

September, 2005 - October, 2005

LENGTH: 2972 words

TITLE: Which Physicians And Practices Are Using Electronic Medical Records?; Survey data show limited use of these information tools.

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TEXT:

Greater use of electronic medical records (EMRs) has the potential to improve the quality of medical care and has become a goal of the U.S. administration. According to the National Ambulatory Medical Care Survey, only an average of 17.6 percent of physicians reported use of EMRs in their office-based practices. The adoption rate did not increase from 2001 through 2003. Practices with more physicians and those owned by health maintenance organizations (HMOs) were significantly more likely to use this technology, but use varied little by the characteristics of individual physicians, the practice's scope of services, or the practice's sources of revenue.

Analysts and policymakers have noted the potential for electronic medical record (EMR) systems to improve the quality of care and have called for expanding their use. [n1] Some researchers contend that the U.S. health care system's adoption of information technology (IT) has not kept pace with that of other industries or countries. [n2] Other researchers contend that the diffusion of health IT (HIT) is progressing at a pace comparable to similar technologies, such as large-scale relational databases. [n3] They note, however, that initial use of IT in health care has lagged behind other IT applications.

In 2004 the federal government announced a framework to accelerate the adoption of HIT, with the goal of having EMRs for most Americans within the next decade. [n4] The framework calls for bringing EMRs into clinical practice through financial and nonfinancial incentives and support; interconnecting clinicians through regional and national networks; improving consumers' access to information and consumer-centric care; and improving population health through public health surveillance, quality-of-care monitoring, and research and dissemination of knowledge.

According to national surveys, the use of EMRs ranged from 17 percent in physicians' office-based practices in 2003 to 29 percent in hospital outpatient departments and 31 percent in hospital emergency departments in 2002. [n5] This study builds on these analyses to examine the situation in physicians' offices over a three-year period (2001-2003) and to analyze in greater depth the relationship between the use of this technology and physician and practice characteristics.

#### Study Data And Methods

Data source. We combined and analyzed data from the questionnaire used to induct physicians into the National Ambulatory Medical Care Survey (NAMCS) for 2001, 2002, and 2003. The National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) annually surveys a probability sample of physicians classified by the American Medical Association or the American Osteopathic Association as engaged primarily in office-based patient care. The survey excludes physicians who are federally employed or specialize in anesthesiology, radiology, or pathology. The NAMCS multistage probability sample involves geographic primary sampling units, physicians within those sampling units, and patient visits within those physicians' practices. Among 6,012 eligible physicians sampled over the three-year period, 13 percent were not available during the reporting period, 30 percent refused to participate, and 56 percent provided complete survey information, including information on practice arrangements and patient visits. This study included responses from this latter group (n = 3,360). To produce unbiased national estimates, the NCHS adjusts the physician sampling weight for physician

nonresponse and physicians who were not available during their randomly assigned reporting week. The nonresponse adjustment takes into account geographic region, location in a metropolitan statistical area (MSA), and specialty. Physicians in the Northeast, MSAs, or medical or surgical specialties are slightly less likely than other physicians to participate. The final sampling weights are inflated for physicians with these characteristics of nonresponders, to produce unbiased estimates. [n6] Details on the sampling and estimation process are available elsewhere. [n7]

Measures. Physicians' responses to the question, "Does your practice use electronic medical records (not including billing records)" (answers: yes, no, or unknown) constituted the measure of the use of this technology. Information on use was missing for about 2.6 percent of physicians. During pretesting of the questionnaire, respondents were asked whether it was clear that "electronic medical records" meant keeping documentation of the patient's condition and treatment information in a computer file rather than a paper file. All respondents said yes.

We explored the influence of practice, individual physician, and geographic factors on EMR use. Practice size (as measured by number of physicians) might be expected to affect EMR use because larger practices could spread the sizeable fixed cost of purchase and implementation over more physicians. The NAMCS does not collect information on the number of patients seen in the practice, which might also be related to EMR use.

Scope of services may also influence adoption, to the extent that EMRs offer the potential for practices with a wider range of services to achieve greater efficiencies. From the questions, "Do you have a solo practice" and "Is this a single- or multispecialty group practice," we grouped the responses of solo and single specialty to represent the low end of scope and the response of multispecialty group to represent the high end.

Practice ownership may also affect adoption. We grouped responses to the question, "Who owns the practice?" into three ownership categories: physician or physician group; health maintenance organization (HMO); and all other health care organizations, including academic medical centers, other hospitals, and other health care delivery organizations. HMOs, which both insure their enrollees and provide or arrange comprehensive care for them, receive revenue from capitation payments, based on their number of enrollees. Capitation payment may give HMOs a stronger financial incentive than the owners of other practices have to minimize the cost of providing care, because the revenue of HMOs is fixed in any given period. In addition, HMOs' responsibility for comprehensive care may involve their providing and bearing the costs of a greater scope of services than in practices in the other ownership categories.

We also examined the association between use of EMRs and the practice's reported sources of revenue (percentage from Medicare, Medicaid, private insurance, other) and involvement with managed care (number of contracts), although neither public nor private payers had historically mounted notable initiatives to encourage adoption of the technology. Because of the substantial missing data for the percentage of revenue from managed care, we did not use that measure. We also explored associations between use and the practice's location, measured by region (Northeast, Midwest, South, West) and whether it was in an MSA.

For characteristics of individual physicians, we examined the respondent's age, specialty, and sex. Younger physicians might be more likely than their older peers to use EMRs if they have had more experience and feel more comfortable with computerized applications. Since the question about use related to the overall practice, however, not the individual physician-respondent, physicians' age might not have been associated with use in the practice.

Analysis. We conducted unadjusted (bivariate) analyses and adjusted analysis based on logistic regression. For the unadjusted analyses, we used chi-square tests to evaluate the percentages of physicians using EMRs for categorical variables, and student's t-test for continuous variables, such as percentages of revenue.

Using logistic regression modeling, we examined the association between the dependent variable (use of EMRs or not) and characteristics of the physician and the practice as independent variables, including the physician's age and the practice's size, scope of services, ownership, and managed care contracts. We used the Wald F test to assess the significance of those associations. Odds ratios are presented to describe the size of the effects.

Because these estimates are based on complex sample surveys rather than the universe of office-based physicians, they are subject to sampling variability. To calculate standard errors and significance tests, we used Taylor series approximations in SUDAAN (version 9.0), which take into account the complex design. [n8] Tests of statistical significance were evaluated at the .05 level.

## Study Results

From 2001 through 2003, 17.6 percent of physicians in office-based practices reported using EMRs, a figure that did not change greatly during the study period (18.2 percent in 2001, 17.3 percent in 2002, 17.3 percent in 2003). Use uniformly increased with the number of physicians in the practice (Exhibit 1). Compared with solo practices, practices with ten to nineteen physicians were more than twice as likely to use EMRs ( $p < .001$ ), and practices with twenty or more physicians were three times as likely to use them ( $p < .001$ ).

The categories of ownership that combined organizational and financial characteristics were significantly associated with use. Compared with practices owned by a physician or physician group, those owned by an HMO were more than three times as likely and practices owned by other health care organizations were almost twice as likely to use EMRs ( $p < .001$ ). Neither the scope of services, as measured by single versus multispecialty practice, nor broadly defined categories of specialty, as measured by primary care, medical, or surgical, were significantly associated with use (Exhibit 1). Use varied by specific physician specialty, however, with psychiatrists and dermatologists least likely and orthopedic surgeons and cardiovascular disease specialists most likely to use EMRs ( $p < .01$ ) (Exhibit 2).

Use did not vary with the percentage of revenue that a practice received from different payers (Exhibit 3). Nor was use associated with the practice's number of managed care contracts (Exhibit 1). The number of a physician's weekly consults in the office and other locations, the alternative measure of size that did not encompass services provided by others in the practice, also showed no association with the type of records used (Exhibit 3). Nor were telephone or e-mail consults associated with the type of record.

In Exhibit 4, the results of the logistic regression analysis indicate that practices with ten to nineteen and twenty or more physicians and those owned by HMOs or organizations other than the physician or physician group continued to have significantly greater odds of using the technology (Wald  $F = 34.2$ ,  $p < .01$ ). Compared with solo practices, practices with twenty or more physicians had more than three times greater odds of using EMRs. Compared with physician-owned practices, practices owned by HMOs had more than four times greater odds, and other health care organizations almost twice the odds, of using the technology. An alternative model examined interaction effects between practice size and ownership, but the interaction effects were not significant. This finding implied that the greater use of EMRs observed with greater practice size was equivalent for each ownership category. Physicians' age, the practice's scope of services, and the number of managed care contracts did not have significant effects.

Using the results from the logistic regression, Exhibit 5 illustrates the effects of the two significant factors, practice size and ownership, on the use of EMRs. It presents the predicted probability by practice size and ownership, adjusted by the physicians' age, the practice's scope of services, and the number of managed care contracts. The highest predicted probability of use in practices owned by physicians ( $Pr = .30$ ) does not reach the lowest level for practices owned by HMOs ( $Pr = .42$ ). The probabilities of use for practices owned by other health care organizations fall closer to the physician-owned than the HMO-owned ones. Physician-owned practices have low probabilities of using EMRs no matter what the size; only about 15.6 percent of practices owned by physicians or physician partnerships, which represent 86.1 percent of office-based physicians, use EMRs. Although about half of the physicians working in HMOs use EMRs, HMO-owned practices account for less than 2 percent of physicians.

## Discussion

According to national probability surveys, the use of EMRs among physicians' office-based practices did not change from 2001 through 2003. This finding is consistent with the sizable investment required and the absence of major initiatives in the past to promote IT.

Factors related to organizational and financial characteristics of the practice rather than characteristics of individual physicians were associated with differential use of EMRs. This pattern is consistent with the ability of larger practices to spread the sizable investment required to purchase and implement the technology over more physicians and services. Supporting the importance of organizational factors, physicians who were employees or contractors were significantly more likely than those who owned their practices to report that their practices used EMRs. These financial and organizational factors may partly explain the variation by specific specialty. For example, the two specialties with the highest use were three times more likely to have ten or more physicians in their practices than the specialty with the lowest use.

Since payers and others have only recently begun to promote EMRs, the absence of an association between use and source of revenue is not surprising. [n9] Limitations of the data preclude identifying which dimension of HMO ownership—including capitation payment, comprehensive care, or insurance function--and associated financial incentives accounted for these findings. Multispecialty practices accounted for 19.6 percent of practices owned by physicians, 42.8 percent owned by other health care organizations, and 69.7 percent of the practices owned by HMOs. The approximation of scope of services available from the data set, single-specialty versus multispecialty practice, might not have adequately captured the effects of differential scope of services, such as laboratory, imaging, ambulatory surgery, and other diagnostic and therapeutic services.

Our findings are consistent with those of other surveys in major respects. In 2003 the Commonwealth Fund sampled physicians from a list provided by the American Medical Association, excluding radiologists, anesthesiologists, pathologists, and dermatologists. Physicians in this survey who were salaried or in larger practices reported significantly higher rates of use. Unlike our findings, primary care physicians reported higher use than specialists, perhaps a reflection of the Commonwealth Fund's exclusion of certain specialties that we included in our survey. As major barriers to adoption, solo practitioners were more likely than other physicians to cite lack of evidence of effectiveness, confidentiality concerns, lack of training, start-up costs, lack of uniform standards, lack of time, and maintenance costs. [n10]

In recent multivariate analysis of the Commonwealth Fund data, physicians using EMRs had significantly higher odds of reporting that they received data from internal sources on the quality of the care they provided to patients. [n11] Physicians' use of EMRs, however, was not associated with the ease of receiving practice-level or quality-of-care data or with physicians' involvement in quality improvement efforts. The authors emphasized that having an EMR does not mean that a physician can fully reap the benefits of using it to improve quality.

A 2001 survey of U.S. physicians by the Center for Studying Health System Change also found that practices with more physicians--in this case, with fifty or more--were more likely than other practices to contain IT. [n12] This study also reported that staff- or group-model HMOs were more likely than other types of practices to have IT to support patient care.

A possible limitation of our study is the 56 percent survey response to the phase with the question on use of EMRs. Bias in the national estimate of use is unlikely, however, because the nonresponse adjustment for the sample weights took into account the characteristics of nonparticipants. Response rates did not differ for the sampling frame characteristic most closely associated with differential use: practice ownership. Another limitation was that for the survey years reported here, NAMCS did not contain functions of the EMR other than documenting and storing patients' conditions and treatments. The 2005 NAMCS is asking about other functions, including computerized orders for prescriptions and tests, test results, clinical notes, reminders for guideline-based interventions or screening tests, and public health reporting.

Our findings suggest opportunities for initiatives to target organizational and financial incentives to foster EMRs. As outlined by the U.S. administration's framework, public policies, such as financial incentives from public insurance programs, may reward practices that adopt the technology and improve the business case for their use. [n13] The level of use in 2001-2003 will provide a valuable baseline by which to measure the effects of the federal initiative.

The authors acknowledge Paul Hebert for providing helpful comments on previous versions of the manuscript.

#### REFERENCE:

[n1.]

U.S. Congress, Office of Technology Assessment, Policy Implications of Medical Information Systems (Washington: U.S. Government Printing Office, 1977); and Institute of Medicine, Crossing the Quality Chasm: A New Health System for the Twenty-first Century (Washington: National Academies Press, 2001).

[n2.]

J. Goldsmith, D. Blumenthal, and W. Rishel, "Federal Health Information Policy: A Case of Arrested Development," Health Affairs 22, no. 4 (2003): 44-55.

[n3.]

A.G. Bower, The Diffusion and Value of Healthcare Information Technology, Pub. no. M6-272-HLTH (Santa Monica, Calif.: RAND, 2005).

[n4.]

D.J. Brailer, The Decade of Health Information Technology: Delivering Consumer-Centric and Information-Rich Health Care, Report to the Secretary of the Department of Health and Human Services, 21 July 2004, [www.hhs.gov/healthit/documents/hitframework.pdf](http://www.hhs.gov/healthit/documents/hitframework.pdf) (28 July 2005).

[n5.]

C.W. Burt and E. Hing, "Use of Computerized Clinical Support Systems in Medical Settings: United States 2001-2003," Advance Data from Vital and Health Statistics no. 353 (Hyattsville, Md.: National Center for Health Statistics, 2005).

[n6.]

Characteristics from the NAMCS sampling frame were compared for responding and nonresponding physicians: geographic region, location in an MSA, physician age and sex, major specialty categories, medical doctor versus doctor of osteopathy, and primary present employment. Chi-square analysis between responding and nonresponding physician distributions found that only region, MSA status, and major specialty were likely to represent different distributions (p .01). The nonresponse adjustment took differential survey participation patterns for region, MSA status, and physician specialty into account.

[n7.]

E. Bryant and I. Shimizu, "Sample Design, Sampling Variance, and Estimation Procedures for the National Ambulatory Medical Care Survey," Vital and Health Statistics 2, no. 108 (Hyattsville, Md.: NCHS, 1988); D.A. Cherry, C.W. Burt, and D.A. Woodwell, "National Ambulatory Medical Care Survey: 2001 Summary," Advance Data from Vital and Health Statistics no. 337 (Hyattsville, Md.: NCHS, 2003);

and D.A. Woodwell and D.A. Cherry, "National Ambulatory Medical Care Survey: 2002 Summary," Advance Data from Vital and Health Statistics no. 346 (Hyattsville, Md.: NCHS, 2004).

[n8.]

Research Triangle Institute, SUDAAN, Release 9.0 (Research Triangle Park, N.C.: RTI, 2004).

[n9.]

For example, in 2004 the Agency for Healthcare Research and Quality awarded contracts to develop five statewide networks that would allow major providers, purchasers, and payers to use health information technology to share information; see AHRQ, "AHRQ Health Information Technology Programs," [www.ahrq.gov/research/hitfact.htm](http://www.ahrq.gov/research/hitfact.htm) (14 March 2005). Several local initiatives starting in 2004 have the goal of increasing use, such as the Massachusetts e-Health Collaborative ("Massachusetts eHealth Collaborative Launches Project to Wire Health Care in the State," Press Release, 6 December 2004, [www.maehc.org/documents/MAeHC-PR-6-Dec-04.pdf](http://www.maehc.org/documents/MAeHC-PR-6-Dec-04.pdf) [14 March 2005]) and WellPoint Health Networks (see "Technology Initiatives," 2005, [www.wellpoint.com/business/health-initiatives.asp](http://www.wellpoint.com/business/health-initiatives.asp) [14 March 2005]). Such efforts provide funding or equipment for using health information technology for patient care. The WellPoint initiative provides almost 19,000 network physicians in California, Georgia, Missouri, and Wisconsin with new technologies designed to increase the quality of care, reduce administrative costs, and improve physicians' communication with patients and pharmacists.

[n10.]

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) (6 March 2005, registration required).

[n11.]

A.M. Audet et al., "Measure, Learn, and Improve: Physicians' Involvement in Quality Improvement," *Health Affairs* 24, no. 3 (2005): 843-853.

[n12.]

M.C. Reed and J.M. Grossman, "Limited Information Technology for Patient Care in Physician Offices," Issue Brief no. 89, September 2004, [www.hschange.org/CONTENT/708](http://www.hschange.org/CONTENT/708) (6 May 2005).

[n13.]

Brailer, *The Decade of Health Information Technology*.