

Electronic health records in small physician practices: availability, use, and perceived benefits

Sowmya R Rao,¹ Catherine M DesRoches,² Karen Donelan,² Eric G Campbell,² Paola D Miralles,² Ashish K Jha³

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¹Mongan Institute for Health Policy, Massachusetts General Hospital, Biostatistics Center, Boston, Massachusetts, USA

²Mongan Institute for Health Policy, Massachusetts General Hospital, Boston, Massachusetts, USA

³Department of Health Policy and Management, Harvard School of Public Health, Boston, Massachusetts, USA

Correspondence to

Professor Ashish K Jha, Department of Health Policy and Management, Harvard School of Public Health, Division of General Medicine, Brigham and Women's Hospital, Veterans Affairs Boston Healthcare System, 677 Huntington Avenue, Boston, MA 02115, USA; ajha@hsph.harvard.edu

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ABSTRACT

Objective To examine variation in the adoption of electronic health record (EHR) functionalities and their use patterns, barriers to adoption, and perceived benefits by physician practice size.

Design Mailed survey of a nationally representative random sample of practicing physicians identified from the Physician Masterfile of the American Medical Association.

Measurements We measured, stratified by practice size: (1) availability of EHR functionalities, (2) functionality use, (3) barriers to the adoption and use of EHR, and (4) impact of the EHR on the practice and quality of patient care.

Results With a response rate of 62%, we found that <2% of physicians in solo or two-physician (small) practices reported a fully functional EHR and 5% reported a basic EHR compared with 13% of physicians from 11+ group (largest group) practices with a fully functional system and 26% with a basic system. Between groups, a 21–46% difference in specific functionalities available was reported. Among adopters there were moderate to large differences in the use of the EHR systems. Financial barriers were more likely to be reported by smaller practices, along with concerns about future obsolescence. These differences were sizable (13–16%) and statistically significant ($p < 0.001$). All adopters reported similar benefits.

Limitations Although we have adjusted for response bias, influences may still exist.

Conclusion Our study found that physicians in small practices have lower levels of EHR adoption and that these providers were less likely to use these systems. Ensuring that unique barriers are addressed will be critical to the widespread meaningful use of EHR systems among small practices.

INTRODUCTION

The adoption and meaningful use of electronic health records (EHRs) is a major US national policy priority for improving the quality and efficiency of the healthcare system. This topic has received bipartisan support and led to the US Congress allocating close to \$30 billion in 2009 to promote adoption of interoperable, certified EHRs. Part of the motivation for the bill was that despite years of private and public sector efforts to spur adoption by US physicians, only a small proportion of US ambulatory care physicians were using EHRs.^{1–5}

Prior work has shown that EHR adoption rates vary by practice size: physicians who work in small practices are less likely to have these systems than physicians who work in larger practices.⁶ The commonly held assumption of most policymakers

has been that the primary challenges for small practices is lack of access to capital, lower ability to handle the productivity challenges that new EHR adoption create, and lesser ability to choose a vendor.⁷ Specific policies within the Health Information Technology for Economic and Clinical Health Act (HITECH) provide for both extra funding and assistance with vendor selection for these small practices.⁸ Yet, many of our assumptions about small practices and why they have not adopted EHRs is not evidence based. We are unaware of prior work that has systematically examined, using nationally representative data, variations in adoption and use patterns based on practice size and sought to identify whether physicians in small practices perceive different barriers to adoption or different benefits from EHRs once adopted compared to physicians who work in larger practices.

Because physicians in small practices provide care for the majority of Americans,⁹ any national goal to improve EHR adoption rates is going to have to address the needs of these providers. The recently formed and funded Regional Exchange Centers (RECs) are supposed to focus their support on practices with less than 10 physicians. To guide the work of RECs and policy makers hoping to drive EHR adoption among physicians who work in small practices, we sought to fill the evidence gap in four areas: their patterns of adoption and use of EHR functions, the unique barriers they face, and the benefits they reap from EHRs. Thus, we used data from a national sample of physicians to answer four questions: Which key functionalities of an EHR represent the largest gaps in adoption between small and large practices? Once EHR systems are adopted, do physicians in small practices use key EHR functions at the same rate as physicians in large practices? Third, what are the key barriers to adoption among physicians in small practices and how do they differ from the barriers faced by large practices? And finally, once adopted, do physicians in small practices report a comparable experience in terms of the impact on clinical practice that is reported by physicians of larger practices? The gaps in knowledge in these four areas are likely hampering effective policy-making to ensure effective EHR adoption among small practices and our work sought to fill these gaps.

METHODS

We have described the survey development, measures of adoption, and sample selection in detail in our earlier publication.⁶ Briefly, we

conducted a mail survey of a nationally representative random sample of 5000 physicians identified from the Physician Masterfile of the American Medical Association.

Measures for adoption of EHRs were developed based on advice from an expert panel that used a modified Delphi process to reach consensus on the functions of EHRs necessary for a system to be qualified as fully functional. Assuming that many physicians would not have a fully functional system but may have components of a system, we defined a minimum set of functions that would merit the use of the term electronic health record and refer to it as a basic system.⁶ The original survey, including the questions asked and the response categories, are provided in the online supplementary appendix.

Analyses

For these new analyses, we grouped physician practice size into four categories—solo or two physicians, 3–5, 6–10, and 11 or more. We chose to designate the solo and two-physician practices as our smallest size group because almost one-third of all physicians in the United States practice in groups of this size.⁹ All analyses were weighted to adjust for the sampling design and non-response. Adjusted percentages and standard errors were obtained from multivariable regression models.¹⁰ All analyses were conducted in SAS 9.2¹¹ and SUDAAN 10.0.1.¹²

Outcome measures

As reported previously, we created a variable for EHR adoption that had three categories—fully functional, basic functional, and no EHR— and treated it as an ordinal variable in the analyses.⁶ Variables representing the availability of each of the functionalities were binary (Yes/No), while the variables for physicians' use of each functionality had three categories—I use it all the time, I use it some of the time, and I do not use it.

Since questions measuring impact on the practice and quality of patient care were only asked of physicians with an EHR, the analysis was restricted to this group of physicians. Both the impact on the practice and quality of patient care were considered to be dichotomous. To measure a positive impact on a practice, we converted a 5-point Likert scale variable into a dichotomous variable by combining the major positive and positive impact groups into one category and the no impact, negative and major negative impact responses into another category. Lastly, we measured barriers to adoption using 3- and 5-point Likert scales. These were analyzed as ordinal variables.

RESULTS

Sample characteristics

Of the 4484 eligible sampled physicians, 2769 completed the survey, yielding an overall response rate of 62%. The characteristics of the respondents by practice size are displayed in table 1. Small practices were more likely than larger practices to be comprised of older, male physicians. They were also more likely to practice in non-hospital based settings and in rural areas than physicians in larger group practices.

Availability of a basic/fully functional EHR, and its functionalities

As shown in table 1, less than 2% of physicians in solo or two-physician (small) practices reported a fully functional EHR (availability of all 17 functionalities) and 5% reported a basic EHR system (<7% overall) compared with 13% of physicians from 11+ group (largest group) practices with a fully functional system and 26% with a basic system (39% overall).

The availability and use of EHR functions by practice size are shown in figure 1A,B, respectively. Small practices differed from

Table 1 Individual and practice characteristics of survey respondents

| | Number of physicians in practice | | | | p Value† |
|---|----------------------------------|--------------|---------------|--------------|----------|
| | 1–2 n=950 | 3–5 n=781 | 6–10 n=459 | 11+ n=487 | |
| Physician characteristics (%) | | | | | |
| Gender | | | | | |
| Male | 77 | 76 | 73 | 70 | 0.04 |
| Female | 23 | 24 | 27 | 29 | |
| Race* | | | | | |
| White | 75 | 75 | 81 | 76 | 0.06 |
| Black/African American | 3 | 5 | 3 | 3 | 0.23 |
| Asian | 17 | 15 | 11 | 15 | 0.03 |
| Other | <1 | <1 | <1 | 1 | 0.87 |
| Ethnicity | | | | | |
| Hispanic or Latino | 6 | 6 | 5 | 2 | <0.001 |
| Not Hispanic or Latino | 93 | 94 | 95 | 98 | |
| Practice specialty | | | | | |
| Primary care | 46 | 48 | 54 | 45 | 0.05 |
| Non-primary care | 53 | 52 | 46 | 54 | |
| Practice characteristics (%) | | | | | |
| Specialty group status | | | | | |
| Single specialty group | 93 | 79 | 73 | 45 | <0.0001 |
| Multi specialty group | 7 | 21 | 27 | 55 | |
| Number of years in practice | | | | | |
| 1–9 years | 8 | 12 | 15 | 14 | <0.0001 |
| 10–19 years | 22 | 32 | 37 | 36 | |
| 20–29 years | 31 | 30 | 26 | 30 | |
| ≥30 years | 39 | 25 | 21 | 19 | |
| Setting | | | | | |
| Hospital, medical center | 17 | 30 | 39 | 62 | <0.0001 |
| Physician office not attached to a hospital | 80 | 66 | 57 | 35 | |
| Other | 3 | 4 | 4 | 2 | |
| Location | | | | | |
| Urban | 80 | 83 | 84 | 86 | 0.02 |
| Rural | 20 | 17 | 15 | 14 | |
| Region of the country | | | | | |
| Northeast | 23 | 19 | 18 | 17 | <0.001 |
| Midwest | 16 | 24 | 26 | 30 | |
| South | 38 | 35 | 32 | 26 | |
| West | 22 | 22 | 23 | 27 | |
| EHR‡ | | | | | |
| Fully functional EHR | <2 | 3 | 6 | 13 | <0.0001 |
| Basic EHR | 5 | 11 | 19 | 26 | |
| No basic or fully functional EHR | 93 | 86 | 75 | 61 | |

*Respondents could select more than one category.

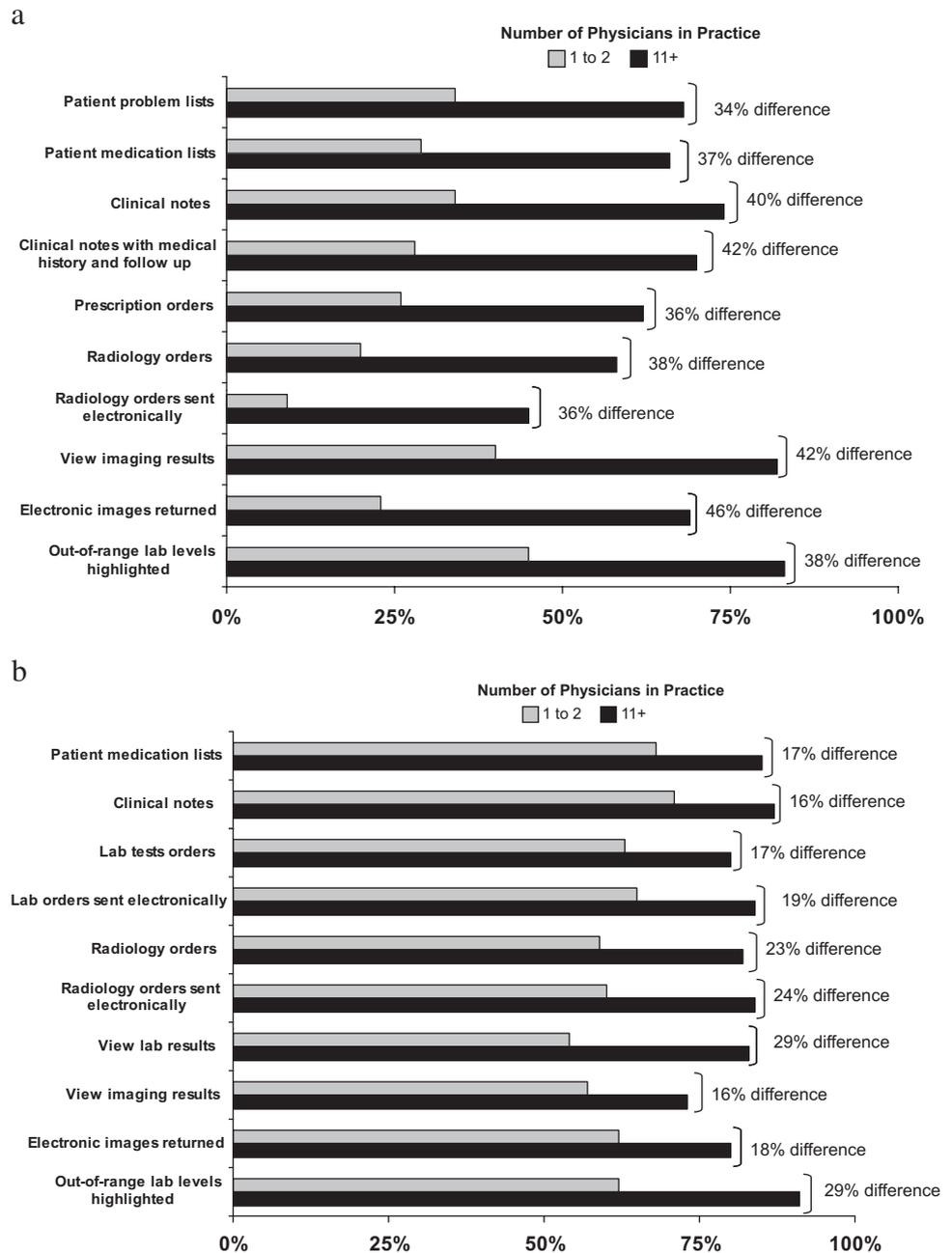
†p Values are based on the Wald χ^2 statistic.

‡Percentages were weighted for the sampling design and non-response, and adjusted for all other variables in the table.

EHR, electronic health record.

larger practices in their reports of the availability of each of the 17 functionalities. There was a 21–46% difference in reports of the availability of each of the functionalities between the smallest and largest group practices (see supplementary online table 1). Patient demographics was the most commonly available functionality, being 73% among the small practices and 94% among the largest practices. The largest gaps between small and large practices were in the ability to access the actual electronic images of radiologic tests (46% difference), radiologic reports (42%), robust electronic clinical notes that include medical history and follow-up (42%), other clinical notes (40%), ordering of radiology (38%), highlighted out-of-range laboratory levels (38%), and prescriptions (36%). There were relatively small gaps for electronic patient demographics (21%) and clinical practice guidelines (23%), the former because adoption rates were close

Figure 1 (A) Availability of functionality by practice size*[±]. *Percentage (SE) obtained from logistic regression model adjusting for all variables (other than electronic health record, EHR) in table 1; weighted for the sampling design and non-response. [±]All p values for differences across groups, based on the Wald χ^2 statistic, are <0.001. (B) Use of functionality **most or all** of the time by practice size among those who have the functionality*[±]. *Percentage (SE) obtained from a generalized multinomial logit regression model adjusting for all variables (other than EHR) in table 1; weighted for the sampling design and non-response. [±]p Values are based on the Wald χ^2 statistic.



to universal, while for the latter adoption rates were poor throughout (supplementary online table 1).

Use of functionalities among adopters of EHR functions

We found that even among providers who had adopted these systems, there were moderate to large differences in their use of the EHR systems after adoption. These differences varied from as little as 8% (for clinical notes that include medical history and follow-up; see supplementary online table 1b) to viewing laboratory results (29%) or having out-of-range laboratory results highlighted (29%) and are presented in figure 1b. Even for ordering prescriptions electronically, a key part of the meaningful use criteria recently announced by the federal government, more than 30% of those in small practices who had adopted these systems did not use them regularly, while only 18% of physicians in large practices failed to use these systems once adopted (supplementary online table 1b).

Barriers to EHR adoption

We found that physicians from the smallest practices were more likely than physicians from larger groups to report financial barriers (see table 2) and concerns about future obsolescence. These differences were both sizeable (13–16%) and statistically significant (p<0.001). Physicians from small practices were also more likely to report concerns about their ability to select and effectively install EHR systems. However, interestingly, we found that physicians from small practices did not report general resistance as a major barrier at a higher rate and did not have greater concerns about the negative productivity effects of EHRs (table 2).

Impact on the practice and quality of patient care of the existing EHR

This analysis was restricted to the 490 physicians with an EHR. Among physicians who had adopted a basic or fully functional EHR, we found very similar rates of benefits from these systems

Table 2 Barriers to adoption by practice size

| | Number of physicians in practice | | | | Difference between 1–2 and 11+ groups % | p Value† |
|--|----------------------------------|--------|--------|--------|---|----------|
| | 1–2 % (SE)* | 3–5 | 6–10 | 11+ | | |
| How much of a <i>major barrier</i> is? | | | | | | |
| Amount of capital needed to acquire and implement | 68 (2) | 65 (2) | 60 (2) | 53 (3) | –15 | <0.001 |
| Uncertainty about return on investment | 53 (2) | 48 (2) | 45 (2) | 37 (2) | –16 | <0.0001 |
| Resistance to adoption from practice physicians | 21 (1) | 32 (2) | 36 (2) | 32 (2) | 11 | <0.0001 |
| Capacity to select, contract and install an EHR | 41 (2) | 36 (2) | 35 (2) | 33 (2) | –8 | 0.03 |
| Concern about loss of productivity during transition | 37 (2) | 39 (2) | 43 (2) | 41 (2) | 4 | 0.23 |
| Concern about inappropriate disclosure of patient information | 19 (1) | 14 (1) | 16 (1) | 16 (1) | –3 | 0.01 |
| Concern about illegal record tampering/hacking | 20 (1) | 15 (1) | 16 (1) | 16 (1) | –4 | <0.01 |
| Concern about the legality of accepting an EHR from a hospital | 14 (1) | 10 (1) | 10 (1) | 8 (1) | –6 | <0.001 |
| Concern about physician’s legal liability | 16 (1) | 12 (1) | 11 (1) | 11 (1) | –5 | <0.001 |
| Finding an EHR that meets your needs | 54 (2) | 49 (2) | 53 (2) | 45 (3) | –9 | 0.04 |
| Concern that the system will become obsolete | 47 (2) | 41 (2) | 40 (2) | 34 (2) | –13 | <0.001 |

*Percentage (SE) obtained from cumulative logit regression models adjusting for all variables (other than EHR) in table 1; weighted for the sampling design and non-response.

†p Values are based on the Wald χ^2 statistic.

EHR, electronic health record.

for physicians in small practices compared to physicians in large practices (table 3). We found no relationship between practice size and the impact of the EHR on the quality of clinical decisions, the quality of communication with patients, or the delivery of preventive or chronic care that meets guidelines (table 3). There were small differences in other areas (quality of communication with other providers, avoiding medication errors, prescription refills), most of which were not statistically significant.

We found a comparable pattern when we examined responses to questions about the impact of the EHR on specific quality metrics such as avoiding a drug allergy, avoiding a potentially dangerous medication interaction, or ordering a critical laboratory test: small differences, most of which were not statistically significant. We did find that physicians in smaller practices were less likely to report having been alerted to a critical laboratory report (61% vs 83%, $p=0.03$) than physicians in the largest

practices. This was consistent with our prior results that physicians in small practices are far less likely to have this functionality available in their electronic systems.

DISCUSSION

A majority of Americans receive their healthcare from physicians in small practices and our study sheds light on their state of EHR adoption—and the challenges ahead for policymakers who seek to help these providers adopt and use EHR systems to improve care. We found that although physicians in small practices were less likely to have adopted nearly all electronic functions that make up an EHR, they were particularly behind in viewing and ordering radiologic tests, having electronic clinical notes, and electronic prescribing. To our surprise, we found that even among providers who had adopted EHR systems, there were still large gaps in the use of individual functions, suggesting that the gaps are not just about adoption alone.

Table 3 Impact on the practice and quality of patient care of the existing EHR

| | Number of physicians in practice | | | | Difference between 1–2 and 11+ groups % | p Value† |
|---|-----------------------------------|--------|--------|--------|---|----------|
| | 1–2 | 3–5 | 6–10 | 11+ | | |
| To what extent has the EHR system affected the following areas at your main practice? | | | | | | |
| | % (SE)* Reporting positive impact | | | | % | |
| Quality of clinical decisions | 69 (7) | 58 (5) | 64 (5) | 71 (4) | 2 | 0.21 |
| Quality of communication with other providers | 74 (7) | 86 (3) | 94 (2) | 85 (3) | 11 | 0.02 |
| Quality of communication with patients | 57 (7) | 58 (6) | 58 (5) | 67 (4) | 10 | 0.39 |
| Prescription refills | 89 (5) | 84 (4) | 88 (3) | 84 (3) | –5 | 0.70 |
| Avoiding medication errors | 72 (7) | 84 (4) | 82 (4) | 80 (3) | 8 | 0.40 |
| Delivery of preventive care that meets guidelines | 59 (8) | 66 (6) | 63 (5) | 63 (4) | 4 | 0.91 |
| Delivery of chronic illness care that meets guidelines | 64 (8) | 63 (6) | 64 (5) | 61 (4) | –3 | 0.97 |
| Since adopting an EHR at your main practice have you? | | | | | | |
| | % (SE)* Responding yes | | | | % | |
| Avoided a drug allergy | 62 (8) | 65 (5) | 68 (5) | 72 (4) | 10 | 0.69 |
| Avoided a potentially dangerous medication interaction | 50 (7) | 64 (6) | 52 (5) | 62 (4) | 12 | 0.21 |
| Been alerted to a critical laboratory value | 61 (7) | 77 (5) | 79 (4) | 83 (3) | 22 | 0.03 |
| Provided preventive care | 56 (8) | 49 (6) | 40 (6) | 52 (5) | –4 | 0.30 |
| Ordered a critical laboratory test | 49 (8) | 46 (6) | 40 (6) | 49 (4) | 0 | 0.69 |
| Ordered a genetic test | 21 (6) | 13 (4) | 9 (3) | 9 (3) | –12 | 0.20 |

*Percentage (SE) obtained from cumulative logit regression models adjusting for all variables (other than EHR) in table 1; weighted for the sampling design and non-response.

†p Values are based on the Wald χ^2 statistic.

EHR, electronic health record.

We found, not surprisingly, that financial issues were a substantial concern to the small office providers, but we also found that these physicians were far more worried about finding a system that met their needs or the future obsolescence of their EHR systems. They were not any more likely to be concerned about productivity losses, especially as related to issues during the time of transition to an EHR system, than physicians in large practices. Finally, we found that once these systems had been adopted and were being used, physicians in small practices were comparably pleased with them, suggesting that once barriers to adoption and use can be overcome, EHR systems should have substantial benefits for physicians in small practices.

There are likely other important issues that may be affecting EHR adoption and effective use among physicians who work in small practices. It is possible that the quality of EHR systems sold to these providers is lower, given that the most well-capitalized vendors may target larger practices or hospital systems. Although our survey could not assess the quality of the EHR systems adopted, our hope is that the certification process required by HITECH helps ensure a minimum quality for EHR systems for all providers. Another key issue for small practices is how well these EHR systems integrate with practice management systems. Given the low operating margins that many of these practices generate, ensuring that EHR systems lead to greater efficiency will be critically important to ensuring that the systems are both adopted and used by the physicians who work in these practices.

Federal policy makers have primarily focused on financial incentives and their additional efforts focused on small practices concentrate on helping these practices select and install EHRs. Our findings confirm that while some of their approaches are reasonable, they will need to address some very specific issues. RECs, the entities focused on helping small practices, must ensure that concerns about obsolescence, whether due to EHR vendors not adequately updating their products or actually going out of business, are effectively addressed. Just getting EHR adopted will not be enough: given that physicians in small practices are far less likely to use these systems even after adoption, our results suggest that RECs will have to remain engaged with these providers for some time to come. While every provider needs ongoing technical support, this will be particularly challenging for small practices and whether RECs can or will be able to play that role is unclear. Finally, physicians from small practices were particularly concerned about whether the current EHR systems will meet their needs—and while the current certification system is designed to ensure that the systems help providers meet meaningful use, we are unaware of any effort to ensure that systems meet the unique challenges faced by small practices. In summary, whether RECs will be successful in engaging and meeting the needs of physicians in small practices is unclear, but we know that the success of the entire national program will, to a large extent, depend on it.

Some have argued that the gaps in adoption are due in part to the greater need for data sharing among practitioners in large practices—and our findings confirmed this argument. However, the findings that physicians in small practices perceived comparable benefits in improving the quality of their clinical decisions and their ability to provide guideline-driven preventive and chronic care proves important. These are very meaningful benefits and the fact that they accrue in small practices at the same rate as in large practices should provide even greater impetus for ensuring that all physicians, regardless of practice size, use EHR systems.

Limitations

There are several limitations to our study. First, although we obtained a 62% response rate, non-responders may be different than responders in their adoption of EHRs and their attitudes toward them. We tried to adjust for non-response bias using statistical techniques, but such approaches are imperfect. A related concern could be that our responses from small practices may have been particularly atypical. However, our response rate among this group was comparable to the overall response rate. Another important limitation is that although we asked about a series of functions, there were important issues that we were not able to address in our survey. For example, although we asked about productivity concerns around the period of EHR implementation, we did not ascertain to what extent concern about long-term productivity was hindering physician adoption of EHR systems. Similarly, there are other valuable functions, such as the ability to view patient lists, that may be particularly important to small practices, that we did not examine in our survey. Finally, our survey did not directly address the potential for EHR systems to generate system-wide cost savings. Although this is clearly a driving policy imperative, we focused on perceived quality gains by physicians.

CONCLUSION

In summary, we examined the patterns of EHR adoption and use as well as perceived barriers to and benefits of EHRs among physicians from small practices. We found both good news and substantial challenges: even among those who have adopted EHRs, physicians from small practices are less likely to use these systems, suggesting that getting them to adopt will not be enough. The unique barriers they face, including fears that systems will not meet their needs or will become obsolete, will need to be faced directly to ensure that these physicians are able to adopt and use EHRs. Finally, if federal policy makers are successful at helping small practice physicians adopt and use EHRs, our findings suggest that the benefits will be substantial, ensuring that all Americans benefit from high quality care irrespective of where they might receive that care.

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