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Characteristics That Predict Physician Participation in a Web-Based CME Activity: The MI-Plus Study

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Abstract

Introduction—Physician use of the Internet for practice improvement has increased dramatically over the last decade, but research shows that many physicians choose not to participate. The current study investigated the association of specific physician characteristics with enrollment rates and intensity of participation in a specific Internet-delivered educational intervention to improve care to post–myocardial infarction (MI) patients.

Methods—Primary-care physicians were recruited for participation in a randomized controlled trial designed to compare effectiveness of an intervention Web site versus a control Web site in the management of adult chronic disease. Physicians were informed that the intervention focused on ambulatory post–myocardial infarction patients. Physician characteristics were obtained from a commercial vendor with data merged from the American Medical Association and Alabama State Licensing Board. Enrollment and Web use were tracked electronically.

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Results—Out of a sample of 1337 eligible physicians, 177 (13.2%) enrolled in the study. Enrollment was higher for physicians with more post-MI patients (≥20 vs < 20 patients, 15.3% vs 9.3%, P = .002) and for those practicing in rural compared to urban areas (16.3% vs 12.1%, P = .046). Intensity of use of the Internet courses after initial enrollment was not predicted by physician characteristics in the current sample.

Discussion—Physicians with more post-MI patients and rural practice location were found to predict enrollment in an Internet-delivered continuing medical education (CME) intervention designed to improve care for post-MI patients. These factors predicted program interest but not program use. More research is needed to replicate these findings to investigate variables that determine physician engagement in Internet CME.

Keywords

education; medical; continuing; evidenced-based practice; Internet use; myocardial-infarction care; diffusion of innovation

Introduction

The Internet provides continuing medical education professionals with the ability to offer an extensive array of on-line learning opportunities that have tremendous potential to improve physician knowledge, performance, and clinical effectiveness. Internet-delivered continuing medical education (CME) offers participants many advantages, including convenience, flexible scheduling, improved access by geographically disbursed learners, and adaptability to learner styles.[1–8] Studies have shown that the instructional efficacy of on-line CME compares favorably with live interactive workshops for knowledge acquisition and transfer, and evidence demonstrating the ability of this type of CME to bring about practice change and patient health-care outcomes is also now beginning to emerge.[5,9,10] In addition, a number of authors have reported positive outcomes in on-line CME associated with effective facilitation of social interaction between participants.[4,11,12]

The growing popularity of Web-based CME courses is reflected by recent dramatic increases in the availability of on-line professional development options. The ACCME 2003 Annual Report reveals that between 1997 and 2006, the number of accredited hours of Internet-delivered CME increased 10-fold, with the number of participating physicians increasing from 38 000 to 2.1 million.[13] In addition, the number of certified Internet-based enduring activities increased by nearly 12% (23 939 versus 26 763) between 2006 and 2007. The number of certified Internet-based live activities increased by nearly 50% (893 in 2006 versus 1330 in 2007) during that same 1-year period.[14,15] Although estimates of the total number and percentage of physicians participating in on-line CME vary, there seems to be general agreement that the popularity of on-line CME among physicians appears to be increasing each year and is expected to continue on this trajectory.[6,16,17]

Despite the increased availability and demonstrated advantages of Web-based approaches, not all physicians use Internet-delivered CME. Much of the previous research in this area has focused on barriers to Internet use or general user satisfaction with on-line CME, rather than identifying characteristics of physician users.[18–20] Although completion of CME is a requirement for maintaining professional standing in all states, physicians have many options in terms of course topics, format and course design, duration, and cost. An array of factors have the potential to influence a physician to participate in a specific CME program, and these include both internal (eg, interest, curiosity, self-assessed need, motivation) and external variables (eg, course availability, reputation or credibility of source, incentives, cost, time, access, distance, course content, other course features such as attractiveness and design of materials, etc). Several studies have been reported that identify characteristics of

physicians who report using Internet CME.[18,21] One study reported that physicians who used on-line CME programs were more likely to be younger and female in comparison to their older and male counterparts in their study sample.[16] The authors discussed their findings in the context of Roger's Diffusion of Innovation Theory, suggesting that the adoption and growth of on-line CME was most likely occurring in diffusion networks dominated by relatively new medical school graduates and women who could be seen as innovators and early adopters.[22]

Other models have also been used to provide a framework for describing interest use by physicians. For example, Choo's general model of information use identifies major elements that influence information-seeking behavior.[23] Application of this model to participation in on-line CME can be seen in the work of Bennett et al,[6] but it has not been widely used by other researchers to interpret the findings in this area. The work of Christensen and Armstrong involving diffusion of innovation[33] also has tremendous potential to assist CME professionals in identifying potent variables that might influence the uptake of Internet CME programs. Given the importance of CME in maintaining professional skills and competencies, and in light of the large inventory of available on-line courses, identifying physician characteristics that lead to CME on-line participation is timely and of major importance to CME providers.

Current Study and Hypotheses

The purpose of this study was to identify potential physician and practice characteristics that predict participation in a specific Internet-based CME intervention. We conducted a retrospective analysis that analyzed enrollment and participation data generated from the MI-Plus study,[24] a randomized-controlled trial of an evidence-based, multimodal Internet-delivered intervention to improve the quality of care of ambulatory post–myocardial infarction (post-MI) patients. Several variables were examined to evaluate their relationship in predicting enrollment rate and intensity of participation in the MI-Plus on-line CME course. We hypothesized that the number of post-MI patients seen by each physician in their practice would represent a numerical indication for strength of "clinical relevance," which has been previously shown to be predictive of physician Internet use.[6,18] Our prediction was that physicians with larger numbers of post-MI patients would be more likely to enroll in the Internet-delivered intervention compared to physicians with fewer post-MI patients. In addition, we hypothesized that self-reported practice location would be related to participation rate, with physicians in urban areas more likely to participate than physicians in rural areas. Previous research has been reported that physicians from rural areas had lower interest in on-line CME in comparison to the same course content offered as live CME lectures.[25] We were interested in whether changes in access to Internet services over time in many rural areas could result in changes in interest in on-line CME participation by rural physicians. Our third and last hypothesis predicted that physician age and practice group size would both be negatively associated with Web course enrollment.[26]

Methods

Study Setting and Sample

Community-based primary care physicians in Alabama caring for post-MI patients were recruited to participate. This group of eligible physicians was initially identified by linking a database purchased from a commercial vendor (SK&A) by the Division of CME, University of Alabama School of Medicine, to Medicare claims data. The Quality Improvement Organization (QIO) for Alabama matched MI cases to physicians by linking inpatient and outpatient claims files (1999–2004). MI cases were identified using ICD-9 codes 410.xx (acute MI) and 412.xx (old MI). The authors received only aggregate information with no

patient identifiers. Physicians were recruited with the use of priority courier service, and repeated (weekly) fax and electronic mail. In addition, a 1-time ad was placed in the Alabama Medical Association's newsletter and telephone solicitation was employed. The overall recruitment goal was 200 physicians, based on a priori power computations for the randomized trial. Physician recruitment incentives included a medical textbook, access to on-line journals, and CME units. Institutional Review Board approval for the study was granted at our institution.

Study recruitment materials and the log-on process informed participating physicians of their assignment to condition, either intervention or control. The initial log-on (enrollment) page was the same for both groups, and confirmed that each participating physician was caring for post-MI Medicare patients.

The MI-Plus Study

Physicians assigned to the MI-Plus intervention arm were provided an Internet-based, multimodal educational program of up to 30 months' duration, depending on enrollment date. The on-line educational program for the intervention group included 9 sequentially released interactive modules, periodic literature updates, a patient toolbox, and 1-time, physician-specific performance feedback. Details of the intervention Internet features are described elsewhere.[24] Physicians in the control arm of the study received quarterly modules on adult medicine case scenarios consisting of 3 cases per module, designed to require approximately 3–5 minutes each to complete. The enrollment period began May 12, 2004 and ended January 18, 2006. Data collection for this analysis was closed November 14, 2006.

Data Elements and Sources

The following physician characteristics were obtained using 2004 AMA data available to the Division of CME: (1) physician gender, (2) year graduated from medical school, (3) birth date, and (4) whether or not primary occupation was full-time direct patient care. These data supplemented the SK&A database containing (5) specialty, (6) practice location, and (7) group size (number of physicians in the practice). Offices of 36 enrolled physicians for whom practice size was missing from the SK&A data were contacted by phone to obtain this information. Using the 5-digit office ZIP Code, (8) practice locations were designated as rural or urban based on the rural–urban commuting area code.[13] Post-MI patients were matched to a physician when Medicare Part B claims (2001–2004) indicated that the post-MI patient had made their most recent 2 outpatient visits to that physician. Finally, (9) physician race/ethnicity was obtained from the Alabama State Licensing Board.

Statistical Analysis

Descriptive statistics (means, medians, ranges, and frequencies) were used to describe the study sample. Bivariate associations were assessed with the use of χ-square statistics, *t* tests, Spearman correlations, and nonparametric tests. Physician age and year graduated from medical school were highly correlated; thus only age was used in subsequent analyses. Categorizations of selected characteristics were informed by the bivariate analysis. Multiple logistic regression was used to identify independent associations of the 7 characteristics—gender, race, age, specialty (family or general practice, general internal medicine), group size, practice location, and number of post-MI patients treated—with enrollment. Analyses were conducted on the entire study population as well as restricting to physicians aged <65 years.

Study Population

Of 1840 physicians in our initial recruitment pool, 136 were determined to be ineligible when contacted by phone (46 not primary care, 9 not treating cardiac patients, 15 not treating Medicare patients, 33 moved out of state, 17 retired, 2 not physicians, 4 on medical/maternity leave, 4 part-time only, and 6 other reasons). An additional 9 physicians were excluded during randomization when they indicated that they did not treat post-MI Medicare patients and 3 physicians were excluded due to electronic enrollment errors. We linked 1514 (89.3%) of the remaining 1695 physicians with AMA data. Following this linkage, an additional 177 physicians were excluded when AMA records indicated that they were not full-time primary-care practitioners. Linkage was higher for enrolled than nonenrolled physicians (97% versus 88%; $P < .001$).

Results

Recruitment Pool

The recruitment pool of 1337 physicians was predominantly male (80.4%) with an average age ± SD of 48.7 ± 10.1 years (range: 29–81). Internists represented 46.6% of the sample and 27.4% of the participating physicians worked in rural areas. The median number of physicians per practice was 3 (range: 1–372). The median number of post-MI patients per physician was 31 (range: 0–420); 4.9% of physicians ($n = 65$) did not have any post-MI patients identified from the Medicare inpatient files. Both practice size and number of post-MI patients were highly skewed, with 3 practices having >100 physicians and 8 having >100 post-MI patients (not the same practices). Practice size and number of post-MI patients were not correlated (Spearman $r = 0.04$, $P = .1$). Because of practice size and number of post-MI patient skewness, these characteristics were categorized for analysis. Race/ethnicity information was available for 88.7% of physicians, which revealed that 79.2% were White, 8.8% Black, 9.5% Asian, and 2.5% other ($n = 30$, 4 American Indian, the remaining 26 known to be NOT White, Black, or Asian).

Enrollment

Enrollment was defined as having logged on to the MI-Plus Web site regardless of how many course modules were subsequently completed. Overall, 13.2% of eligible physicians in the recruitment pool enrolled in the Web-based CME course. The average age of physicians who enrolled (mean = 48.7 years) was similar to that of the original recruitment pool, as were the practices in terms of number of physicians within group practices (TABLE 1). In terms of absolute percentages, enrollment was higher for men, internists, physicians practicing in rural areas, and for physicians who followed more post-MI patients (TABLE 1). TABLE 2 presents unadjusted and adjusted odds ratios for enrollment in the Internet study. Physicians with more post-MI patients and physicians located in rural areas were more likely to enroll, and these associations persisted with multivariable adjustment. Similar results were observed when the analysis was restricted to physicians aged <65 years (data not shown).

Intensity of Participation

Overall, 91 physicians were randomized to the intervention arm and 86 physicians were randomized to the control arm. The median number of case modules completed by the overall group was 1, with a range from 0 ($n = 52$; 29.4%) to 9 ($n = 1$; 0.6%). The median number of visits to the Web site was 3, with a range from 1 ($n = 41$; 23.2%) to 35 ($n = 1$; 0.6%). Significant correlations were not found between age, group size, or number of post-MI cases per physician and the number of case modules completed, number of Web site visits, or randomization group (intensity of participation or engagement).

Discussion

In this regional, community-based study of primary-care physicians, both practice case mix and rural location were modestly and significantly associated with enrollment in Internet CME. A full understanding of our results may require looking at our findings with the use of several models or frameworks. The implications of our findings for future studies and the design and delivery of CME programs will emerge from this discussion.

Our results about case mix are largely consistent with previous research showing that relevance to clinical practice is a requirement for successful CME efforts.[6,8,27,28] Recent surveys show that physicians are most likely to use the Internet to obtain medical information related to a specific question related to a specific clinical case, and seem to learn best when looking for the answer to a clinical question that arises from actual practice.[4,6,21] An illustration of this can be found in a recent study that reported that physicians' likelihood of enrollment in a multicomponent Internet CME course to improve chlamydia screening increased with the number of at-risk women in their practice.[29] In our study sample, it seems likely that physicians caring for a larger number of post-MI patients found MI-Plus on-line course more relevant to their practice than recruited physicians with fewer post-MI patients. The application of Choo's theoretical model to this finding could be appropriate, as one might assume that physicians with more post-MI patients had larger information needs than physicians with fewer post-MI patients, leading to motivation for information-seeking behaviors. Behaviorally, these information-seeking behaviors would be seen or expressed as higher rates of enrollment in a course that physicians were told was designed to increase their skills in providing care to their post-MI patients.

So why didn't this same group of physicians also exhibit more active participation in the course once enrolled? Choo's model postulates that every search for information (cognitive need) is accompanied by affective or emotional needs. It may be that physicians in our sample quickly satisfied an emotional need (to "do something") by course enrollment, but failed to satisfy cognitive needs through their interaction with the first course module. Is it possible, for example, that the content in the initial course module was familiar or not engaging? If so, Choo's model would suggest that unmet information needs could give rise to feelings of frustration or dissatisfaction (rather than feelings of satisfaction) that would terminate information seeking. However, an analysis of course evaluation results revealed that the overwhelming majority of participants rated the on-line program favorably, data that does not support the application of Choo's model to our results.

Alternatively, it is possible that low participation intensity (number of visits to the Web site and number of case modules completed) might be accounted for by the method used to reimburse physicians for participation in the study. Physicians were reimbursed for course enrollment with free on-line literature searches, medical textbook, on-line journal subscriptions, and e-mailed quarterly medical topics updates following course registration. Consequently, it was possible for a physician to enroll on the course Web site and leave right away without completing any course modules and still be reimbursed for participation. Without additional data from participants, it is difficult to interpret these results fully. Future studies may want to examine the effects of providing reimbursement for completing course modules, or possibly a "distributed" approach that provides positive reinforcement at several points (based on time or course content).

The finding that rural practice was associated with significantly higher enrollment (compared to urban practice) in the MI-Plus Internet course could suggest an "emerging market" for CME. Although this conclusion is tempting, the small sample size of rural physicians and relatively low overall participation rate gives us pause. As in other parts of

the United States, rural areas in Alabama have less access to high-speed Internet services compared to urban areas in the region, a gap that may be narrowing each year but was still substantial in 2004–2006. Less access to the Internet in these geographic areas originally led us to predict low enrollment rates from the rural physicians in the MI-Plus study. However, our results suggest that our sample of Alabama rural physicians were a receptive audience (when enrollment rates are compared to physicians from urban areas) for Web-delivered CME. This might be explained by the fact that these rural physicians were recruited specifically because the CME content addressed specific needs based on practice characteristics (ie, the result of purposive sampling) in combination with the lack of other CME options to address these specific educational needs. Historically, rural physicians have tended to have fewer local CME opportunities than their urban counterparts.[30,31] CME delivered via the Internet has the potential to address this problem, and consequently could play an important role in retention of physicians in rural areas.[32] It is important to note, however, that because only 16.3% of the rural physicians in our eligible study pool enrolled in the MI-Plus Internet course, more research effort is needed to identify effective recruitment strategies to increase enrollment from this target population further. If rural physicians are by definition more socially isolated from colleagues and access to live CME activities, it may be useful for CME professionals and researchers to look at social factors that have been recently found to facilitate positive outlines in on-line CME.[11]

The application of Diffusions of Innovation Theory (DoI) could also be helpful in interpreting our results. Rogers[22] proposed that innovative technologies and ideas are initially tested, adopted, and promoted by innovators and early adopters (opinion leaders), spreading later to other members of the diffusion network who can be categorized as early majority, late majority, and laggards. A key tenet of the theory is that personal characteristics define each of these category types and predict how quickly an innovation or new idea will be embraced by an individual. In general, individuals will adopt an innovation if they believe that it will enhance their utility, yield some relative advantage, and if they believe that the potential benefits outweigh the costs. Some authors have suggested that Internet CME can be viewed as educational innovation that is still in the early stages of growth and development,[33] and that growth in on-line CME can be conceptualized as occurring in diffusion networks.[16] The phenomenon of traditionally low participation rates in on-line CME programs might be explained by Rogers's observation that innovators comprise a relatively small percentage of any social system. In the context of the current study, physicians who chose to enroll could be viewed as innovators and early adopters. Presumably, the newness and unfamiliarity of the MI-Plus program would likely only initially attract this segment of the population of physicians. While this is a helpful and interesting way to think about the initial enrollment of the MI-Plus participants, it does not necessarily help us understand the large percentage of enrolled participants who subsequently minimized their participation after enrollment and on average completed only 1 course module.

Our findings can also be viewed in the context of what Christensen and Armstrong describe as a "disruptive technology." [33] According to this theory, physicians and other health professionals with busy schedules and very little time for traditional live CME meetings and activities may decide to participate in professional development activities that are "good enough" to meet their needs for licensure, immediate relevance of the subject matter (clinical relevance), convenience, and quick (and often free) access. With the use of examples from several industries, the authors suggest that disruptive technologies typically attract nonmainstream participants (or customers) with their focus on convenience and simplicity. Over time, disruptive technologies are capable of gaining access to mainstream markets (and audiences) by adding other attributes to their innovative products. In the case of on-line CME activities, these might include new teaching strategies based on cognitive

science, adult learning theory, and other highly interactive, learner-centered approaches. Leading providers of CME run the risk of losing physician participants to new providers of CME who successfully employ innovative disruptive technology to physicians who seek educational opportunities that are "good enough" because of formats and venues that are convenient and accessible.[33]

The MI-Plus course participants could be thought of as nonmainstream CME participants, willing to accept an online educational program that is "good enough" to satisfy their needs for easy access, immediate relevance to practice needs, and low (no) cost. A strategic advantage of disruptive technologies in CME lie in their ability to deliver relevant content "on demand" to large audiences that are currently served by traditional programs. From a disruptive technology perspective, we may have successfully attracted an appropriate target audience of CME consumers, ie, primary-care physicians in Alabama who may be defined as innovators and early adopters from the perspective of adopting an innovative technology to meet their CME needs.

Our study has a number of limitations. Given the length (30 months) and multimodal format of our Internet intervention, our findings may be difficult to compare with studies involving CME Internet courses using other formats and courses of shorter duration. It is possible that different participants are attracted to different types of Internet-based CME, making comparison across studies difficult. In addition, the 8 physician characteristics examined in the current study did not predict intensity of participation in the online course. Data needed to examine the predictors of persistence after course enrollment was not available due to the original study design. Multidimensional measures designed to evaluate engagement in Internet-delivered courses more comprehensively have been reported elsewhere (Houston, 2007).

Another limitation was that information on previous experience with Internet CME was not systematically collected from study participants, limiting both the interpretation and generalizability of our results. However, because many of our participants were recruited from the Alabama Practice-Based CME Network, we can assume that most had experience with on-line CME courses. Collecting self-report data on estimates of previous Internet use would have been very helpful, and may have emerged as a predictor of intensity of participation.

Because our sample of physicians all practiced in Alabama, our findings may not generalize to other regions of the country. In addition, better data and a larger sample size are needed to describe the professional development needs of primary care physicians in rural Alabama accurately and confidently. Our study sample was purposive, in that we specifically recruited physicians who reported caring for post-MI patients. This recruitment and selection method may have created a biased sample of participants who were intentionally recruited because of the clinical relevancy of the offered on-line program. Given the study design, our finding that rural physicians were more likely than urban physicians to participate may be, at least in part, an artifact of the research protocol. As a result, we are cautious in generalizing our results to other samples of rural physicians who have other case mix clinical practices.

Conclusions

The 2 strongest predictors of primary-care physician enrollment in our Internet educational program, having more post-MI patients and being an internist, were consistent with the generally accepted concept that clinical relevance is a prerequisite for physician engagement in educational interventions. Factors that predicted initial physician enrollment, however, do

not predict the extent and duration of course participation after initial enrollment. Future studies are needed to identify the variables that enhance active participation following initial enrollment, as well as the development of effective course content that sustains course participation. The positive relationship between rural practice and Internet enrollment, however, was an unexpected finding and suggests to us that as access to the Internet becomes ubiquitous in the United States, Web-based educational programs may become strategically more important as a potentially effective means to address the unmet CME needs among rural physicians who could be categorized as innovators or early adopters. Future research efforts may want to focus on the needs of this group.

Recruiting physicians to participate in professional development activities, including new state-of-the-art on-line CME programs, is obviously a challenging task. For the professional medical educator, Internet-based interventions may be the best available approach to providing high quality, low-cost programs to busy physicians who are juggling multiple demands. As an example of a “disruptive technology,” e-learning technology has the potential to dramatically change the landscape of continuing education programs for health-care professionals. In order to prepare for this revolution, further study of how best to engage physicians in evidence-based on-line learning is needed.

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Lessons for Practice

- Clinical relevance was a strong predictor of enrollment in Web-delivered CME, as with all CME.
- Rural practices were more likely to enroll in Web-delivered CME.
- Participants may be viewed as innovators and early adopters from a diffusion of innovation perspective.
- On-line CME may be seen as a type of disruptive technology.
- Future research is needed to identify the educational needs of rural providers, and strategies for increasing participation in Internet CME more clearly.

TABLE 1

Characteristics of Physicians Who Enrolled in an Internet-Delivered Educational Study: The MI-Plus Study, 2004–2006

Characteristic[a]	Number in Pool	Percent of Pool (Column %)	Number Enrolled	Percent Enrolled (Row %)	*P* (for Differences in Enrollment)
All	1337	100.0%	177	13.2%	
MD sex					0.053
Male	1075	80.4%	152	14.1%	
Female	262	19.6%	25	9.5%	
MD race					0.5
White	939	70.2%	124	13.2%	
African-American	104	7.8%	10	9.6%	
Asian	113	8.5%	19	16.8%	
Other/unknown	181	13.5%	24	13.3%	
MD age					0.2
<45	480	35.9%	61	12.7%	
45–54	511	38.2%	67	13.1%	
55–64	243	18.2%	40	16.5%	
65+	102	7.6%	9	8.8%	
Mean ± SD (range)	48.6 ± 10.2 (29–81)		48.7 ± 9.8 (29–81)		
Practice: specialty					0.09
Internal medicine	623	46.6%	93	14.9%	
Family/general practitioner	714	53.4%	84	11.8%	
Practice: number of MDs in group[b]					0.7
1	406	30.4%	57	14.0%	
2–3	419	31.3%	53	12.6%	
≥4	464	34.7%	63	13.6%	
Median (range)	3 (1–372)		3 (1–199)		
Practice: location					0.046
Urban	970	72.6%	117	12.1%	
Rural	367	27.4%	60	16.3%	
Number of post-MI patients[c]					0.009
0–19	453	33.9%	42	9.3%	

Characteristic[a]	Number in Pool	Percent of Pool (Column %)	Number Enrolled	Percent Enrolled (Row %)	*P* (for Differences in Enrollment)
20–45	436	32.6%	65	14.9%	
≥46	448	33.5%	70	15.6%	
Median (range)	31 (0–420)		40 (0–154)		

[a]Missing data: age, 1; size, 48.

[b]Thirty-nine general practice.

[c]Tertiles.

TABLE 2

Predictors of Physician Enrollment in an Internet-Delivered Educational Study: The MI-Plus Study, 2004–2006[a]

	Unadjusted			Adjusted[b] Model		
Characteristic	**OR[c]**	**95% CI[d]**	***P***	**OR[c]**	**95% CI[d]**	***P***
Male (vs female)	1.6	1.0–2.4	0.05	1.3	0.8–2.1	0.2
Race: African American vs White	0.7	0.4–1.4	0.3	NA		
Race: Asian vs White	1.3	0.8–2.2	0.2	NA		
Age: ≥65 years (vs <65)	0.6	0.3–1.2	0.2	NA		
Internist (vs family practice)	1.3	1.0–1.8	0.09	1.3	0.9–1.8	0.1
Group size: ≥4 vs <4 physicians	1.0	0.7–1.4	0.9	NA		
Practice location: rural vs urban	1.4	1.0–2.0	0.04	1.4	1.0–2.0	0.04
Number of post-MI patients per physician: ≥20 vs <20	1.8	1.2–2.5	0.002	1.5	1.0–2.2	0.03

[a] MI: myocardial infarction.

[b] Characteristics for which $P < .1$ in bivariate analyses were included in the adjusted model.

[c] OR: odds ratios.

[d] CI: confidence intervals.