

# Medical Groups' Adoption Of Electronic Health Records And Information Systems

Practices are encountering greater-than-expected barriers to adopting an EHR system, but the adoption rate continues to rise.

by **David Gans, John Kralewski, Terry Hammons, and Bryan Dowd**

**ABSTRACT:** We surveyed a nationally representative sample of medical group practices to assess their current use of information technology (IT). Our results suggest that adoption of electronic health records (EHRs) is progressing slowly, at least in smaller practices, although a number of group practices plan to implement an EHR within the next two years. Moreover, the process of choosing and implementing an EHR appears to be more complex and varied than we expected. This suggests a need for greater support for practices, particularly smaller ones, in this quest if the benefits expected from EHRs are to be realized.

**M**OST MEDICAL GROUP PRACTICES have computer-based billing systems and patient scheduling systems, but the expansion into clinical support functions has been slow.<sup>1</sup> Physician practices are experiencing downward price pressures from managed care plans and from Medicare and Medicaid, as well as pressure to document and improve the quality of care; pay-for-performance programs will but strengthen these forces.

Although the empirical evidence documenting consistent cost or quality improvements resulting from implementing electronic health records (EHRs) in group practices is still limited, there is widespread political support for implementation. The American Academy of Family Practice has asserted that the effective use of information technology (IT) is essential for the provision of high-quality care in the increasingly complex health care field.<sup>2</sup> Purchasers of care, including some large employers and the Centers for Medicare and Medicaid Services (CMS), are promoting EHR adoption and are considering programs to help finance the costs or to provide financial incentives to those who implement EHRs.<sup>3</sup>

In spite of this enthusiasm, the adoption of EHRs appears to be proceeding rela-

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tively slowly, for a number of reasons.<sup>4</sup> Because of the large number of systems being offered, it is not easy—especially for smaller practices—to identify which systems would meet a practice's needs. There is justifiable concern about the stability of many companies offering EHRs and whether the products will have adequate technical support. It is difficult for some physician practices—especially those that are small and physician-owned—to meet the managerial challenges and the capital costs of EHR systems.<sup>5</sup> There are anecdotal descriptions of successful return on investment by practices that have implemented EHRs and credible projections of positive return on investment; however, we are not aware of an extensive, methodologically sound assessment in the literature.<sup>6</sup>

There are good reasons to expect clinical and perhaps economic benefits for practices implementing EHRs and considerable interest in furthering their adoption, but also a great deal of uncertainty. We assessed the rate and process of adoption of IT and EHRs by medical group practices through findings from a national survey conducted during January and February 2005 and a series of interviews and site visits to practices.

## Study Data And Methods

■ **Data.** Our data are from a survey of a stratified random sample of group practices drawn from a national database of 34,490 medical groups that we assembled for a previous project.<sup>7</sup> *Group practices* were defined as three or more physicians practicing together with a common billing and medical record system. We placed these 34,490 practices into sixteen sampling cells for our EHR study (four regions and four practice sizes), and we drew 50 percent random samples of the group practices in each cell. These practices were surveyed using a three-stage process: (1) All of those with e-mail addresses were asked by e-mail to complete a Web-based survey instrument, then (2) a paper survey was mailed to practices with no e-mail address and to those who had not yet responded to the Web survey with a request to complete the Web survey or return the mailed paper survey.<sup>8</sup> These two requests resulted in 2,879 responses to the two surveys combined, with rates of response ranging from 13.6 percent for practices with five or fewer physicians to 26.9 percent for practices with twenty-one or more physicians. After reviewing the patterns of respondents and nonrespondents in each cell, (3) we conducted a telephone survey of a stratified sample of 750 nonresponding practices selected randomly from each cell. The telephone survey obtained a 97 percent response rate and so provided excellent data to detect nonresponse bias in the combined Web and mail survey results.

■ **Study methods.** The percentage of practices with EHRs was slightly higher among respondents to the combined Web and mail surveys (15.5 percent) than respondents to the telephone survey (13.4 percent); this difference is attributable in part to a higher fraction of larger practices (a higher percentage of which have EHRs) in the combined Web and mail survey respondents. To examine the potential for nonresponse bias from these surveys, we compared those responses with the

telephone survey responses for the principal question about whether a practice has an EHR system. The correlation between type of survey response and whether a practice has an EHR was not significant ( $p = .09$ ). Because we had observed that the percentage of practices with EHRs differs greatly by size of practice (although not by geographic region), we then used logistic regression to compare rates of EHRs for telephone survey respondents to respondents to the combined Web and mail surveys, controlling for practice size. In this analysis, the percentage of practices with EHRs was, again, slightly higher among the combined Web and mail respondents than among the telephone respondents for the smaller groups, and again the variable for type of survey was not statistically significant ( $p = .10$ ). We concluded that there might be a small but not statistically significant nonresponse bias in the combined Web and mail survey data, and we pooled data from the combined Web and mail survey and telephone survey for further analysis.<sup>9</sup>

The combined data were roughly evenly distributed among the four regions, with adequate numbers in each size cell for analyses by region, size and specialty of practice, and other factors. The overall response rate for the combined data set was 21.1 percent, ranging by size from 16.1 percent for practices with five or fewer physicians to 33.9 percent for practices with twenty-one or more, and by region from 17.6 percent for the eastern region to 24.7 percent for the western region.<sup>10</sup>

### Study Results

■ **Adoption of EHRs.** Using the combined database, 15.0 percent percent of all respondents reported that they had EHRs. After the results were reweighted to adjust for our sample's being stratified by size of practice, an estimated 14.1 percent of the 34,490 group practices in our universe database had EHRs (Exhibit 1).

The fraction of practices that have implemented EHRs varies greatly by prac-

**EXHIBIT 1**  
**Type Of Health Record Used, By Practice Size, 2005**

Number of FTE physicians in practice	Type of record (%)				
	Paper medical record filed in cabinet	Scanned image filed electronically using a document image management system (DIMS)	Dictation and transcription system combined with DIMS	EHR in a relational database	Other
5 or fewer	78.0	2.3	6.3	12.5	0.9
6-10	73.9	3.0	7.2	15.2	0.7
11-20	67.0	1.6	11.7	18.9	0.9
21 or more	65.8	3.1	10.7	19.5	1.0
All practices <sup>a</sup>	75.3	2.5	7.2	14.1	0.9

**SOURCE:** The information in this exhibit is derived from the authors' own analyses.

**NOTE:** FTE is full-time equivalent.

<sup>a</sup> Percentage of all practices combined with an electronic health record (EHR) in the raw data was 15.0 percent, corrected to 14.1 percent after weighting to correct for having oversampled larger practices.

tice size, somewhat by specialty type and ownership, and minimally by region.<sup>11</sup> As others have found, smaller practices have lower EHR adoption rates.<sup>12</sup> We found that about 12 percent of practices with five or fewer full-time-equivalent (FTE) physicians have EHRs, while practices with more than ten physicians have higher rates (about 19 percent); these estimates, particularly for smaller practices, may be biased upward. The higher rates of adoption for larger practices could be explained by greater available financial resources and administrative capacity or by other factors.<sup>13</sup>

These data indicate that only about one-fifth of practices with twenty-one or more physicians have adopted these technologies; about 12–13 percent of practices with five or fewer physicians have EHRs. However, a substantial number of practices indicate that they are planning to adopt EHRs in the future (Exhibit 2). If these plans were to be fully carried out, about 60 percent of practices would have adopted EHR technologies two years from now, and 80 percent among the largest practices (twenty-one or more physicians). But even if the projections proved reliable, the data show that smaller practices are implementing at a slower rate than larger practices and that nearly half of practices with five or fewer FTE physicians currently do not have EHRs and have no plans to implement them within the next two years. Further, projections such as these must be regarded as quite uncertain; adoption may fall short of these plans. It will be important to track adoption and implementation over time to determine whether these intentions are realized, and to better understand factors that influence the rate of implementation.<sup>14</sup>

■ **What can these EHRs do?** To further evaluate what an EHR system means and can do, we asked the practices that have EHRs to indicate whether the EHR systems have each of the capabilities listed in Exhibit 3.<sup>15</sup> The capabilities are ordered roughly from most likely to least likely to be present.

Overall, these EHRs have extensive capabilities, with nearly all allowing re-

**EXHIBIT 2**  
**Degree Of Electronic Health Record (EHR) Implementation, By Practice Size, 2005**

Number of FTE physicians in practice	Degree of implementation (%)				
	Fully implemented for all physicians in all locations	Implementation in process	Implementation planned in next 12 months	Implementation planned in next 13–24 months	Not implemented and no plans to implement in next 24 months
5 or fewer	10.4	10.3	12.6	18.9	47.8
6–10	13.6	11.8	15.9	21.4	37.3
11–20	13.9	20.7	20.0	18.4	27.0
21 or more	11.0	28.5	15.7	24.2	20.2
All practices <sup>a</sup>	11.5	12.7	14.2	19.8	41.8

**SOURCE:** The information in this exhibit is derived from the authors' own analyses.

**NOTE:** FTE is full-time equivalent.

<sup>a</sup>Percentage of all practices that have fully implemented an EHR for all physicians in all locations in the raw data was 15.0 percent, corrected to 11.5 percent after weighting to correct for having oversampled larger practices.

**EXHIBIT 3**  
**Electronic Health Record (EHR) Capabilities, By Size Of Medical Group, 2005**

EHR feature/capability	Number of physician FTEs in practice (%)			
	5 or fewer	6-10	11-20	21 or more
Patient demographics	99	99	99	100
Visit/encounter notes	98	96	99	98
Patient medications/prescriptions	96	97	98	98
Presenting complaint	96	97	99	95
Physical exam/review of systems	97	96	97	96
Past medical history	95	95	99	95
Problem lists	94	93	94	96
Procedure/operative notes	92	93	97	96
Laboratory results	89	87	94	97
Drug interaction warnings	79	75	81	84
Radiology/imaging results	75	72	87	89
Consult/reports from specialists	78	81	86	84
Referrals to specialists	84	79	78	77
Drug reference information	76	80	78	79
Immunization tracking	80	72	64	75
Drug formularies	62	64	67	68
Clinical guidelines and protocols	64	62	71	64
Integration with practice billing system	84	83	83	75

**SOURCE:** The information in this exhibit is derived from the authors' own analyses.

**NOTE:** FTE is full-time equivalent.

ording and retrieval of the basic elements of the medical record (the first eight capabilities listed). Capabilities for managing results of laboratory and imaging tests and referrals are somewhat less available, and least available are several relating to prescribing drugs (except for the patient medication list), tracking immunizations, and using clinical guidelines and protocols. We do not discern consistent differences in capabilities by size of practice. Just over 80 percent of these practices' EHRs are integrated with the practice's billing system, which is necessary to realize some of the benefits to documentation of services provided and billed.

■ **What are the perceived benefits of EHRs?** We asked all respondents to provide a subjective evaluation of the (experienced or expected) benefit of EHRs to the practice, using a five-point scale ranging from 1 (no value) to 5 (very important value). Exhibit 4 provides mean values for practices that reported having EHRs.

Administrators of practices that have EHRs speak from experience and clearly believe that the EHRs make major contributions to their practices: Most of the scores were 4 ("important value") or higher. Improved access to medical record information was the highest-rated benefit, and improved workflow in the practice was second. It has been pointed out that redesigning and improving workflow is essential to fully realizing the benefits of IT. Scores for features that are important in the direct care of the patient are generally higher than those related to cost sav-

**EXHIBIT 4**  
**Perceived Benefits Of Electronic Health Records (EHRs) To The Practice, 2005**

<b>Benefit to the practice</b>	<b>Mean rating</b>
Improved access to medical record information	4.60
Improved workflow	4.49
Improved patient communications	4.28
Improved accuracy for coding evaluation and management procedures	4.28
Improved drug refill capabilities	4.21
Reduced medication errors	4.19
Improved charge capture	4.16
Improved clinical decision making	4.15
Improved claim submission process	4.13
Reduced medical records staff expenses	3.96
Reduced medical records storage costs	3.92
Reduced transcription costs	3.92
Reduced medical records transportation costs	3.64
Improved physician recruitment	3.31

**SOURCE:** The information in this exhibit is derived from the authors' own analyses.

**NOTE:** Based on a five-point scale ranging from 1 (no value) to 5 (very important value).

ings. Whether this results from a lag in achieving savings or the possibility that there are few realized savings is unknown, but it suggests that benefits to patient care are at least as important as improvements in the financial performance of the practice. We did not see consistent differences in benefits experienced by size of practice for practices that have EHRs. A separate analysis showed that practices that have not implemented EHRs and have no plans to do so in the next two years rate each of the (expected) benefits lower than practices that have implemented, are implementing, or plan to implement EHRs (data not shown). Different expectations of benefits presumably help explain these practices' decisions not to adopt.

■ **What are the barriers to EHR adoption?** To explore barriers to EHR adoption from the broadest perspective, we asked both those practices that have implemented EHRs and those that have not to rate the items shown in Exhibit 5 in terms of their importance as factors making EHR implementation difficult. None of the barriers was rated at 4 or above, and most were rated around 3 (“complicates implementation to some degree”). For those with and without EHRs, the top five barriers were related to aspects of costs and to concern about physicians' support and ability to use the new system. Practices that have implemented EHRs rated the “people barriers”—lack of support from physicians, nonphysician providers, and other clinical staff—higher than those that have not. As one might expect, practices that have not implemented EHRs and have no plans to do so within two years rate nearly all of these barriers higher than practices that have implemented, are implementing, or plan to implement EHRs (data not shown).

**EXHIBIT 5  
Barriers To Implementing Electronic Health Records (EHRs), 2005**

Barrier	Mean rating		
	Practices with EHRs	Practices without EHRs	All practices responding
Lack of support from practice physicians	3.32	3.15	3.18
Lack of capital resources to invest in an EHR	3.31	3.58	3.54
Concern about physicians' ability to input into the EHR	3.18	3.40	3.37
Concern about loss of productivity during transition to EHR	3.04	3.24	3.21
Inability to easily input historic medical record data into EHR	2.97	3.24	3.20
Available EHR software does not meet the practice's needs	2.77	2.81	2.81
Insufficient return on investment from EHR system	2.74	3.15	3.09
Lack of support from practice clinical staff	2.73	2.43	2.48
Insufficient time to select, contract, install, implement EHR	2.70	2.88	2.86
Lack of support from practice nonphysician providers	2.68	2.31	2.37
Inability to integrate EHR with practice billing/claims system	2.67	2.90	2.87
Practice staff does not have skills or training to use EHR	2.65	2.62	2.63
Inability to evaluate, compare, and select appropriate EHR	2.60	2.86	2.82
Lack of support from practice administration	2.43	2.06	2.12
Security and privacy concerns	2.31	2.34	2.34

**SOURCE:** The information in this exhibit is derived from the authors' own analyses.

**NOTE:** Based on a five-point scale ranging from 1 (not a problem) to 5 (makes implementation very difficult).

Lack of capital resources and concern about loss of productivity during transition to an EHR system are rated among the top five barriers for practices that have implemented EHRs and those that have not. Our data show that for those practices that have implemented EHRs, the average initial cost was approximately \$33,000 per physician (somewhat higher per physician for smaller practices and lower for larger practices), with maintenance costs of about \$1,500 per physician per month (data not shown). Added to the monthly maintenance cost, the initial cost, even if amortized over five years at 8 percent interest, would translate into about a 10 percent reduction in take-home pay each year for most primary care practices. Because of the structure of the tax code, most practices do not have retained earnings, and, consequently, the capital equipment expenditures are funded directly from physician income. If the practice were to pay the initial costs in the first year, the reduction in take-home pay would be quite large. Taken together, this means that the substantial initial cost of EHRs, lack of good information about the return on investment in EHRs, and lack of access to capital and other financial resources are likely to greatly limit the adoption of those technologies, particularly for smaller primary care practices.

Preliminary analysis of our interviews suggests that a substantial fraction of practices also experience a reduction in practice productivity during implementation of 10–15 percent for at least several months. The interviews and site visits to

*“The majority of practices are finding the transition to EHRs difficult even if the physicians and nurses are fully supportive.”*

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practices also indicate that many practices believe that their net revenue will eventually improve after implementing EHRs, but it is unclear whether this results from improved efficiency, capturing more billable service units, or reducing costs. Nor is there any clear agreement about the magnitude of either of these financial gains to the practice. We also found that for most practices, actual costs of implementation were higher than they had expected, with cost overruns averaging about 25 percent over the vendors' estimates.

Barriers such as lack of the ability to evaluate EHR proposals and systems and inability to find systems that meet the practices' needs also received relatively high scores. These barriers presumably could be lowered by providing information and decision support to practices. We did not ask what kinds of help were available to or used by practices, but we did ask what might help them.

■ **What could increase the rate or decrease the difficulty of implementing EHRs?** We asked about a number of actions that government or the private sector might take to make the EHR decision process easier: development of standardized questions to ask EHR vendors, model requests for proposal for EHRs and EHR contracts; information on integration capabilities of EHR products with various practice management systems; educational programs on how to select and implement an EHR system; and certification for EHR vendors. Practices with and without EHRs rated the importance of each of these actions relatively highly (between 3.4 and 4.2 on a five-point scale). Several professional organizations are providing this kind of information, and the CMS's recently launched Doctors' Office Quality Information Technology (DOQ-IT) program is intended to provide help through quality improvement organizations (QIOs) in many of these areas.<sup>16</sup> It will be important to assess the effectiveness of these efforts.

We also asked a question of practices with EHRs that focused on what the “impact of possible federal government actions” would be on the EHR selection process. These actions included direct financial assistance (grants, tax credits, and low-interest loans), rewards for implementing IT by pay-for-performance programs, publishing agreed-upon industrywide technology standards, and modifying the Stark self-referral prohibitions to allow increased sharing of technology. All were rated between 2.9 and 3.5 on a five-point scale (3 equaled “some value”), but none were rated 4 (“important”) or 5 (“extremely important”). Practices without EHRs rated each of the items slightly higher, and we found no discernable pattern related to group size (data not shown). Perhaps federal action is less important than one might think, or perhaps practices consider it unlikely to happen in the near future.

■ **Use of other computer-based information systems.** Although this study fo-

cused on EHR adoption, we also explored other uses of computer-based information systems in the group practices. As found in previous studies, more than 90 percent of group practices now have computer-based billing systems and patient scheduling systems. These systems are not costly to install and provide immediate efficiency gains—an attractive combination, even for small primary care practices. As expected, most practices that have EHRs use them for tasks that are done manually in many other practices. Although 90 percent of practices with paper medical records reported that they write prescriptions manually, only 16 percent of practices with EHRs did so. Similarly, practices with EHRs are less likely to use manual methods to accomplish other tasks related to prescriptions, ordering and managing the results of laboratory and imaging tests, and referrals and consultations, but not all do, and a sizable fraction of practices without EHRs manage some of these tasks electronically (data not shown).<sup>17</sup> Consequently, it appears that there is both some consistency and considerable variation in the patterns of use of manual and computerized mechanisms to manage clinical support functions, and having EHRs does not imply that it is used to manage all of these tasks. This variation suggests an opportunity to characterize and better understand the various adoption paths that practices take toward adopting an EHR system and to determine whether some are more likely than others to lead to success.

The purpose of our interviews and site visits with practice administrators and physician leaders in some of the practices surveyed was to gain a richer understanding of decisions to implement EHRs and other clinical IT, the process of choosing and implementing IT, perceptions of barriers and facilitating factors, and the benefits expected and realized. An early finding from our interviews is that the transition from computer-based administrative information systems to fully implemented EHRs is a major undertaking that creates dislocation among the clinical staff and is more complicated, more difficult, and more expensive than we or most practices expected. The majority of practices are finding the transition difficult even if the physicians and nurses are fully supportive.

**O**UR SURVEY RESULTS RAISED and only partially answered many questions about the adoption process, the motivations driving adoption, and the contributions of these systems to the success of physician practices and to national goals to reduce costs and improve quality of care. If the projections provided by the practices prove to be accurate, the growth of EHRs over the next two years will be dramatic. It is tempting to conclude that physician practices will adopt IT that promises to improve practice efficiency, quality, and service despite the paucity of evidence that EHRs reliably lead to these benefits, and of evidence that having an EHR reliably improves a practice's financial performance. Although the number of anecdotes continues to increase, we are not aware of large-scale studies to document financial consequences or clinical benefits.

The information gleaned from analyses of these data and our interviews and site

visits should enable a better understanding of these dynamics and how best to increase practices' success in choosing and implementing EHRs and other IT. The picture that is emerging is more complicated than we expected, and the difficulties that practices are encountering in choosing and implementing EHRs are greater. We suggest that more studies that include interviews and case studies—including spending time with clinicians, administrators, and patients in their practices—will lead to better understanding of the difficulties and of which strategies and tactics will increase practices' success in this important endeavor.

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 This study was supported by the Agency for Healthcare Research and Quality (AHRQ) under Task Order no. 5, "Assessing Adoption of Effective Information Technology by Medical Group Practices," through IDSRN Contract no. 290-00-0017 to the University of Minnesota, with the Medical Group Management Association (MGMA) Center for Research as subcontractor. The views expressed herein are those of the authors and do not necessarily represent the position of AHRQ or the U.S. Department of Health and Human Services.

## NOTES

1. For a synthesis of a number of studies, see D.J. Brailer and E.L. Terasawa, "Use and Adoption of Computer-based Patient Records," October 2003, [www.chcf.org/topics/view.cfm?itemID=21525](http://www.chcf.org/topics/view.cfm?itemID=21525) (29 July 2005); and R.H. Miller and I. Sim, "Physicians' Use of Electronic Medical Records: Barriers and Solutions," *Health Affairs* 23, no. 2 (2004): 116–126. See also A.M. Audet et al. "Information Technologies: When Will They Make It into Physicians' Black Bags?" *Medscape General Medicine* 6, no. 4 (2004), [www.medscape.com/viewarticle/493210](http://www.medscape.com/viewarticle/493210) (28 June 2005; registration required); N.F. Piland et al., *The Current Status of Electronic Medical Record and Practice Automation Systems in Medical Group Practices, Second Annual Report* (Englewood, Colo.: Medical Group Management Association Center for Research, December 2002); and R.H. Miller, J.M. Hillman, and R.S. Given, "Physician Use of IT: Results from the Deloitte Research Survey," *Journal of Healthcare Information Management* 18, no. 1 (2004): 72–80. Brailer and Terasawa point out that the estimates of EHR use vary among different studies for a variety of reasons, including the characteristics of the particular practices surveyed. We report percentages of practices that have EHRs rather than percentages of physicians; the latter would be higher than the former because large practices are more likely than small practices to have EHRs.
2. J.C. Martin, et al., "The Future of Family Medicine: A Collaborative Project of the Family Medicine Community," *Annals of Family Medicine* 2, Supp. 1 (2004): S3–S32.
3. For a recent review of pay-for-performance programs, see M.B. Rosenthal et al., "Paying for Quality: Providers' Incentives for Quality Improvement," *Health Affairs* 23, no. 2 (2004): 127–141.
4. See Brailer and Terasawa, "Use and Adoption of Computer-based Patient Records"; Miller and Sim, "Physicians' Use of Electronic Medical Records"; Audet et al., "Information Technologies"; and Piland et al., *The Current Status*. Regarding reasons for slow adoption, see C.J. McDonald, "The Barriers to Electronic Medical Record Systems and How to Overcome Them," *Journal of the American Medical Informatics Association* 4, no. 3 (1997): 213–221; Miller and Sim, "Physicians' Use of Electronic Medical Records"; Piland et al., *The Current Status*; K. MacDonald, J. Metzger, and M. Mann, "Achieving Tangible IT Benefits in Small Physician Practices," September 2002, [www.chcf.org/topics/view.cfm?itemID=19898](http://www.chcf.org/topics/view.cfm?itemID=19898) (29 July 2005); and R.H. Miller, I. Sim, and J. Newman, "Electronic Medical Records: Lessons from Small Physician Practices," October 2003, [www.chcf.org/topics/view.cfm?itemID=21521](http://www.chcf.org/topics/view.cfm?itemID=21521) (29 July 2005).
5. Audet et al., "Information Technologies"; Brailer and Terasawa, "Use and Adoption"; and L. Landro, "Doctors Say Office Technology Is Costly and Cumbersome," *Wall Street Journal*, 27 July 2003.
6. For examples of implementation, see S. Barlow, J. Johnson, and J. Steck, "The Economic Effect of Implementing an EMR in an Outpatient Clinical Setting," *Journal of Healthcare Information Management* 18, no. 1 (2004): 46–51; and Miller et al., "Electronic Medical Records." The cost-benefit analysis is in S.J. Wang et al., "A Cost-Benefit Analysis of Electronic Medical Records in Primary Care," *American Journal of Medicine* 114, no. 5 (2003): 397–403.
7. This group practice database is being assembled from multiple sources, including members and other contacts in the MGMA database, commercial databases, several professional associations including the

American Medical Association, and others under a contract from AHRQ to the University of Minnesota and the MGMA Center for Research. The total number of U.S. group practices is not known, but we estimate it to be somewhat larger than the 34,490 practices we identified, perhaps in the range of 40,000–50,000. Fewer than one-third of the practices are MGMA members.

8. The instruments used can be viewed at Medical Group Management Association Center for Research, [www.mgma.com/research/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=152](http://www.mgma.com/research/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=152) (29 July 2005).
9. If there is a nonresponse bias in the Web and mail survey data (and therefore in the combined data), it is likely to result in a small (1–2 percent) overestimate of the fraction of practices with EHRs, and it is more likely to affect estimates for the smaller practices. This would be consistent with practices without EHRs being less interested in EHRs and less likely to respond to the Web and mail surveys.
10. Because there are many more small practices in the United States than large ones, even after we oversampled larger practices, the 3,629 practices responding broke into categories of 47.8 percent with five or fewer physicians, 24.3 percent with six to ten physicians, 13.3 percent with eleven to twenty physicians, and 14.6 percent practices with twenty-one or more physicians.
11. The definition of *EHR* in the survey was chosen in consultation with staff at AHRQ with intent to make clear that items in the EHR are searchable and retrievable. We assumed that this definition would be familiar to most practice administrators; we did not encounter any confusion expressed in comments on returned surveys or in our interviews. See Note 8.
12. For example, see Audet et al., “Information Technologies.” Audet and colleagues also found that use of EHRs in solo physician practices is lower than in practices with two to nine physicians.
13. We observed variation by specialty type (multispecialty versus single specialty and particular specialties represented), by type of ownership, and by relationship to academic institutions (data not shown). The effects of these factors are generally smaller than that of size of practice, and they interact with each other and with size of practice and other variables; they will be analyzed using multivariate models (results not reported here). Variation by region was relatively small.
14. This survey was conducted confidentially (rather than anonymously), and contact information was collected for most respondents, enabling follow-up surveys of responding practices.
15. The remaining analyses rely on responses to the Web and mail surveys because these questions were not asked on the shorter telephone survey. By extension from the answers to the questions common to all the surveys, we think that any nonresponse bias is small and that nonrespondents would, if different from respondents, be slightly less positive about the benefits of EHRs.
16. The Doctors Office Quality Information Technology (DOQ-IT) program will provide support to small and medium-size practices selecting and implementing EHRs. For more information, see [www.doqit.org](http://www.doqit.org).
17. It is likely that most practices, regardless of their commitment to becoming wholly computerized or “paperless,” will for some time have to interact with some pharmacies, consultants, and diagnostic testing sources by nonelectronic means. For example, some radiology groups may be able neither to receive requests for studies nor to report the results electronically.