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# Electronic Medical Records Are Not Associated With Improved Documentation in Community Primary Care Practices

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Karissa A. Hahn, MPH,<sup>1</sup> Pamela A. Ohman-Strickland, PhD,<sup>1</sup>  
Deborah J. Cohen, PhD,<sup>1</sup> Alicja K. Piasecki, MPH,<sup>1</sup> Jesse C. Crosson, PhD,<sup>1</sup>  
Elizabeth C. Clark, MD, MPH,<sup>1</sup> and Benjamin F. Crabtree, PhD<sup>1,2</sup>

## Abstract

The adoption of electronic medical records (EMRs) in ambulatory settings has been widely recommended. It is hoped that EMRs will improve care; however, little is known about the effect of EMR use on care quality in this setting. This study compares EMR versus paper medical record documentation of basic health history and preventive service indicators in 47 community-based practices. Differences in practice-level documentation rates between practices that did and did not use an EMR were examined using the Kruskal–Wallis nonparametric test and robust regression, adjusting for practice-level covariates. Frequency of documentation of health history and preventive service indicator items were similar in the 2 groups of practices. Although EMRs provide the capacity for more robust record keeping, the community-based practices here do not use EMRs to their full capacity. EMR usage does not guarantee more systematic record keeping and thus may not lead to improved quality in the community practice setting.

## Keywords

electronic medical records, primary care, quality, medical record review

The adoption of electronic medical records (EMRs) in ambulatory settings has been widely recommended by both the Institute of Medicine and the Future of Family Medicine Project as a means to reduce errors and improve the quality of health care.<sup>1–4</sup> An EMR could potentially improve acute care and chronic disease management<sup>5</sup> by lowering rates of missing clinical information, offering better guideline-based decision support, reducing medication errors,<sup>6</sup> and improving the coordination of patient care.<sup>7</sup>

To date, the majority of EMR research demonstrating the potential benefit of this technology has been conducted in large integrated health systems.<sup>8–10</sup> The practices in these systems typically use EMRs that were developed in-house and have access to technical support resources and information sharing capacities essential for the effective use of this technology. Often, these resources are not present in community primary care practices, where most medical care in the United States is delivered,<sup>11,12</sup> making it difficult to translate the findings into patient care improvements in the community practice setting.<sup>13,14</sup> In fact, one previous study of community practices demonstrated that practices with EMRs had lower rates of adherence to diabetes care guidelines than practices with paper medical records.<sup>13</sup>

With recent mandates for health care reform through expanded health information technology use and incentives

to use e-prescribing tools, both as stand-alone systems or as part of a full-function EMR,<sup>15</sup> community-based practices are likely to adopt EMRs in ever-increasing numbers. Therefore, understanding how the use of commercially available EMRs is associated with the quality, safety, and efficiency of health care is paramount.

This article examines how clinical documentation varies in community primary care practices that use paper medical records when compared with those that use EMRs. The purpose of this analysis is to understand if the use of commercially available EMRs in the community practice setting is associated with differences in documentation.

<sup>1</sup>University of Medicine and Dentistry of New Jersey, Somerset, NJ

<sup>2</sup>Cancer Institute of New Jersey, New Brunswick, NJ

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## Corresponding Author:

Karissa A. Hahn, MPH, Department of Family Medicine, UMDNJ, RWJMS, One World's Fair Drive, 1st Floor, Somerset, NJ 08873  
Email: [clarkeka@umdnj.edu](mailto:clarkeka@umdnj.edu)

## Methods

We conducted a secondary analysis of cross-sectional data collected at baseline from a quality improvement intervention study, Using Learning Teams for Reflective Adaptation. Data were collected from April 2003 through November 2004. This study used a multimethod assessment process<sup>16</sup> to inform a facilitated team-building intervention<sup>17</sup> aimed at improving guideline adherence for chronic disease among 47 primary care practices located in urban, suburban, and rural New Jersey and eastern Pennsylvania. We included solo, small group, and large group practices. Many practices in our sample were independent community practices. Some practices in our sample were owned by or affiliated with health systems but did not receive intensive support for EMR usage and implementation. Written informed consent to participate in the study was received from the medical directors and/or lead physicians of each practice as well as from staff members prior to participation. The University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School Institutional Review Board approved this study.

### Data Collection

Participating practices generated a list of patients who were seen in their office during the previous 12 months for any reason, as well as separate lists for asthma, coronary artery disease, diabetes, and hypertension using *International Classification of Diseases, Ninth Revision* codes. Research nurses conducted medical record reviews for 20 randomly selected patients from each of the 5 lists. When a practice had fewer than 20 patients with a particular condition, the medical records of all patients with the particular diagnosis code were examined. The medical record review collected information about a patient's basic health history, preventive services received, and chronic disease management. A total of 4115 medical records were reviewed and available for analysis.

Practice managers and lead physicians also completed a practice information form used to determine practice ownership, type of medical record system, characteristics of the patient population (eg, payer mix, race/ethnicity), number of clinicians, whether there was a change in the medical record system in the previous year, and number of years the practice had been in existence.

### Measures

Research nurses examined each medical record and noted whether the following items were documented: race, weight, height, past medical history, family medical history, alcohol use status, medication lists, problem lists,

cigarette smoking status in last 3 visits, cholesterol screening in the previous 5 years, and screening for breast (women age 40 and older), cervical (women ages 18-70 who did not have a hysterectomy), and prostate cancer (prostate-specific antigen testing, men age 50 and older). Colorectal cancer screening was not included because these data were missing for some practices. Practice-level documentation scores were constructed by averaging the documentation status for each item across all the eligible medical records reviewed for a specific practice.

Based on information from the lead physician or office manager, we classified practice record systems as either EMR or paper.

### Statistical Analyses

Descriptive statistics, including proportions for all categorical variables and means with standard deviations for continuous variables, were calculated to describe the practices and patients. The Kruskal-Wallis test was used to test nonparametric relationships between type of medical record and presence of basic health history and preventive service indicators. Robust regression was used to model multivariate regressions investigating associations between the type of medical record and presence of basic health history and preventive service indicators. Models were adjusted for the following practice-level variables: number of clinicians, number of years in business, owner of the practice (physician or other), and whether the practice changed medical record systems in the previous year. The SAS/STAT software for Windows, version 9.1.3 (SAS Institute Inc, Cary, NC),<sup>18</sup> was used for all statistical analyses, with the ROBUSTREG procedure for linear regression and the NPAR1WAY procedure for nonparametric testing. For both types of testing we used the Bonferroni adjustment for multiple tests.

## Results

Of the 4115 medical records examined, slightly more than half of the patients were female (54%), and the mean age was 53.8 years. Other patient characteristics are displayed in Table 1.

Thirteen of 47 practices (28%) were using EMRs; 3 of these practices (6%) reported changes in the medical record system in the previous year. Other relevant practice characteristics are shown in Table 2.

Table 3 shows documentation frequencies for practices using electronic and paper medical records. Overall, the frequency with which basic health history items were documented was high, with the exception of race/ethnicity and height, which were dramatically lower than all

**Table 1.** Patient Characteristics

| Characteristics                           | Percentage or Mean (N = 4115) |
|-------------------------------------------|-------------------------------|
| Sex                                       |                               |
| Male                                      | 46%                           |
| Female                                    | 54%                           |
| Age (years)                               | 53.8 (SD = 18.5)              |
| Race                                      |                               |
| White                                     | 17%                           |
| Black/African American                    | 3.5%                          |
| Asian                                     | 0.5%                          |
| Other                                     | 1%                            |
| Unknown                                   | 78%                           |
| Number of medical conditions <sup>a</sup> |                               |
| 0                                         | 17.6%                         |
| 1                                         | 49.7%                         |
| 2                                         | 25.8%                         |
| 3                                         | 6.7%                          |
| 4                                         | 0.2%                          |

<sup>a</sup>Documentation in the medical record of the following medical conditions: diabetes, asthma, heart disease, and hypertension. Maximum score is 4.

other items regardless of whether the practice used an EMR. Other than cholesterol screening in the past 5 years, the frequency with which preventive service indicators were documented was low regardless of whether the practice used an EMR. Although practices that use paper medical records had slightly higher rates of documentation for most items than practices using EMRs, nonparametric analysis showed that the type of medical record was not associated with the frequency of documentation by practice. Multivariate analysis (not shown in table) adjusted for number of clinicians, number of years in business, owner of the practice (physician or other), and whether there was a change in the medical record system in the previous year did show an association between type of medical record and weight ( $P = .0013$ ), race ( $P = .0400$ ), breast cancer screening ( $P = .0012$ ), and prostate cancer screening ( $P = .0059$ ) documentation, with practices with paper medical records more likely to document these items than practices with EMRs. Additionally, there was an association between number of clinicians in a practice on documentation of family history, alcohol, problem lists, and past medical history (all  $P < .0001$ ), with practices with more clinicians being more likely to document all items except past medical history. We examined these relationships further by stratifying by number of clinicians but did not find a significant effect of type of medical record on the documentation of these items.

**Table 2.** Practice Characteristics

| Characteristics                                           | Percentage or Mean (N = 47) |
|-----------------------------------------------------------|-----------------------------|
| Type of medical record system                             |                             |
| Electronic medical record                                 | 28% (n = 13)                |
| Paper                                                     | 72% (n = 34)                |
| Number of clinicians                                      | Mean = 4.5                  |
| Owner                                                     |                             |
| Physician                                                 | 77% (n = 36)                |
| Other                                                     | 23% (n = 11)                |
| Number of years under current ownership                   | Mean = 10.2                 |
| Change in medical record system during the previous year? |                             |
| Yes                                                       | 6% (n = 3)                  |
| No                                                        | 94% (n = 44)                |

## Discussion

We found that clinical documentation of basic health history and preventive service indicators were not significantly improved in primary care practices using EMRs when compared with those using paper medical records. Multivariate analysis controlling for practice-level factors did show a statistically significant difference in documentation of weight, race, breast cancer screening, and prostate cancer screening; however, all differences were in the direction of better documentation in paper medical records than in EMRs. Moreover, we found that documentation frequency in both types of medical records were remarkably similar. Both record types had high documentation of basic health history items and lower documentation of race, height, and many preventive service indicators. Given what we know about regular primary care practice patterns, these findings are not surprising. Basic health history items (eg, problem lists, past medical history, family history, medication lists) are used by clinicians in most patient care encounters and are thus likely to be well documented, whereas preventive services, which are addressed less frequently, are less likely to be documented.

This high degree of correlation suggests that practices are using both charting systems similarly and that clinicians are thinking about how clinical tasks are performed in EMRs the same way they did when using paper systems, suggesting that work styles developed in paper-based settings are not being altered when transitioning to computer-based record systems. This is of concern because the full capabilities of EMRs likely will not be used as a result. All systems have certain capabilities and

**Table 3.** Practice-Level Medians (25th and 75th Percentiles) and Kruskal–Wallis Test Results for Medical Record Type

| Variable                                        | EMR Practices,<br>Median (25, 75) | Non-EMR Practices,<br>Median (25, 75) | Kruskal–Wallis<br>PValue |
|-------------------------------------------------|-----------------------------------|---------------------------------------|--------------------------|
| <b>Basic health measures</b>                    |                                   |                                       |                          |
| Problem list                                    | 98.0 (34.5, 99.0)                 | 98.3 (89.9, 100)                      | .3127                    |
| Past medical history                            | 100 (97, 100)                     | 98.8 (92.6, 100)                      | .3039                    |
| Medication list                                 | 95.0 (64.0, 99.0)                 | 96.9 (92, 99)                         | .6152                    |
| Family history                                  | 93.9 (87, 98.6)                   | 96.5 (87.4, 98.9)                     | .3851                    |
| Cigarette smoking status noted in past 3 visits | 29.3 (12.9, 64.0)                 | 28.8 (16.1, 63.2)                     | .9905                    |
| Alcohol                                         | 89.8 (66.7, 97.1)                 | 90.3 (84, 96.6)                       | .7035                    |
| Race                                            | 2.0 (0, 14.9)                     | 15.1 (4, 41.7)                        | .0320 <sup>a</sup>       |
| Height                                          | 40.9 (7.1, 77.1)                  | 54.8 (19.2, 84.8)                     | .6591                    |
| Weight                                          | 96.9 (94.9, 98.9)                 | 99 (96.9, 100)                        | .0568                    |
| <b>Preventive health services</b>               |                                   |                                       |                          |
| Cholesterol screening in past 5 years           | 70.2 (64.4, 77.8)                 | 75.1 (71.0, 82.3)                     | .2487                    |
| Mammography (women age 40 and older)            | 18.4 (3.8, 24.1)                  | 22.7 (17.9, 26.3)                     | .1280                    |
| Pap smear (women ages 18–70, no hysterectomy)   | 19.5 (10.0, 29.7)                 | 20.9 (11.8, 34.6)                     | .8304                    |
| PSA (men age 50 and older)                      | 15.4 (5.3, 45.8)                  | 42.0 (30.0, 52.4)                     | .0618                    |

Abbreviations: EMR, electronic medical record; PSA, prostate-specific antigen.

<sup>a</sup>Nonsignificant after Bonferroni adjustment:  $0.05/13 = .00385$ .

limitations. For clinicians and staff to use the EMR to its fullest potential, changes will need to be made to the way work is organized and how practice members interact with the documentation system. For example, the EMR has the capability of doing more for health care than just reducing medical errors and improving documentation. It also has the potential to enable information sharing across practices in response to a particular patient's needs, to enhance care, to improve care across populations, and to identify new opportunities for care. We need to think more about how to change our work processes to achieve these goals and make the most of this new tool.

There are several possible reasons why we may not have detected improvements in documentation in practices with EMRs. First, previous studies have found that EMRs are often used in unexpected ways in primary care practices. For example, practices may disable certain features for various reasons, eliminating some of the potential added utility of the EMR.<sup>19</sup> Second, while we did not collect specific information on the features of the EMRs used in our sample, most practices did not have the financial resources required to develop customized systems or to spend extensive time on implementation. Thus, these practices are likely to use commercially produced EMR systems that have not been shown to improve quality.<sup>10,13</sup> Third, among those practices with paper medical records, the frequency of documentation was already quite high for many basic health history items, suggesting that use of EMRs may merely be changing the tool but not the process that is already in place for documentation.

The degree to which EMRs will improve care quality depends not only on the usefulness of the EMR system but also on how well the system is implemented into the practice.<sup>20</sup> Effective EMR implementation requires understanding and changing workflow to optimize EMR use in patient care. While health system and hospital owned practices may have access to institutional resources to address EMR implementation, independently owned practices, such as those in our study, do not and this may lead to suboptimal EMR implementation. Although we can hope to improve care quality in the United States by expanding EMR use through incentive programs<sup>21,22</sup> and by pushing to integrate guidelines into EMRs, unless we help practices effectively implement this tool it is unlikely that the hopes for improved quality will be fulfilled. While many of the recently funded Regional Extension Centers may focus on fostering greater EMR adoption, there may be real opportunities for these Centers to improve health care quality by improving EMR use among practices that have already adopted and are using this tool. The focus of this effort could be on using the EMR to enhance patient care processes.

Several specific findings require a brief comment. Race was infrequently documented, which we believe is a result of disagreement within the medical community about whether race/ethnicity should be routinely noted in medical records or noted only when clinically relevant.<sup>23–25</sup> We believe the low frequency of documentation for breast and cervical cancer screening is because of a

preference by many women in our region to seek this care from gynecologists, as has been reported in previous studies.<sup>26,27</sup> The relatively high frequency of documentation of alcohol use is likely the result of how this measure was assessed, with any mention of alcohol in the chart counted. Cigarette use, in contrast, had a more stringent measure, which explains its lower frequency and suggests that the practices in this study are not treating smoking status as a vital sign to be assessed at every visit.

There are several limitations to this analysis. This analysis is cross-sectional in nature; thus, we are not able to examine change over time. Furthermore, because this was a secondary data analysis, we did not have access to all the information we might have in a study designed solely to answer this research question. Thus, for practices that have EMRs, we do not have information on the date that an EMR was implemented, what type of specific training and support was available to the practices, which EMR systems were used, and whether the practice uses the EMR exclusively or still uses paper medical records in some situations. As noted previously, some practices in our sample were owned by health systems and may have had access to more training or resources than the typical independent community practice. As with any observational study, there may be additional confounders that were not adjusted for in our analysis.

## Conclusion

Our analysis found that documentation of basic health history and preventive service indicators was not significantly different in practices with EMRs than in practices with paper medical record systems. This may be due, in part, to already high documentation frequency in paper medical records for some items. More research is needed to fully understand the factors that shape EMR use and health care quality in the community practice setting.

## Authors' Note

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## References

1. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academies Press; 2001.
2. Kohn LT, Corrigan J, Donaldson MS, eds. *To Err Is Human: Building a Safer Health System*. Washington, DC: National Academies Press; 2000.
3. Martin JC, Avant RF, Bowman MA, et al. The Future of Family Medicine: a collaborative project of the family medicine community. *Ann Fam Med*. 2004;2(suppl 1):S3-S32.
4. Bodenheimer T, Grumbach K. Electronic technology: a spark to revitalize primary care? *JAMA*. 2003;290:259-264.
5. Hillestad R, Bigelow J, Bower A, et al. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Aff (Millwood)*. 2005;24:1103-1117.
6. Smith PC, Araya-Guerra R, Bublitz C, et al. Missing clinical information during primary care visits. *JAMA*. 2005;293:565-571.
7. Burton LC, Anderson GF, Kues IW. Using electronic health records to help coordinate care. *Milbank Q*. 2004;82:457-481.
8. Arar NH, Wang CP, Pugh JA. Self-care communication during medical encounters: implications for future electronic medical records. *Perspect Health Inf Manag*. 2006;24:3.
9. Arar NH, Wen L, McGrath J, Steinbach R, Pugh JA. Communicating about medications during primary care outpatient visits: the role of electronic medical records. *Inform Prim Care*. 2005;13:13-22.
10. Chaudhry B, Wang J, Wu S, et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. *Ann Intern Med*. 2006;144:742-752.
11. American Medical Association. *Medical Groups in the United States*. Chicago, IL: AMA Press; 1999.
12. InterStudy. *Competitive Edge: HMO Industry Report and Regional Market Analysis*. Minneapolis, MN: InterStudy; 1997.
13. Crosson JC, Ohman-Strickland PA, Hahn KA, et al. Electronic medical records and diabetes quality of care: results from a sample of family medicine practices. *Ann Fam Med*. 2007;5:209-215.
14. DesRoches CM, Campbell EG, Rao SR, et al. Electronic health records in ambulatory care—a national survey of physicians. *N Engl J Med*. 2008;359:50-60.
15. Rangel C. Medicare Improvements for Patients and Providers Act of 2008 (PL 110-275). <http://www.govtrack.us/congress/billtext.xpd?bill=h110-6331>. Accessed October 27, 2010.
16. Crabtree BF, Miller WL, Stange KC. Understanding practice from the ground up. *J Fam Pract*. 2001;50:881-887.
17. Stroebe CK, McDaniel RR Jr, Crabtree BF, Miller WL, Nutting PA, Stange KC. How complexity science can inform a reflective process for improvement in primary care practices. *Jt Comm J Qual Patient Saf*. 2005;31:438-446.

18. SAS Institute. SAS 9.1 for Windows [computer program]. Version 9.1. Cary, NC: SAS Institute; 2002-2003.
19. Crosson JC, Stroebe C, Scott JG, Stello B, Crabtree BF. Implementing an electronic medical record in a family medicine practice: communication, decision making, and conflict. *Ann Fam Med*. 2005;3:307-311.
20. Karsh BT. Beyond usability: designing effective technology implementation systems to promote patient safety. *Qual Saf Health Care*. 2004;13:388-394.
21. Endsley S, Baker G, Kershner BA, Curtin K. What family physicians need to know about pay for performance. *Fam Pract Manag*. 2006;13:69-74.
22. Centers for Medicare and Medicaid Services. Physician Quality Reporting Initiative: 2007 Reporting experience. <https://www.cms.gov/PQRI/Downloads/PQRI2007Report-Final112032008CSG.pdf>. Accessed March 30, 2010.
23. Bigby M, Thaler D. Describing patients' "race" in clinical presentations should be abandoned. *J Am Acad Dermatol*. 2006;54:1074-1076.
24. Witzig R. The medicalization of race: scientific legitimization of a flawed social construct. *Ann Intern Med*. 1996;125:675-679.
25. Williams HC. Have you ever seen an Asian/Pacific Islander? *Arch Dermatol*. 2002;138:673-674.
26. Pemberton AG, Margolis KL, Mink PJ, McGovern PG, Lurie N. Women's preferences for specialists who provide cancer screening and general medical care. *J Gen Intern Med*. 1998;13:624-626.
27. Schmittiel J, Selby JV, Grumbach K, Quesenberry CP Jr. Women's provider preferences for basic gynecology care in a large health maintenance organization. *J Womens Health Gend Based Med*. 1999;8:825-833.