

# Physician Attitudes on Ease of Use of EHR Functionalities Related to Meaningful Use

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The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 created incentives and provided technical assistance to spur widespread adoption of electronic health records (EHRs) in the United States. HITECH was designed to support greater use of health information technology in order to improve the efficiency and quality of patient care. Among its many provisions, HITECH authorized the Medicare and Medicaid EHR Incentive Programs, which began providing incentive payments to physicians and hospitals that demonstrated “Meaningful Use” (MU) of EHRs in 2011. HITECH also established a national EHR Certification Program to ensure that certified EHR technology included specific functionalities that meet MU criteria. In 2011, more than half of office-based physicians had adopted some type of EHR system, and about three-fourths of these physicians reported that their EHR was certified to meet MU criteria.<sup>1</sup>

To achieve the aims of HITECH, it is important to understand physician attitudes toward the use of EHRs after adoption. A key factor in physician acceptance of EHRs is the extent to which users perceive the technology to be easy to use and useful in enhancing patient care.<sup>2,3</sup> Since certification requires that functionalities meet technical standards, physician attitudes toward newer, more robust EHRs that meet MU criteria may differ from older systems. Attitudes may also depend on EHR implementation, such as receipt of technical assistance and amount of training.<sup>4</sup> Anecdotal reports suggest growing physician dissatisfaction with the usability of EHRs,<sup>5</sup> and physician difficulties in using EHR systems may lead to unintended consequences such as new work and safety issues.<sup>6</sup> Thus, understanding the factors related to physician attitudes on ease of use of specific EHR functions has important clinical and policy implications.

Prior research on physician attitudes regarding EHRs has focused on the barriers and benefits of EHR adoption,<sup>7-9</sup> satisfaction with EHRs overall<sup>10,11</sup> and during implementation,<sup>12,13</sup>

## ABSTRACT

**Objectives:** To assess physician attitudes on ease of use of electronic health record (EHR) functionalities related to “Meaningful Use” (MU) and whether perceived ease of use was associated with EHR characteristics, including meeting MU criteria, technical assistance from EHR vendors or regional extension centers, and the amount of clinical staff training.

**Study Design:** A cross sectional analysis of the 2011 Physician Workflow study, nationally representative of US office-based physicians.

**Methods:** Cross-sectional data were used to examine physician attitudes on ease of use of 14 EHR functionalities related to MU, among physicians with any EHR system.

**Results:** For 11 of the 14 EHR functions examined, physicians with EHRs that met MU criteria were significantly more likely than physicians that also utilized EHR systems to report that EHR functions were easy to use. For 8 of the functions examined, physicians receiving technical assistance from a vendor or regional extension center were significantly more likely to report that the EHR function was easy to use.

**Conclusions:** Our study of a nationally representative survey of office-based physicians found that physicians’ adoption and perceived ease of use of EHR functionalities related to MU was generally high.

*Am J Manag Care. 2015;21(12):e684-e692*

and influences of EHR use on professional and workplace satisfaction.<sup>14,16</sup> Fewer studies have focused on the association of EHR characteristics with ease of use related to specific EHR functions.<sup>17,18</sup> Physician surveys from single states have found relationships between EHR robustness and physician satisfaction with EHRs overall,<sup>10,19</sup> and a recent study using national data found that physicians using certified EHRs were more likely to report clinical benefits.<sup>20</sup> However, these studies were limited to EHR robustness in relation to perceptions of satisfaction and usefulness, but not ease of use. Important gaps remain in our understanding of the associations between EHR characteristics with perceived ease of use, particularly for newer functionalities, such as secure messaging and public health reporting.

This study used nationally representative survey data from 2011 to examine physician attitudes on the ease of use of EHR functionalities related to MU. We also assessed whether perceived ease of use varied by EHR characteristics, including EHR certification, receipt of technical assistance from vendors or regional extension centers, and the amount of clinical staff training. Findings have important policy implications for the potential role of robustness and implementation support to influence physician attitudes on usability of some EHR functions.

## METHODS

### Data Sources and Analysis Sample

The data source was the 2011 National Ambulatory Medical Care Survey (NAMCS) Physician Workflow study, the first wave of a longitudinal panel survey of US office-based physicians.<sup>1</sup> The Physician Workflow study was conducted by the National Center for Health Statistics and collected information on physicians' attitudes toward and experiences with EHRs across many domains. Survey content was developed with the guidance of an expert advisory panel, and separate questionnaires were developed for physicians using an EHR and physicians who had not yet adopted an EHR. Questions about ease of use of specific EHR functionalities were included on the EHR adopter questionnaire only.

The sample for the Physician Workflow study was a subset of physicians who were contacted to participate in the 2011 NAMCS Electronic Health Records Survey (NEHRS). The target universe for the NAMCS was nonfederal, office-based physicians in the United States, excluding radiologists, anesthesiologists, and pathologists. A total of

### Take-Away Points

Physician attitudes on ease of use of electronic health record (EHR) functionalities were generally positive.

- Among a nationally representative sample of office-based physicians, EHR adoption and perceived ease of use of EHR functionalities related to Meaningful Use (MU) were relatively high.
- Physicians using an EHR that met MU criteria were much more likely to report that EHR functionalities were easy to use.
- Technical assistance and training were associated with ease of use for some but not all EHR functionalities.

5232 physicians were sampled for the Physician Workflow study; the response rate for the 2011 survey was 61%, yielding a final sample size of 3180. This analysis was limited to respondents who used an EHR at their primary practice location in 2011 (n = 1793). Information on adoption of specific EHR functions was obtained from corresponding respondents of the 2011 NEHRS. Additional information on the survey methods is available elsewhere.<sup>1</sup>

### Rates of Adoption and Physician Attitudes on Ease of Use of Specific EHR Functions

We examined rates of adoption and physician attitudes on the ease of use of EHR functionalities related to MU. Adoption of specific EHR functions was measured using a NEHRS question asking whether the physician's reporting location had computerized capabilities for each function. Fourteen of the 16 EHR functions listed in the Physician Workflow study mapped to MU Stage 1 or Stage 2 core or menu requirements; we focused our analyses on these 14 functions.

Perceived ease of use was measured from physician responses to the question: "Please indicate your level of ease or difficulty for each EHR function." Response categories included: "very easy," "easy," "difficult," "very difficult," and "not applicable." Physicians were instructed to select "not applicable" if they did not have or did not use a particular EHR function. Physicians were considered as having adopted and been using a specific function if they had a response other than "not applicable" for the question about ease of use of the function. We reported on physicians' perceived ease of use of EHR functionalities, conditional on their adoption and use of that specific function. To report on ease of use, we used dichotomous variables that combined the "very easy" and "easy" responses into 1 group and combined "difficult," "very difficult," and missing responses in the comparison group. Missing responses across items ranged between 1% and 13% of physicians. Because we coded missing responses as "difficult" or "very difficult" in the analysis, rather than excluding them from the denominator, the estimates of ease

of use may be conservative. Results were not sensitive to the exclusion of missing responses.

### EHR Characteristics Associated With Perceived Ease of Use

The study hypothesized that EHR characteristics, including certification and implementation support, would be positively associated with perceived ease of use.

To measure EHR certification, we created a dichotomous variable indicating whether or not the respondent's EHR was certified to meet the Stage 1 MU criteria. This variable was created based on responses to the question: "Does your current system meet Meaningful Use criteria as defined by the Centers for Medicare & Medicaid Services (CMS)?" Response categories were "yes," "no," and "uncertain." Physicians who answered "yes" were considered to have EHRs that met MU criteria. Of the entire sample, 8.4% answered "no," 14.4% answered "uncertain," and 1.4% did not answer the question. Sensitivity analyses using an alternative measure of whether physicians had 9 of the 15 computerized capabilities that compose the core MU requirements yielded similar results to the main analysis.

To measure EHR implementation support, we created variables for technical assistance from EHR vendors or regional extension centers and the amount of clinical staff training. Receipt of technical assistance was measured using the questions: "Did you receive help from EHR vendors in analyzing your practice work flow?" and "Did you receive help from regional extension centers (RECs) in analyzing your practice work flow?" Since respondents may have received assistance from both vendors and RECs, we combined "yes" responses to either question as having received technical assistance. The amount of clinical staff training was determined using the question: "How many hours, on average, did clinical staff spend in training to implement your practice's EHR system?" To balance cell sizes, we created 3 categories for the amount of training as 0 to 8 hours (combining responses "1 to 8 hours" and "did not receive training"), 9 to 40 hours, and 41 or more hours (combining "41 to 80 hours" and "over 80 hours").

In multivariate analyses, we included additional controls for physician (age, specialty) and office characteristics (size [number of physicians], ownership, practice type, metropolitan status, region) that have been associated with EHR adoption and physician attitudes toward EHRs in previous research (listed in [Table 1](#)).<sup>21,22</sup>

### Analyses

Univariate descriptive statistics were calculated to describe the percent of physicians that adopted specific

EHR functions, and among EHR adopters, the percent of physicians who reported the EHR function was easy to use (either "very easy" or "easy"). Multivariate logistic regression analyses were used to examine whether perceived ease of use varied by EHR characteristics while controlling for other physician and office characteristics. All analyses were conducted using Stata version 11.2 software (StataCorp LP, College Station, Texas) using weights to account for nonresponse and adjusting standard errors for the complex survey design of the data.

## RESULTS

### EHR Characteristics Among Physicians With Any EHR

Using a nationally representative sample of EHR adopters, more than three-fourths (76%) reported that their EHR met MU criteria ([Table 2](#)). Fewer than half (45%) of EHR adopters reported the receipt of technical assistance with analyzing practice work flow from EHR vendors or RECs. About 1 in 5 (22%) physicians with any EHR received 41 or more hours in clinical staff training to implement their EHR system.

### Adoption and Perceived Ease of Use of EHR Functionalities Related to Meaningful Use

Among physicians that had adopted an EHR, physicians' rate of adopting and using 14 EHR functions related to MU ranged from 98% (recording a comprehensive list of medications and allergies) to 40% (public health reporting) ([Table 3](#)). Overall, at least 75% of EHR adopters reported adopting and using 9 of the 14 EHR functions we examined. Functions related to documentation had the highest rates of adoption and use; exchanging secure messages with patients and public health reporting had the lowest adoption rates.

Among physicians who reported adopting and using a given EHR function, the percent who reported the function was easy to use ranged from 91% (viewing laboratory results) to 49% (public health reporting). At least 75% of EHR adopters considered 10 of the 14 functions we examined as easy to use; this included functions related to documentation, ordering, viewing results, decision support, patient engagement, and clinical data exchange.

In general, the percent of physicians who considered a particular EHR function to be easy to use was higher for more commonly adopted EHR functions and lower for less commonly adopted EHR functions. For example, the percent of physicians who considered the least commonly adopted functions as easy to use, were relatively low; these

■ **Table 1.** Characteristics of Office-Based Physicians and Physicians With Any Electronic Health Record

	All Physicians (n = 3180)	Physicians With Any EHR (n = 1793)
Physician characteristics		
Age, years		
≥50	63%	57%
<50	37%	43%
Specialty		
Nonprimary care	52%	49%
Primary care	48%	51%
Office characteristics		
Size: physicians, n		
1	24%	13%
2	10%	11%
3-5	23%	25%
6-10	17%	20%
≥11	13%	21%
Unknown	13%	10%
Ownership		
Physician or physician group	56%	50%
Hospital/academic medical center	14%	17%
Health maintenance organization/other healthcare corporation	9%	13%
Community health center	4%	5%
Other/unknown	18%	15%
Practice type		
Single specialty	67%	60%
Multi-specialty	21%	30%
Unknown	12%	10%
Metropolitan status		
MSA	88%	87%
Non-MSA	12%	13%
Region		
Northeast	20%	19%
Midwest	21%	22%
South	36%	34%
West	22%	24%

EHR indicates electronic health record; MSA, metropolitan statistical area.

Source: 2011 National Ambulatory Medical Care Survey (NAMCS) Physician Workflow study, conducted by the National Center for Health Statistics.<sup>1</sup>

included public health reporting (49%), viewing data on quality measures (63%), secure messaging with patients (68%), and reminders based on guidelines (69%).

### EHR Characteristics and Perceived Ease of Use of Specific EHR Functions

Physician attitudes on ease of use of specific EHR functions varied according to some EHR characteristics (Table

4) (see also eAppendix Table [eAppendix available at [www.ajmc.com](http://www.ajmc.com)]). For 12 of the 14 functions examined, physicians with EHRs that met MU criteria had 56% to 196% higher odds of reporting the EHR function was easy to use. EHR certification had the strongest association with perceived ease of use in providing reminders for guideline-based interventions or screening tests (+196% difference in the odds of ease of use) and providing patients with a clinical summary

■ **Table 2. EHR Characteristics Among Physicians With Any Electronic Health Record**

EHR Characteristics	Percent of Physicians (n = 1793)
EHR certification	
Yes, EHR meets MU criteria	76%
No or uncertain	24%
Technical assistance from EHR vendors or regional extension centers	
Yes, received help in analyzing practice work flow	45%
No	55%
Amount of clinical staff training	
0-8 hours	30%
9-40 hours	48%
≥41 hours	22%

EHR indicates electronic health record; MU, Meaningful Use.  
Source: 2011 National Ambulatory Medical Care Survey (NAMCS) Physician Workflow study, conducted by the National Center for Health Statistics.<sup>1</sup>

for each visit (+176%). EHR functions related to documentation and viewing clinical data showed smaller differences based on whether physicians' EHRs met MU criteria. For example, EHR certification had no significant effect on ease of use for recording a comprehensive list of medication and allergies or viewing imaging reports.

Receipt of technical assistance from EHR vendors or RECs had some association with perceived ease of use (Table 4). For 8 of the 14 functions examined, physicians receiving technical assistance had 55% to 174% higher odds of reporting that the EHR function was easy to use. Technical assistance had the strongest relationships with ease of use of EHR functions related to public health reporting (+174%), viewing data on quality of care (+101%), and exchanging secure messages with patients (+98%).

The amount of clinical staff training had little association with perceived ease of use (Table 4). Relative to 0 to 8 hours, clinical staff training of 9 to 40 hours had no effect on perceived ease of use for any EHR functions. Training of 41 or more hours was associated with 51% to 60% lower odds of reporting that the EHR function was easy to use for 4 functions: viewing imaging reports, recording clinical notes, providing patients with clinical summaries, and recording problem lists.

### Physician and Office Characteristics Associated With Perceived Ease of Use of Specific EHR Functions

With the exception of practice ownership, we found little association of physician and office characteristics with perceived ease of use that was consistent across the 14 EHR functions (see eAppendix Table). For 9 of the 14 functions examined, physicians in practices owned by a health main-

tenance organization (HMO) or other healthcare corporation had 125% to 494% higher odds of reporting the EHR function was easy to use compared with physicians working in physician-owned practices.

## DISCUSSION

Using a nationally representative survey of office-based physicians conducted in 2011,<sup>1</sup> in this study, we provide one of the first studies on the association of EHR characteristics with physician attitudes on ease of use of EHR

functionalities related to MU.<sup>10,16,18,19</sup> We found that both adoption of specific EHR functions and perceived ease of use were relatively high. In 2011, at least three-fourths of EHR adopters reported adopting and using 9 of 14 EHR functions related to MU; furthermore, at least 3 of 4 EHR adopters considered 10 of the 14 EHR functions as easy to use. However, we found that physicians considered less commonly available EHR functions as less easy to use.

We also found that some EHR characteristics were associated with physicians' ease of using EHR functions. For 12 of the 14 EHR functions we examined, physicians with EHRs that met MU criteria were significantly more likely than physicians with other EHRs to report that EHR functions were easy to use. Technical assistance during EHR implementation played a significant, though less important, role in perceived ease of use compared with EHR certification. More clinical staff training was associated with lower ease of use for a few EHR functions. This finding might be due to the complexity of implementation, concomitant changes to practice work flow, or the possibility that physicians with less experience with EHRs required more initial training.<sup>13,23</sup>

Our findings suggest that EHR certification and implementation support might play a role in physician attitudes toward EHRs. Although concern has been expressed that EHR vendors have developed poorly designed systems,<sup>24</sup> our findings offer preliminary evidence that EHR certification is associated with perceived ease of use. The MU criteria were selected with the goal of enabling EHRs to support improved safety, quality, and efficiency of patient care.<sup>25</sup> MU criteria require that EHRs have the capabilities to enable the collection of important patient data, in addition to



**Table 3. Adoption and Perceived Ease of Use of EHR Functionalities Related to Meaningful Use Among Physicians With Any EHR**

	Percent of Physicians <sup>a</sup> With Adoption of EHR Functionality	Conditional on Adoption, Percent of Physicians Reporting EHR Functionality Is Easy to Use
Documentation		
Recording a patient problem list	0.94	0.86
Recording a comprehensive list of the patient's medications and allergies	0.98	0.84
Recording clinical notes	0.97	0.83
Ordering		
Ordering prescriptions electronically (sending a prescription directly to a pharmacy at the point-of-care)	0.91	0.88
Ordering lab tests electronically at point-of-care	0.72	0.80
Viewing results and quality measures		
Viewing lab results	0.88	0.91
Viewing imaging reports	0.82	0.85
Viewing data on quality-of-care measures	0.62	0.63
Decision support		
Clinical decision support (eg, alerts for drug interactions or contraindications)	0.86	0.84
Providing reminders for guideline-based interventions or screening tests	0.64	0.69
Patient engagement		
Providing patients with clinical summaries for each visit	0.75	0.80
Exchanging secure messages with patients	0.42	0.68
Clinical data exchange		
Exchanging patient clinical summaries with other physicians	0.77	0.76
Public health reporting	0.40	0.49
EHR indicates electronic health record. <sup>a</sup> n = 1793. Estimates are unadjusted. Source: 2011 National Ambulatory Medical Care Survey (NAMCS) Physician Workflow study, conducted by the National Center for Health Statistics. <sup>1</sup>		

computerized ordering and clinical decision support capabilities considered critical to improving quality of care.<sup>26,27</sup> Our findings are consistent with prior studies that found higher EHR satisfaction and greater reporting of EHR benefits among physicians using EHRs that were relatively robust or met MU criteria.<sup>10,19</sup> Since the advent of HITECH, the number of certified EHR vendor products has increased dramatically.<sup>28</sup> The role of certification in influencing physician attitudes toward EHRs warrants further examination.

We did find variation in perceived ease of use across EHR functions, with more physicians reporting that less common EHR functions were more difficult to use. Prior research has found that perceptions of EHR usefulness improved as users moved beyond the implementation stage and acquired more EHR experience.<sup>23,29-32</sup> Physicians may have less experience with more novel and advanced EHR

functions that involve more complex work flow such as decision support, engagement with patients, or clinical data exchange with outside providers. Perceived ease of use was lowest for EHR functions requiring external coordination, including public health reporting, secure messaging with patients, and viewing data on quality measures. Improvements in the adoption and ease of use of public health reporting functions of EHRs may hinge on improvements in state and local public health systems' capacity to exchange data with physicians.<sup>33</sup> Our findings suggest that technical assistance from EHR vendors or RECs may play a role in improving ease of use of some EHR functions.

Very few physician or practice characteristics were associated with perceived ease of use of specific EHR functions. Physicians in practices owned by HMOs or other healthcare corporations were more likely to consider 7

**Table 4.** Association of Electronic Health Record Characteristics With Perceived Ease of Use, by Specific EHR Function (adjusted odds ratios<sup>a</sup>)

	EHR Meets Meaningful Use Criteria	Technical Assistance From EHR Vendor or REC	Clinical Staff Training 9-40 Hours	Clinical Staff Training ≥41 Hours
Documentation				
Recording a patient problem list	1.89 <sup>b</sup>	1.56	0.97	0.49 <sup>c</sup>
Recording a comprehensive list of the patient's medication and allergies	1.46	0.72	1.57	0.82
Recording clinical notes	1.56 <sup>c</sup>	1.16	1.09	0.47 <sup>b</sup>
Ordering				
Ordering prescriptions electronically (sending a prescription directly to a pharmacy at the point of care)	2.62 <sup>b</sup>	1.94 <sup>b</sup>	0.96	0.84
Ordering lab tests electronically at point of care	2.48 <sup>b</sup>	1.38	1.02	0.67
Viewing results and quality measures				
Viewing lab results	2.24 <sup>b</sup>	1.7	0.87	0.55
Viewing imaging reports	1.38	1.68 <sup>c</sup>	0.62	0.40 <sup>b</sup>
Viewing data on quality-of-care measures	2.54 <sup>b</sup>	2.01 <sup>b</sup>	1.52	1.27
Decision support				
Clinical decision support (eg, alerts for drug interactions or contraindications)	2.31 <sup>b</sup>	1.26	1.54	1.07
Providing reminders for guideline-based interventions or screening tests	2.96 <sup>b</sup>	1.80 <sup>b</sup>	1.46	1.45
Patient engagement				
Providing patients with clinical summaries for each visit	2.76 <sup>b</sup>	1.98 <sup>b</sup>	0.90	0.48 <sup>c</sup>
Exchanging secure messages with patients	1.43	2.00 <sup>c</sup>	0.67	0.64
Clinical data exchange				
Exchanging patient clinical summaries with other physicians	1.94 <sup>b</sup>	1.55 <sup>c</sup>	1.05	0.69
Public health reporting	2.17 <sup>c</sup>	2.74 <sup>b</sup>	1.46	1.39
EHR indicates electronic health record; REC, regional extension center. <sup>a</sup> Adjusted odds ratios from logistic regression. Estimates adjusted for physician and office characteristics listed in Table 1. <sup>b</sup> Significant at <i>P</i> < .01. <sup>c</sup> Significant at <i>P</i> < .05. Source: 2011 National Ambulatory Medical Care Survey (NAMCS) Physician Workflow study, conducted by the National Center for Health Statistics. <sup>1</sup>				

of the 14 EHR functions as easy to use. Integrated delivery systems have promoted EHRs as a critical part of patient care, and the rate of EHR adoption has been higher among these practices.<sup>21,34</sup> The influence of delivery system organization on physician attitudes toward EHRs is an important subject of future research.

**Policy Implications**

Our findings have noteworthy implications for both policy and clinical practice. Usability has been emphasized as key to achieving the benefits from EHRs. However, current EHRs have been criticized as having poor usability, which can lead to unintended consequences such as inefficiency and harm to patients.<sup>5,35</sup> Our findings suggest that

certification and implementation support may play a role in physician attitudes on ease of use, particularly for functionalities newly required by the MU program.

**Limitations**

Our measure of EHR certification (ie, whether a physician was using an EHR that met MU criteria) was not directly validated, though our estimate was consistent with another government survey, and our findings were robust to sensitivity analyses. Additionally, we did not have data on physicians' experience with, and actual use of, specific EHR functions, and we were unable to assess physician acceptance and satisfaction with their EHRs. Although the survey response rate was relatively high, nonresponse bias

may lead to overestimates of physicians' positive perceptions regarding ease of use. Given the cross-sectional nature of this analysis, we cannot conclude that our findings represent causal relationships, nor could we examine trends. Our findings may also partly reflect an "early adopter" phenomenon whereby physicians who are more willing to use new technology or had adopted EHRs at an earlier point in time were most likely to perceive EHRs as easy to use.<sup>11</sup>

Our study also did not address certain important topics of interest. The findings reflect physician attitudes on EHR ease of use only, and the survey did not examine actual usability and other predictors of technology acceptance (ie, usefulness, compatibility), which are opportunities for future research. Correlation of ease of use with satisfaction and impacts was beyond the scope of this study. Future research should examine the reasons why perceptions of ease of use vary across physicians (ie, user interface) and how usability of EHRs can be enhanced.<sup>3,36</sup>

## CONCLUSIONS

Among physicians with any EHR, we found that adoption of specific EHR functions related to MU and perceived ease of use were generally high. Ease of use was significantly higher among physicians adopting EHRs that met MU criteria. Perceived ease of use was higher among those receiving technical assistance from EHR vendors or RECs for some, but not all, functionalities. More research to understand and improve EHR usability will be critical to ensuring HITECH goals are met.

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**Source of Funding:** None.

**Author Disclosures:** The authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

**Authorship Information:** Concept and design (MFF, JK, VP); analysis and interpretation of data (MFF, JK, VP); drafting of the manuscript (MFF, JK, VP); critical revision of the manuscript for important intellectual content (MFF, JK); statistical analysis (MFF).

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**eAppendix Table.** Association of EHR, Physician and Office Characteristics With Perceived Ease of Use, by EHR Functionality

	<b>Problem List</b>	<b>Medication/Allergy List</b>	<b>Clinical Notes</b>	<b>Electronic Prescribing</b>	<b>Ordering Lab Tests</b>
<u>EHR characteristics</u>					
EHR certification					
Yes, EHR meets MU criteria	1.89***	1.46	1.56**	2.62***	2.48***
No or uncertain	1.00	1.00	1.00	1.00	1.00
Technical assistance from EHR vendor/REC					
Yes, received help	1.56	0.72	1.16	1.94***	1.38
No	1.00	1.00	1.00	1.00	1.00
Amount of clinical staff training					
0 to 8 hours	1.00	1.00	1.00	1.00	1.00
9 to 40 hours	0.97	1.57	1.09	0.96	1.02
41 or more hours	0.49**	0.82	0.47***	0.84	0.67
<u>Physician characteristics</u>					
Age					
Less than 50	1.01	1.38	1.00	1.65**	1.29
50 or over	1.00	1.00	1.00	1.00	1.00
Specialty					
Non primary care	1.00	1.00	1.00	1.00	1.00
Primary care	1.10	1.74***	1.36	1.57	1.00
<u>Office characteristics</u>					
Size: number of physicians					
1	1.00	1.00	1.00	1.00	1.00
2	3.02**	1.43	0.60	1.06	2.78**
3-5	1.09	0.73	0.85	1.65	1.44
6-10	0.80	0.62	0.67	1.20	1.73
11+	0.52	0.51	0.74	1.74	2.66**
Unknown	1.38	0.39	0.64	1.14	0.24
Ownership					
Physician or physician group	1.00	1.00	1.00	1.00	1.00
Hospital/academic medical center	0.58	0.78	0.71	0.67	1.30
HMO/other health care corporation	2.11	2.18	2.25**	2.99**	2.89**
Community health center	0.39	0.29***	0.75	0.96	0.65
Other/unknown	1.67	1.42	4.56***	0.49	1.16
Practice type					
Single specialty	1.00	1.00	1.00	1.00	1.00
Multi-specialty	1.03	1.18	0.79	0.76	0.96
Unknown	0.47	1.50	0.36	1.40	14.47***
Metropolitan status					
MSA	1.00	1.00	1.00	1.00	1.00
Non-MSA	0.88	1.06	0.73	1.40	1.17
Region					
Northeast	1.50	1.18	1.16	1.66	1.55
Midwest	1.05	0.75	0.75	1.13	1.33
South	1.00	1.00	1.00	1.00	1.00
West	1.19	1.29	1.48	0.94	1.32

EHR indicates electronic health record; MSA, Metropolitan Statistical Area; MU, Meaningful Use; REC, regional extension centers.

Adjusted odds ratios from logistic regression. Significant at  $P < .01$  (\*\*) and  $P < .05$  (\*). “\*\*\*” indicates  $P \leq .001$ .

Source: 2011 National Ambulatory Medical Care Survey Physician Workflow study by the National Center for Health Statistics. (n = 1793)

**eAppendix Table.** Association of EHR, Physician and Office Characteristics with Perceived Ease of Use, by EHR Functionality (*continued*)

	Viewing Lab Results	Viewing Imaging Reports	Viewing Quality of Care Measures	Clinical Decision Support	Reminders for Guidelines
<u>EHR characteristics</u>					
EHR certification					
Yes, EHR meets MU criteria	2.24***	1.38	2.54***	2.31***	2.96***
No or uncertain	1.00	1.00	1.00	1.00	1.00
Technical assistance from EHR vendor/REC					
Yes, received help	1.70	1.68**	2.01***	1.26	1.80***
No	1.00	1.00	1.00	1.00	1.00
Amount of clinical staff training					
0 to 8 hours	1.00	1.00	1.00	1.00	1.00
9 to 40 hours	0.87	0.62	1.52	1.54	1.46
41 or more hours	0.55	0.40***	1.27	1.07	1.45
<u>Physician characteristics</u>					
Age					
Less than 50	1.34	1.74**	1.04	1.02	1.08
50 or over	1.00	1.00	1.00	1.00	1.00
Specialty					
Non primary care	1.00	1.00	1.00	1.00	1.00
Primary care	1.59	1.00	1.33	1.05	1.01
<u>Office characteristics</u>					
Size: number of physicians					
1	1.00	1.00	1.00	1.00	1.00
2	1.41	1.37	0.56	1.27	0.85
3-5	1.42	1.77	0.71	2.61**	0.90
6-10	1.41	1.41	0.53	1.09	0.62
11+	1.21	1.09	0.73	1.8	1.06
Unknown	0.51	5.27**	2.01	1.58	0.46
Ownership					
Physician or physician group	1.00	1.00	1.00	1.00	1.00
Hospital/academic medical center	2.35**	1.56	0.66	0.74	0.85
HMO/other health care corporation	2.86**	2.29**	1.32	4.76***	3.42***
Community health center	0.22***	0.69	0.50	0.53	1.02
Other/unknown	2.17	0.97	1.7	1.16	0.9
Practice type					
Single specialty	1.00	1.00	1.00	1.00	1.00
Multi-specialty	1.60	2.20**	1.19	0.66	1.47
Unknown	3.62	0.42	0.30	1.18	2.77
Metropolitan status					
MSA	1.00	1.00	1.00	1.00	1.00
Non-MSA	1.17	0.76	1.02	0.83	1.14
Region					
Northeast	2.34**	1.63	1.09	1.20	1.27
Midwest	1.17	1.09	0.94	0.88	0.81
South	1.00	1.00	1.00	1.00	1.00
West	1.60	1.47	1.18	1.03	1.25

EHR indicates electronic health record; MSA, Metropolitan Statistical Area; MU, Meaningful Use; REC, regional extension centers.

Adjusted odds ratios from logistic regression. Significant at  $P < .01$  (\*\*) and  $P < .05$  (\*). “\*\*\*” indicates  $P \leq .001$ .

Source: 2011 National Ambulatory Medical Care Survey Physician Workflow study by the National Center for Health Statistics. (n = 1793)

**Appendix Table.** Association of EHR, Physician and Office Characteristics with Perceived Ease of Use, by EHR Functionality (*continued*)

	Patient Clinical Summaries	Secure Messaging	Exchange With Other Physicians	Public Health Reporting
<u>EHR characteristics</u>				
EHR certification				
Yes, EHR meets MU criteria	2.76***	1.43	1.94***	2.17**
No or uncertain	1.00	1.00	1.00	1.00
Technical assistance from EHR vendor/REC				
Yes, received help	1.98***	2.00**	1.55**	2.74***
No	1.00	1.00	1.00	1.00
Amount of clinical staff training				
0 to 8 hours	1.00	1.00	1.00	1.00
9 to 40 hours	0.90	0.67	1.05	1.46
41 or more hours	0.48**	0.64	0.69	1.39
<u>Physician characteristics</u>				
Age				
Less than 50	0.85	1.28	1.01	1.34
50 or over	1.00	1.00	1.00	1.00
Specialty				
Non-primary care	1.00	1.00	1.00	1.00
Primary care	0.94	1.37	0.66**	1.08
<u>Office characteristics</u>				
Size: number of physicians				
1	1.00	1.00	1.00	1.00
2	0.59	0.49	0.78	0.29**
3-5	1.02	0.57	0.91	0.42**
6-10	0.55	0.83	0.53	0.32**
11+	0.52	0.63	0.60	0.56
Unknown	0.62	0.12	1.51	0.45
Ownership				
Physician or physician group	1.00	1.00	1.00	1.00
Hospital/academic medical center	1.22	1.79	1.51	0.87
HMO/other health care corporation	1.44	5.94***	3.49***	0.91
Community health center	0.81	0.28	0.54	0.43
Other/unknown	1.26	1.22	2.37**	0.8
Practice type				
Single specialty	1.00	1.00	1.00	1.00
Multi-specialty	1.10	1.30	2.09***	1.86
Unknown	2.23	9.09	0.40	3.29
Metropolitan status				
MSA	1.00	1.00	1.00	1.00
Non-MSA	0.78	0.70	1.00	0.82
Region				
Northeast	0.63	0.83	2.13**	0.89
Midwest	0.81	1.83	0.99	0.76
South	1.00	1.00	1.00	1.00
West	0.88	2.31**	1.12	0.65

EHR indicates electronic health record; MSA, Metropolitan Statistical Area; MU, Meaningful Use; REC, regional extension centers. Adjusted odds ratios from logistic regression. Significant at  $P < .01$  (\*\*) and  $P < .05$  (\*). Adjusted odds ratios from logistic regression. “\*\*\*” indicates  $P \leq .001$ .

Source: 2011 National Ambulatory Medical Care Survey Physician Workflow study by the National Center for Health Statistics. (n = 1793)