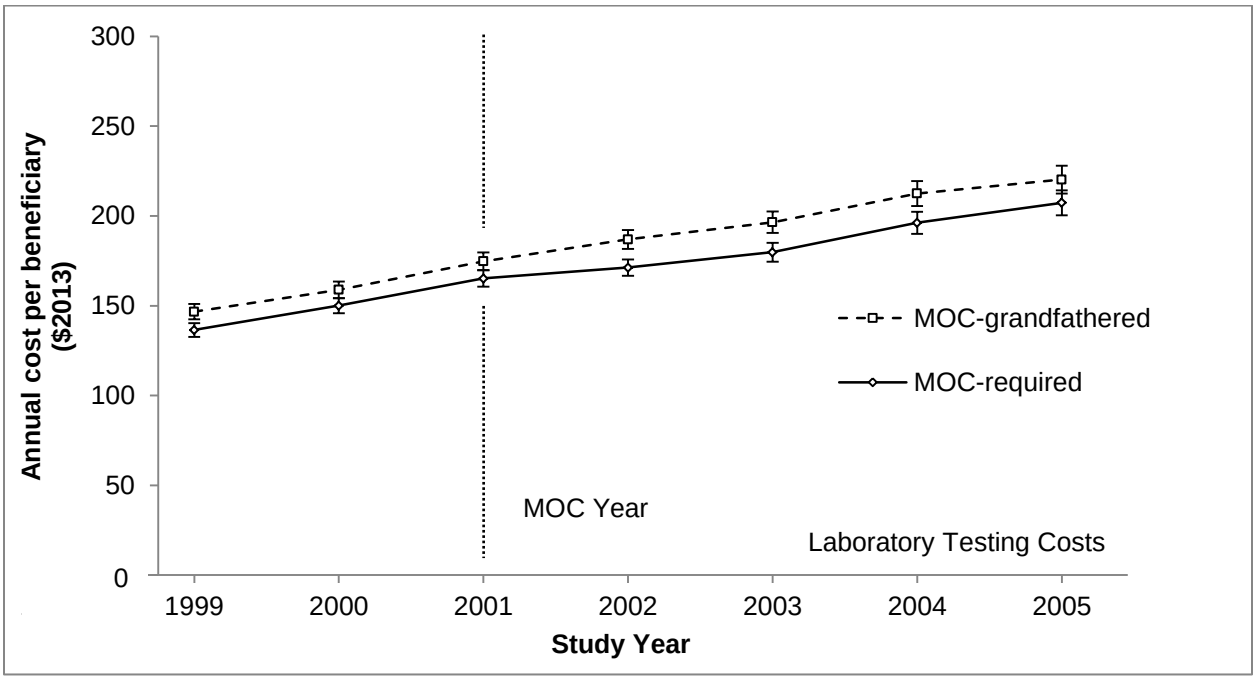
eFigure 10. Minor procedures and endoscopy costs unadjusted yearly means



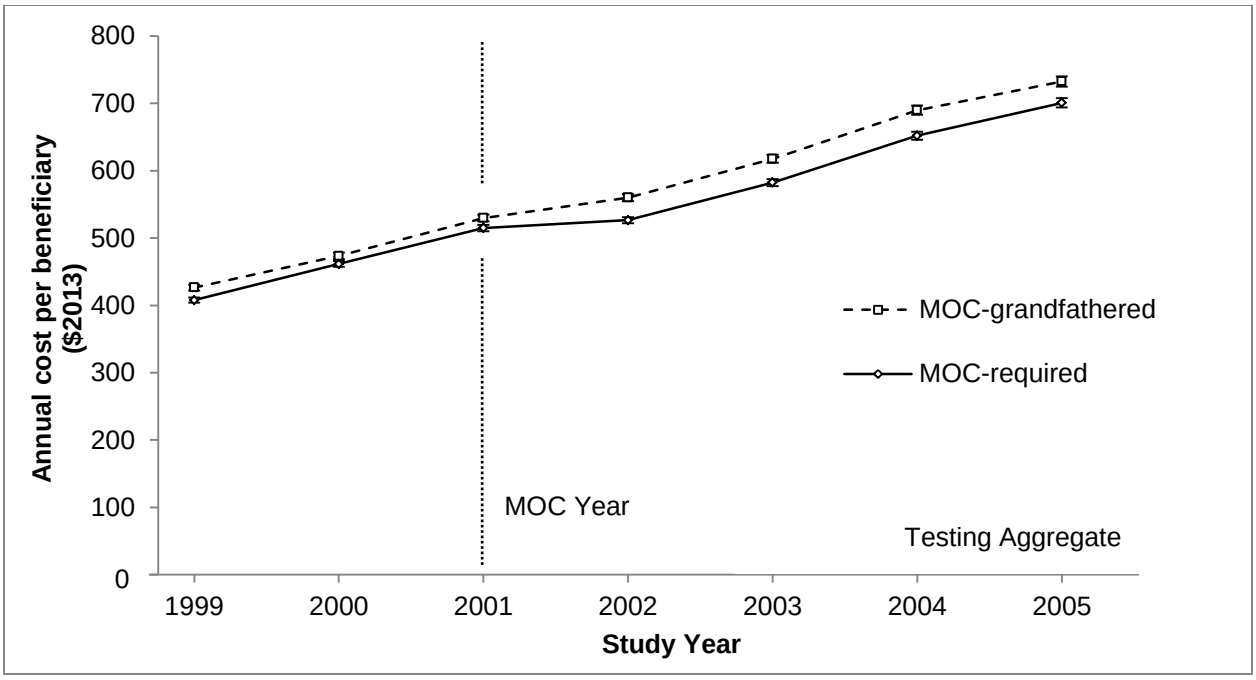
eFigure 11. Imaging costs unadjusted yearly means



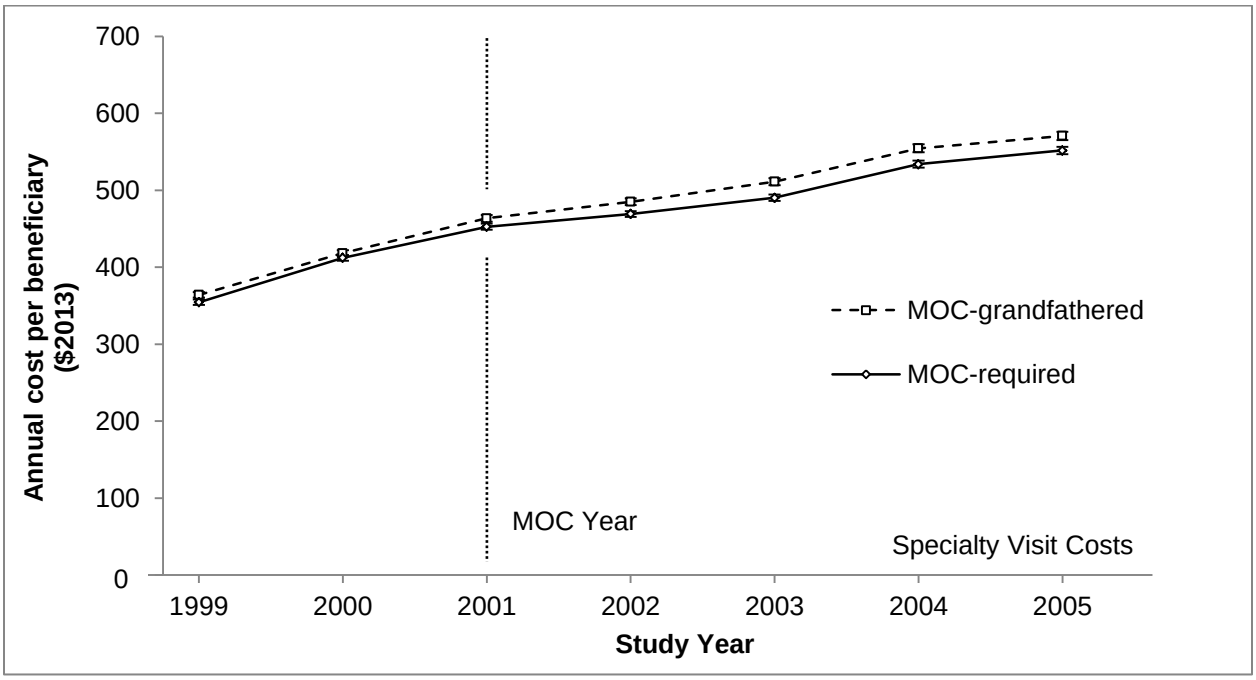
eFigure 12. Laboratory testing costs unadjusted yearly means



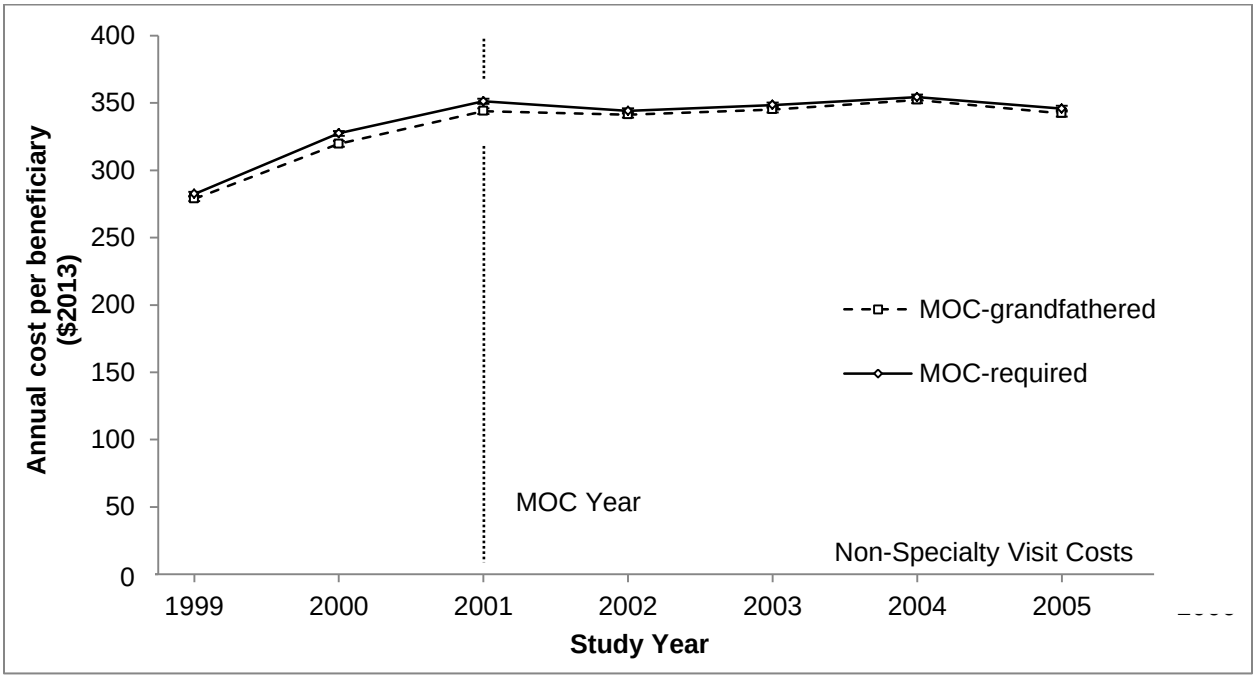
eFigure 13. Testing aggregate (imaging and laboratory tests) unadjusted yearly means



eFigure 14. Specialty visit costs unadjusted yearly means



eFigure 15. Non-specialty visit costs unadjusted yearly means



eMethods 12. Definition of chronic condition indicators

Chronic Condition Indicators

Baseline chronic condition indicators included as risk adjusters were based on the Hierarchical Condition Categories (HCC) defined by Pope et al.[8] HCC conditions are used by CMS in risk adjusting Medicare Advantage capitation rates. HCC indicators are defined based on the presence of select ICD-9 codes on claims in either year 1999 or year 2000. HCC indicators associated with acute conditions were not included as risk adjusters (e.g., HCC-154 Severe Head Injury or HCC-2 Opportunistic Infections).

eTable 12. Individual HCC indicators

HIV/AIDS	
HCC-1	HIV/AIDS
Neoplasms	
HCC-7	Metastatic Cancer and Acute Leukemia
HCC-8	Lung, Upper Digestive Tract, and Other Severe Cancers
HCC-9	Lymphatic, Head and Neck, Brain, and Other Major Cancers
HCC-10	Breast, Prostate, Colorectal, and Other Cancers and Tumors
Diabetes	
HCC-15	Diabetes with Renal or Peripheral Circulatory Manifestation
HCC-16	Diabetes with Neurologic or Other Specified Manifestation
HCC-18	Diabetes with Ophthalmologic or Unspecified Manifestation
HCC-19	Diabetes without Complication
Protein Calorie Malnutrition	
HCC-21	Protein Calorie Malnutrition
Liver Disease	
HCC-25	End-Stage Liver Disease
HCC-26	Cirrhosis of Liver
HCC-27	Chronic Hepatitis
Gastrointestinal Disease	
HCC-32	Pancreatic Disease
HCC-33	Inflammatory Bowel Disease
Rheumatoid Arthritis	
HCC-38	Rheumatoid Arthritis and Inflammatory Connective Tissues Disease
Hematological/Immunity Disorders	
HCC-44	Severe Hematological Disorders
HCC-45	Disorders of Immunity
Substance Abuse	
HCC-51	Drug/Alcohol Psychosis
HCC-52	Drug/Alcohol Dependence
Psychiatric Disorders	
HCC-54	Schizophrenia
HCC-55	Major Depressive, Bipolar, and Paranoid Disorders
Neurological Disorders	
HCC-70	Muscular Dystrophy
HCC-71	Polyneuropathy
HCC-72	Multiple Sclerosis
HCC-73	Parkinson's and Huntington's Disease
HCC-74	Seizure Disorders and Convulsions

eTable 12 (con't)

Heart Disease	
HCC-80	Congestive Heart Failure
HCC-83	Angina Pectoris/ Old Myocardial Infarction
HCC-92	Specified Heart Arrhythmias
Cerebrovascular Disease	
HCC-100	Hemiplegia/Hemiparesis
HCC-101	Cerebral Palsy and Other Paralytic Syndromes
Vascular Disease	
HCC-104	Vascular Disease with Complications
HCC-105	Vascular Disease
Lung Disease	
HCC-107	Cystic Fibrosis
HCC-108	Chronic Obstructive Pulmonary Disease
Eye Disease	
HCC-119	Proliferative Diabetic Retinopathy and Vitreous
Kidney Disease	
HCC-130	Dialysis
HCC-131	Renal Failure
Skin Ulcer	
HCC-149	Chronic Ulcer of Skin, Except Decubitus

eMethods 13. List of variables used in the propensity matching models

The propensity scores used for matching beneficiaries between the MOC-required and MOC-grandfathered beneficiary cohorts were generated using logistic regression. The variables noted below were used to construct the propensity model.

- Beneficiary age in 1999
- Beneficiary age squared in 1999
- Beneficiary gender
- Beneficiary indicator for white race
- 48 individual beneficiary HCC indicators (All indicators listed in eTable 12 except for HCC-130: Dialysis and HCC-70 for Muscular Dystrophy)
- The total number of beneficiary HCC Indicators (of all listed in listed in eTable 12)
- State indicators
- The beneficiary's attributed physician's gender
- An indicator for whether the beneficiary's attributed physician was an international medical school graduate
- An indicator for whether the beneficiary's attributed physician passed their internal medicine exam on their first attempt
- The beneficiary's attributed physician's first attempt internal medicine exam score

eMethods 14. Definition of Spending Categories.

Classification of costs based on BETOS coding was adapted from McWilliams et al.[9], and include costs from the carrier claims files and hospital outpatient claim files. Each HCPCS (CPT) code in claims was matched with a Berenson Eggars Type of Service (BETOS) code. These codes were in turn used to classify spending into categories. eTable 13 defines these categories.

eTable 13. Classification of costs based on BETOS coding

Cost Category	BETOS Codes
Major Procedures	P0 = Anesthesia; P1A = Major procedure - breast; P1B = Major procedure - colectomy; P1C = Major procedure - cholecystectomy; P1D = Major procedure - turp; P1E = Major procedure - hysterectomy; P1F = Major procedure - explor/decompr/excis disc; P1G = Major procedure - Other; P2A = Major procedure, cardiovascular-CABG; P2B = Major procedure, cardiovascular-Aneurysm repair; P2C = Major Procedure, cardiovascular-Thromboendarterectomy; P2E = Major procedure, cardiovascular-Pacemaker insertion; P2F = Major procedure, cardiovascular-Other; P3A = Major procedure, orthopedic - Hip fracture repair; P3B = Major procedure, orthopedic - Hip replacement; P3C = Major procedure, orthopedic - Knee replacement; P3D = Major procedure, orthopedic - other; P4A = Eye procedure - corneal transplant; P4B = Eye procedure - cataract removal/lens insertion; P4C = Eye procedure - retinal detachment; P4D = Eye procedure - treatment of retinal lesions; P4E = Eye procedure - other
Minor Procedures & Endoscopy	P5A = Ambulatory procedures - skin; P5B = Ambulatory procedures - musculoskeletal; P5C = Ambulatory procedures - groin hernia repair; P5D = Ambulatory procedures - lithotripsy; P5E = Ambulatory procedures - other; P6A = Minor procedures - skin; P6B = Minor procedures - musculoskeletal; P6C = Minor procedures - other (Medicare fee schedule); P6D = Minor procedures - other (non-Medicare fee schedule); P8A = Endoscopy - arthroscopy; P8B = Endoscopy - upper gastrointestinal; P8C = Endoscopy - sigmoidoscopy; P8D = Endoscopy - colonoscopy; P8E = Endoscopy - cystoscopy; P8F = Endoscopy - bronchoscopy; P8G = Endoscopy - laparoscopic cholecystectomy; P8H = Endoscopy - laryngoscopy; P8I = Endoscopy - other
Imaging	I1A = Standard imaging - chest; I1B = Standard imaging - musculoskeletal; I1C = Standard imaging - breast; I1D = Standard imaging - contrast gastrointestinal; I1E = Standard imaging - nuclear medicine; I1F = Standard imaging - other; I2A = Advanced imaging - CAT/CT/CTA: brain/head/neck; I2B = Advanced imaging - CAT/CT/CTA: other; I2C = Advanced imaging - MRI/MRA: brain/head/neck; I2D = Advanced imaging - MRI/MRA: other; I3A = Echography/ultrasonography - eye; I3B = Echography/ultrasonography - abdomen/pelvis; I3C = Echography/ultrasonography - heart; I3D = Echography/ultrasonography - carotid arteries; I3E = Echography/ultrasonography - prostate, transrectal; I3F = Echography/ultrasonography - other

Lab Tests	M5A = Specialist - pathology (HCPCS moved to T1G in 2003); T1A = Lab tests - routine venipuncture (non-Medicare fee schedule); T1B = Lab tests - automated general profiles; T1C = Lab tests - urinalysis; T1D = Lab tests - blood counts; T1E = Lab tests - glucose; T1F = Lab tests - bacterial cultures; T1G = Lab tests - other (Medicare fee schedule); T1H = Lab tests - other (non-Medicare fee schedule)
Specialty Visits	M1A = Office visits - new; M1B = Office visits - established; M5B = Specialist - psychiatry; M5C = Specialist - ophthalmology; M5D = Specialist - other; M6 = Consultations For all provider types except: 01 = General practice; 08 = Family practice; 11 = Internal medicine; 12 = Manipulative therapy (osteopaths only); 37 = Pediatric medicine; 38 = Geriatric medicine; 84 = Preventive medicine

eTable 13 (con't)

Cost Category	BETOS Codes
Non-Specialty Visits	M1A = Office visits - new; M1B = Office visits - established; M5B = Specialist - psychiatry; M5C = Specialist - ophthalmology; M5D = Specialist - other; M6 = Consultations For only the following provider types: 01 = General practice; 08 = Family practice; 11 = Internal medicine; 12 = Manipulative therapy (osteopaths only); 37 = Pediatric medicine; 38 = Geriatric medicine; 84 = Preventive medicine

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