Wisconsin Ambulatory Health Information Technology (HIT) Survey 2006-2007

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Abstract

This survey of Wisconsin ambulatory practice sites in Wisconsin was conducted in Fall/Winter of 2006/2007 to ascertain the use of health information technology in outpatient clinics and practices. Response rates were much higher from clinics belonging to large systems (ten or more locations) than independent clinics and those belonging to smaller systems, thus overall responses significantly over-represent large systems. For this reason, our report includes separate estimates for large systems as opposed to independent and small-system sites. Rural and urban sites, primary care sites, multi-specialty practice sites, and specialty-only sites are also reported separately.

Thirteen percent (13%) of practices reported using fully electronic medical records (EMRs); 41% had at least partially electronic medical records, and 45% reported having no electronic medical records (these are weighted estimates to adjust for the over-representation of large-system sites). The proportion of large-system sites featuring fully electronic records was not significantly different ($p>.05$) than for small-system and independent sites nor were urban sites significantly different than rural sites. On the other hand, large-system sites and urban sites were significantly more likely to have at least partially electronic medical records than their counterparts.

Thirty-six percent (36%) of physicians practice at responding sites with fully electronic medical records, and over 83% practice at responding sites with at least partially electronic records. However, these proportions reflect the over-representation of large-system sites, where 39% of physicians use fully electronic records and 50% have partially electronic records, compared to only 14% and 23% respectively in independent and small-system sites.

Over 70% of sites with fully or partially electronic medical record systems include applications for recording the medical history and clinical narratives; managing prescribing; sending laboratory test orders; viewing laboratory and imaging results; providing reminders based on clinical guidelines; and aiding chronic disease management, referral tracking, and communication with patients. However, a large proportion of those so equipped do not actually use the following functions: prescription formulary alerts (49%), laboratory order entry (30%) and transmission to the laboratory (46%), guidelines-based clinical alerts (35%), chronic disease management (34%), referral tracking (34%), and communicating with patients (25%). This implies a substantial portion of the expected benefits of EMR use in the outpatient setting have not yet been achieved. Sites affiliated with large systems and primary care practices were significantly more likely to use most of these applications compared to independent and small-system sites, and specialty-only practices.

Ninety-eight percent (98%) of respondents with an EMR reported being able to access patient information offsite when needed (for example, during hospital rounds or on-call). Ninety-eight percent (98%) of respondents reported their EMR system could exchange data with their electronic Practice Management Systems.

A majority of current EMR users reported that an EMR improved ("Slightly Better" or "Substantially Better") each of nine practice functions queried, ranging from 51% who stated it improved the competitive position of the practice, to 99% who felt it improved clinician access to patient information. A majority of sites that had not yet installed an EMR system predicted an

EMR would improve seven out of nine of these same practice functions, although the predicted degree of improvement was significantly lower ($p<.001$) for each item than that actually reported by practices with EMR systems already installed. In other words, both current and potential EMR users positively rate the impact of an EMR on their practices, and current users experience higher benefits than predicted by those who have not yet installed EMR systems.

Of sites currently lacking an EMR system, 48% of respondents plan to implement such a system in the next 3 years, while 12% did not know and 40% did not plan to. Over 40% of responding sites that did not currently have EMR systems installed rated 6 of 10 queried barriers as "Major" (delaying or making implementation difficult) or "Extreme" (significantly delaying or threatening implementation), whereas a substantially smaller proportion of sites with an EMR system already installed reported actually experiencing such severe barriers. Economic barriers predominated among those cited by practices without an EMR, including lack of capital (70%), concerns about productivity loss during implementation (51%), and concerns about the overall return on investment (50%) The first two factors were also the most frequently cited barriers by sites already equipped with an EMR (28% and 34% respectively), but only 1% of these had concern about the return on investment. The severity of barriers experienced by practices with an EMR already implemented were significantly lower ($p<.001$) than those cited by practices without an EMR. It cannot be known if this reflects an overly pessimistic view by practices that have not installed an EMR or whether actual attributes of those practices enhance the barriers. Among sites that had already installed EMR systems, independent practices and those affiliated with small systems were significantly ($p<.001$) more likely to rate four of the barriers as "Major" or "Extreme" than their large-system counterparts: administrative acceptance; insufficient knowledge to evaluate, compare, and select an appropriate EMR; insufficient time to select, contract, install, and implement an EMR; and the lack of EMR certification or standardization. This suggests that focused efforts in these areas might improve EMR adoption rates in independent and small-system sites.

Considerable interest was expressed in exchanging electronic patient information with other parties both inside the same health organization and with other health organizations. The highest priorities were for exchange between the clinic sites and partners within the same health system, including hospitals, laboratories, other clinics, and imaging providers. These priorities were matched by high proportions of practice sites currently participating in such exchange (87%, 88%, 78% and 82% respectively). However, considerable priority was also placed on being able to communicate with pharmacies both inside and outside the same organization. The proportion of sites placing top priority on provider-pharmacy exchange (71% for pharmacies within the same system and 40% for pharmacies outside the same system) was much higher than the actual proportion achieving such exchange (48% and 18% respectively). Thus, it appears there is strong demand for ePrescribing but also challenges that are interfering with its realization. Nineteen percent (19%) of responding sites had free-standing ePrescribing systems that were separate from a more comprehensive EMR. While over 95% of these applications were actively used to produce safety alerts and formulary alerts, only 8% were currently capable of transmitting prescriptions electronically to pharmacists.

A high priority was also placed on electronic exchange to serve provider-patient communication. Rapid progress appears to be occurring in this sector, with 75% of clinics using Internet for provider-patient correspondence, 71% for prescription refill management, 65% for providing patients with test results, and 64% of clinics allowing patient data entry using the Internet.

However, the vast majority of respondents using the Internet for these functions are large-system sites.

Fifty-nine percent (59%) of sites report that some performance measures regarding their practice are made publicly available, and 31% report that such measures are linked to economic incentives by health plans.

Compared with the National Ambulatory Medical Care Survey, upon which we based many questions, the rate of adoption of electronic health records in Wisconsin in 2006-2007 is substantially higher than that reported by a nationwide sample of physicians in 2005. This is likely due in part to a higher proportion of Wisconsin ambulatory physicians and practices being associated with larger group practices and health systems.

Introduction

In November 2005, Governor Doyle issued Executive Order 129 establishing the eHealth Care Quality and Patient Safety Board and charging it to, among other things, "…annually assess the extent to which automated information and decision support systems are used by health care providers in Wisconsin and annually assess options and progress on the action plan to achieve automation of all health care systems by 2010." To fulfill part of this charge and establish a baseline measurement, the eHealth board commissioned Seth Foldy MD, MPH of the Medical College of Wisconsin and MetaStar to conduct a survey of physician practice sites.

The objectives of the study were to:

- Provide information to the Governor's eHealth Board on the status of health information technology adoption and health information exchange participation among providers in Wisconsin
- Design an assessment process that is repeatable and can yield trends over time
- Design a method that permits benchmarking with national or other states' data

For the purposes of this report, Health Information Technology (HIT) is the use of computers and computer programs to store, protect, retrieve, and transfer clinical, administrative, and financial information electronically within health care settings. An Electronic Medical Record (EMR) system is a system by which providers manage clinical information longitudinally for each patient for both medical management and medico-legal purposes. Practice Management Systems (PMS) are those that manage the business functions of a practice, which may include one or more of patient and payer demographics, registration for encounters, scheduling, third-party billing, patient billing, and similar functions. Health Information Exchange (HIE) is the electronic sharing of patient information about a particular patient across organizational boundaries for clinical purposes other than purely billing or other administrative needs. Electronic prescribing or ePrescribing is a system for electronically recording prescriptions, with other features that may include unidirectional or bidirectional electronic communication between prescribers and pharmacists, automated checking of prescriptions against formulary lists, and decision support features that identify potential safety problems like drug-drug or drug-allergy interactions.

Survey Methodology/Data Collection

We sent a self-administered survey tool to Wisconsin physician practice sites via US mail. The survey focused on two aspects of electronic health (e-health) information:

- The extent of the implementation and use of Health Information Technology, including EMR systems, by Wisconsin health care providers
- The desire and ability of Wisconsin health care providers to exchange e-health information

Tool

The tool was designed to be completed either online or using a paper questionnaire, which could be faxed back to MetaStar for data entry.

When designing the tool we considered a variety of content resources. These included the 2005 National Center for Health Statistics National Ambulatory Medical Care Survey, as well as MetaStar's 2005 Environmental Scan physician office tool, the eHealth Initiative Connecting Communities Toolkit Interview Template by Type of Stakeholder[1], the California Regional Health Information Organization Inventory tool[2], the Medical Group Management Association 2005 physician office survey tool, other Quality Improvement Organization (QIO) physician office surveys, the Centers for Medicare & Medicaid Services (CMS) Doctor's Office Quality-Information Technology (*DOQ-IT) Office Systems Survey* tool, and experiences of MetaStar DOQ-IT staff and the authors.

The survey (Attachment A) collected information on the practice location, specialties offered and the number of providers at each site, site ownership and system size, and the types and extent of health information systems in use, being implemented, or planned. These included Internet connectivity, practice management systems, electronic medical records, and electronic prescribing systems. The survey also requested information on a site's PMS and EMR vendors, go-live dates, the variety of applications installed (for example, computerized test entry, alerts about out-of-range test results, viewing of imaging studies, notifiable disease reporting, and chronic disease management), and whether the applications are actually used. Respondents were also queried about their perceptions of the benefits of and barriers to EMR adoption.

The survey tool also included questions about whether practice sites electronically send or receive a wide variety of information types with other sites inside the same system or with other entities, the priority placed on such exchanges, whether quality measures are publicly reported and whether they affect reimbursement, and whether and how providers use the Internet to communicate with patients.

MetaStar DOQ-IT staff working in the field with many physician practice sites and a large Wisconsin clinic system manager reviewed the survey tool for face validity. The hardcopy tool was 8 pages containing 29 questions using skip methodology such that those with or without an EMR were asked to answer 26 or 23 questions respectively.

[1] http://toolkit.ehealthinitiative.org/
[2] http://www.calrhio.org/crweb-files/docs-hie/CalHIE-InvMethodology.pdf

Unit of analysis

Practice sites (separate outpatient practice or clinic locations) were used as the unit of analysis. Although there is no state-level system for tracking physician practice sites, this study was able to build on a list of primary care (defined as family practice, general internal medicine or pediatrics and obstetrics/gynecology) and multi-specialty (multiple specialties including at least one primary care specialty) site addresses maintained by MetaStar to support its work. MetaStar augmented that list to include specialty-only practice sites (defined as excluding primary care specialties) with the cooperation of the Wisconsin Medical Society and the Wisconsin Medical Group Management Association, and extensive website searches. The total list included 2,819 practice sites.

Sampling

Surveys were sent to addresses representing 1,567 practice sites including:

- 700 independent sites or sites belonging to small systems (<10 sites)
  - 387 primary care sites and multi-specialty sites (100% sample)
  - 313 specialty care (20% sample)
- 28 large systems – organizations with 10 or more sites
  - Comprised of 867 sites (100% sample) of all specialty types

One survey was mailed to a single respondent for each large system, soliciting information about each individual practice site in that system. This was done to reduce redundant labor and improve data consistency compared to having individual sites complete surveys independently. Independent sites and sites affiliated with small systems each received their own survey.

Strategies to Increase Response Rate and Accuracy

Survey distribution was based partly on advice from stakeholders and lessons learned from MetaStar's 2005 Environmental Scan. Surveys were sent to the manager of each site's operations or information systems. For large medical groups, the survey was mailed to the system level informatics or clinic operations director, but in small systems or independent practices, it was addressed to the manager (or lacking same, the chief physician) working at each site. For large-system respondents, we provided a check-off list of sites, so the responder could either complete one form that applied to all the sites or separate forms about separate subsets of sites in the system.

To facilitate response and prevent duplicates, we preprinted each site name and address for which responses were desired on each form. We added a unique identifier to each form to avoid data-entry confusion among similarly named sites. This identifier also served as a password for Internet responses.

The Wisconsin Medical Society promoted physician participation in the survey using its electronic newsletter.

To make the mailing more noticeable and to motivate the practice manager to respond, we sent the tool in 9" x 12" window envelopes printed with the logos of the Wisconsin Department of Health and Family Services, MetaStar, and the Medical College of Wisconsin; "Important! Contains Governor's e-Health Board Survey," and an invitation to "help transform health care."

MetaStar staff made repeated follow-up phone calls to all non-respondents from large systems and a random sample of the independent/small-system practices to encourage responses. We faxed additional copies of the tool if requested and, in some cases, worked through the survey with the respondent on the phone. When respondents refused to complete the full survey, we asked them to answer the questions: "Do you have an EMR?" and "Are there plans for installing an EMR in your practice location within the next 3 years?"

To reduce possible response bias among independent/small-system sites, a 20% random sample of these sites were repeatedly contacted to increase their response rate.

Data Collection Period

The surveys were mailed to the practice sites in late October 2006. The first round of follow-up calls was made in November 2006. This mailing occurred during a very active election campaign, which may have affected the response rate to the survey.

Additional rounds of follow-up calls were begun after the winter holidays and continued until the end of February 2007.

Statistical Analysis

Item responses are reported both as numbers and as the proportion of responses divided by the number actually responding to that particular item. Some items have much lower response rates than others, reflected in smaller denominators. These measures are also reported for subpopulations of respondents, including independent and small-system sites versus large-system sites, rural sites versus urban sites, and by site specialty types (primary care, multi-specialty, and specialty-only).

We used the Chi-Square test to assess statistical significance (defined as $p<.05$) for comparison of items with two categorical responses (e.g., Yes or No). For items with multiple ordered responses (usually as a five-level response scale), statistical significance was assessed using RIDIT (Relative to an Identified Distribution) analysis. To account for multiple comparisons, significance for these items was defined as $p<.001$.

Results

Response Rate

We accepted a survey as valid if the respondent completed at least question 13, "Does your practice location use ELECTRONIC MEDICAL RECORDS (EMR), not including billing records?" Surveys for 928 of the 1,567 practice sites were returned with this question complete for a 59% overall response rate. Site response rates were much higher for large systems (86%) compared to independent or small-system sites (25%). Thus, data for the overall survey population over-represents large-system respondents except when weighted.

To detect possible response bias among independent and small practices, a 20% sample of these were repeatedly contacted to obtain responses. This group had a 69% response rate compared to the 25% overall response rate, but differences in responses between these two groups never exceeded a significance of $p<.001$ (used given the large number of comparisons) and very few differed at a p of .05. Responses from the entire sample of independent and small system sites are thus presented throughout the report without adjustment.

Most responses were by paper entry with only 67 responding online.

Characteristics of Respondents

Survey responses are grouped in three different ways:

- Sites belonging to large systems (i.e., at least 10 affiliated sites) vs. independent sites or those belonging to small systems;
- Sites containing primary care specialties (including OB-Gyn) only vs. multi-specialty sites (multiple specialties including at least one primary care specialty) vs. non-primary care specialty-only sites; and
- Urban clinics (those in counties included in Census Metropolitan Statistical Areas[3]) vs. rural clinics.

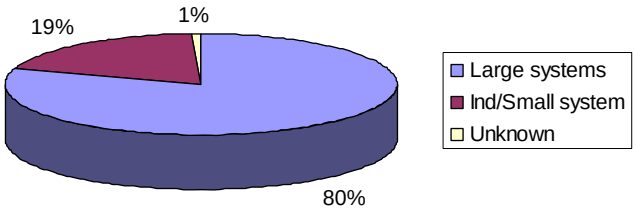
Large Systems or Independent/Small Systems

Eighty percent (80%) of responding sites were part of a large system. This is consistent with data from the Wisconsin Medical Society that 67% of Wisconsin physicians are in group practices of 50 or more physicians, considerably above national norms.[4] However, it also reflects the higher response rate among large-system sites vs. small-system sites. Thus, results reported from the entire survey population may be biased by over-representation of large-system sites. Separate breakouts are therefore offered for these two subpopulations for more precise information on each group.

[3] The Dartmouth Atlas for Health Care Geographic Query Finder http://www.dartmouthatlas.org/data/finder.shtm
[4] *Wisconsin eHealth Action Plan*, p19, December 1, 2006.

Independent/small-system sites were more likely to be solo practices than were large-system sites (33% versus 2%) and to be composed exclusively of non-primary care specialists (43% versus 32%). Large-system sites were more likely to be hospital outpatient departments (11% versus 2%) and to be multi-specialty clinics that include primary care (66% versus 24%). These differences should be considered in comparing results between these two categories.

Figure 1. Percent of respondents from large-system versus small-system or independent practice sites



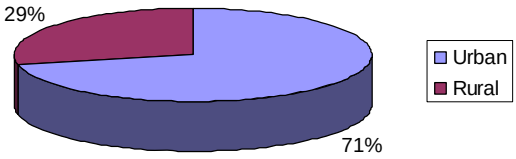
Urban or Rural

Seventy-one percent (71%) of respondent sites were located in urban Metropolitan Statistical Areas (MSAs). Responding urban and rural sites were similar in terms of the proportion that were managed by a larger group practice or integrated delivery system (85% versus 86% respectively); or were community health centers (7% each), solo practices (16% versus 18%), or multi-specialty sites (18% versus 16%). Rural sites were more likely than urban sites to be primary care practices (70% verses 49%) or freestanding practices (90% versus 81% respectively). Urban sites were more likely than rural sites to be part of large systems (82% versus 76%), specialty-only practices (33% versus 14%), or hospital outpatient departments (11% versus 2%). Thus some differences between rural and urban clinics may reflect these confounders and should be considered in comparing the data breakouts.

Table 1. Respondents: Urban / Rural

	Urban		Rural	
Responses/%	651	71%	262	29%
Part of larger group practice or integrated delivery system	85%		86%	
Community Health Centers	7%		7%	
Solo practitioner	16%		18%	
Multi-specialty	18%		16%	
Primary Care practices	49%		70%	
Free-standing practices	81%		90%	
Large systems	82%		76%	
Specialty-only	33%		14%	
Hospital Outpatient Department	11%		2%	
Total	913			

Figure 2. Respondents: Urban / Rural



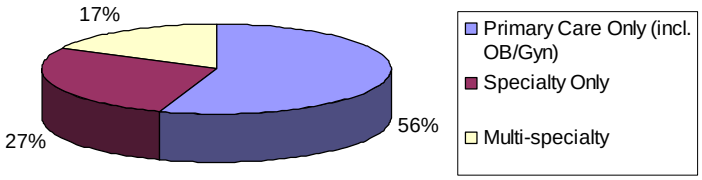
Specialties

Fifty-six percent (56%) of practice sites were limited to primary care specialties (family medicine, primary care medicine, primary care pediatrics, or OB/GYN), 17% included primary care and other specialties ("multi-specialty"), and 27% included only non-primary care specialties ("specialty only"). The three specialty types were similar in the proportion operated by a large system (84%, 85%, and 80% respectively).

Table 2. Respondents: Specialties

Specialties			Large System
Primary Care	410	56%	84%
Multi-specialty	128	17%	85%
Specialty Only	203	27%	80%
Responses	741		

Figure 3. Respondents: Specialties



High-Speed Internet Connection

Ninety-five percent (95%) of sites reported having a high-speed Internet connection at least equivalent to DSL or cable bandwidth (Figure 4). One hundred percent (100%) of practices in large systems reported high speed Internet, compared to only 82% among independent or small-system practices ($p<0.01$). There was no significant difference between urban and rural sites or by practice specialty.

Figure 4. % of All Respondents with High-Speed Internet

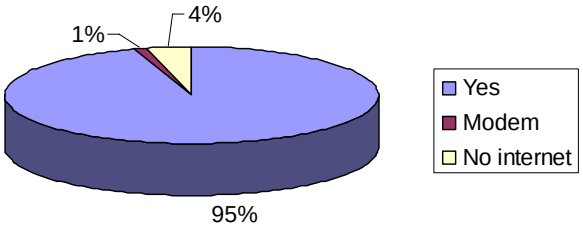
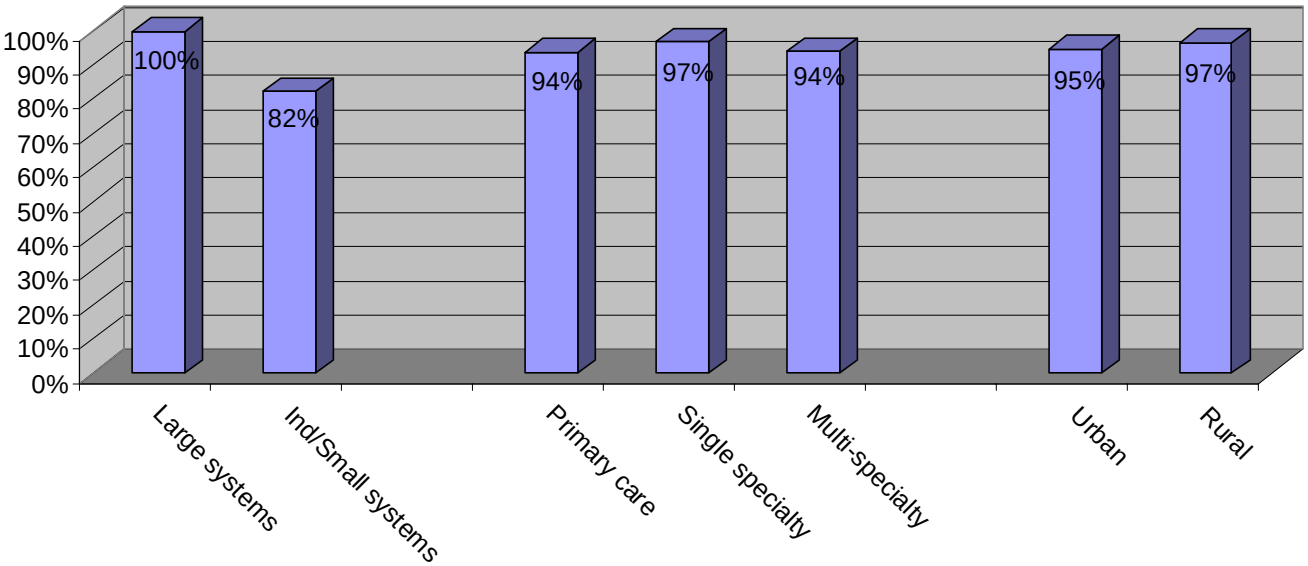


Figure 5. Percent of Respondents with High Speed Internet

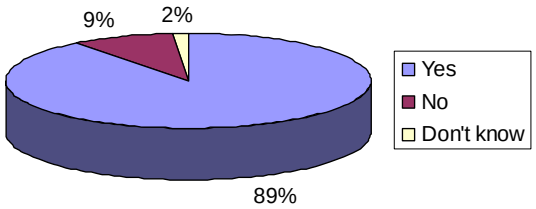


Electronic Claims Submission

Eighty-nine percent (89%) of responding sites stated they submit claims (bills) electronically.

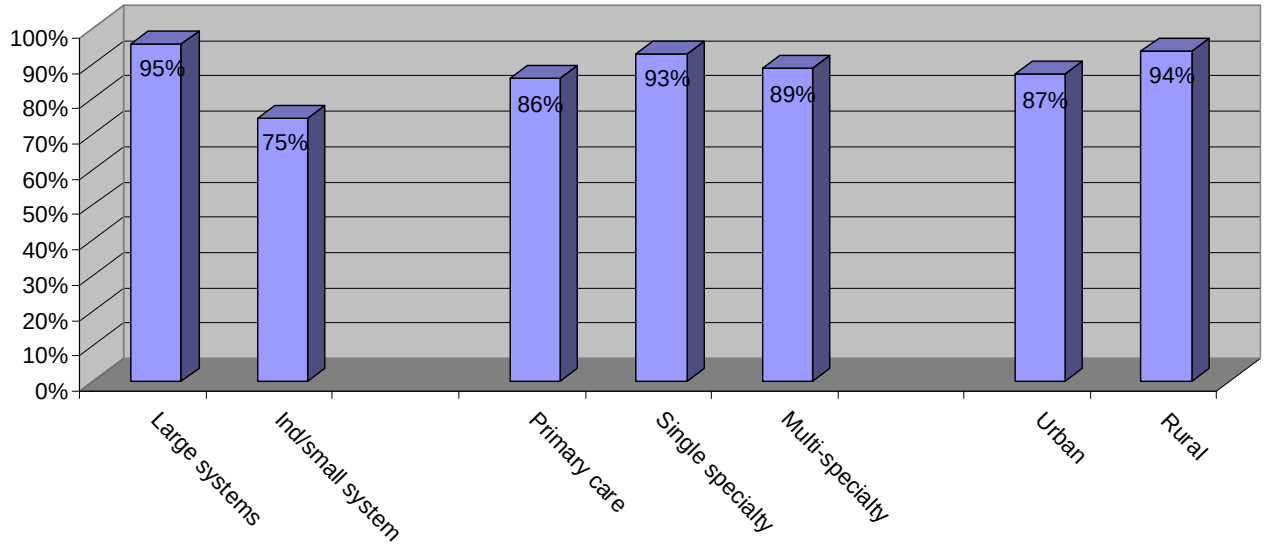
Table 3. Submits Claims Electronically		
Yes	527	89%
No	54	9%
Don't know	9	2%
Responses	590	

Figure 6. Submits Claims Electronically



Responses during telephone surveys suggested this question may have been interpreted differently by different respondents. Some respondents answered, "Yes, our vendor (name) does that," and others answered, "No, our vendor (same name) does that."

Figure 7. Submits Claims Electronically



Large-system sites were significantly more likely ($p<.001$) to submit claims electronically than small-system and independent practices, while other differences were not statistically significant.

Practice Management Systems

Seventy-seven percent (77%) of responding sites reported having an electronic practice management system to assist with practice management functions like scheduling, registration, and demographics; and to track claims and finances. Thirteen percent (13%) did not have an electronic practice management system and 10% of respondents did not know.

Table 4. Has Practice Management System		
Yes	518	77%
No	86	13%
Don't know	69	10%
Responses	673	

Figure 8. Has Practice Management System

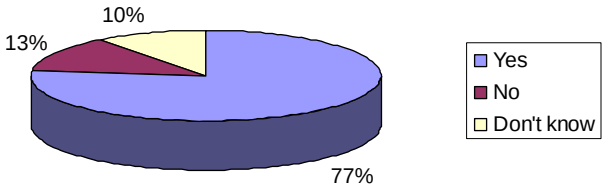
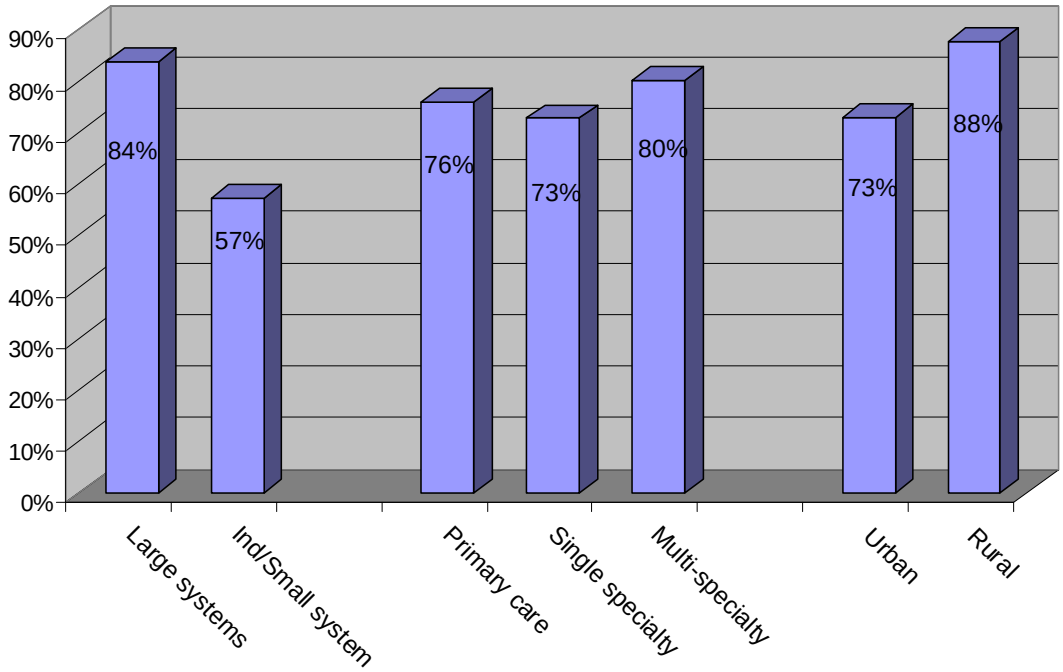


Figure 9. Has Practice Management System



Large-system sites were significantly more likely ($p < .001$) to have electronic practice management systems than independent/small-system sites, while other differences were not statistically significant.

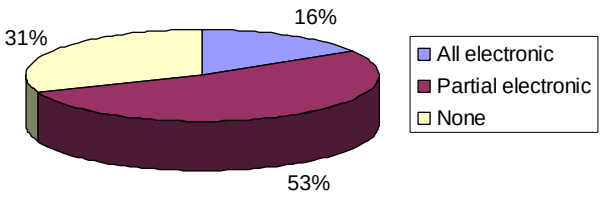
Implementation of Electronic Medical Records

In response to the question "Does your practice location use ELECTRONIC MEDICAL RECORDS (EMRs), not including billing records?" respondents could choose among four responses: "Yes, all electronic," "Yes, part paper and part electronic," "No," and "Don't know."

Sixteen percent (16%) of practice sites reported having fully electronic medical records, 53% part electronic and part paper, and 31% no electronic medical records.

Table 5. Use Electronic Medical Records		
Yes, all electronic	149	16%
Yes, part paper and part electronic	493	53%
No	285	31%
Don't know	1	0%
Responses	928	

Figure 10. Has Electronic Medical Records



As previously noted, these crude results over-represent large health care systems given the higher response rate of those sites. Results weighted for the proportion of large-system versus small-system and independent clinics in the overall survey population offer a more realistic assessment of EMR adoption to be:

- 13% of practice sites have fully electronic medical records
- 41% of practice sites have partially electronic medical records
- 45% of practice sites have no electronic medical records

Seventeen percent (17%) of large-system sites reported having fully electronic medical records compared to 11% of small-system and independent sites, a statistically insignificant difference. However, 64% of large-systems sites had partially electronic medical records, compared to only 11% of independent and small-system sites ($p<.001$), and only 19% of large-system sites lacked any electronic medical record, compared to 77% of small-system and independent sites ($p<.001$) (1% answered "don't know" to this question.)

Multi-specialty sites were significantly more likely ($p<.001$) to have fully or partially electronic medical records than other specialty types.

The proportion of rural and urban sites were equally likely to have fully electronic records (16%), but rural sites were more likely to have no electronic records (39% vs. 28% respectively, $p<.05$).

Figure 11. Has Electronic Medical Records

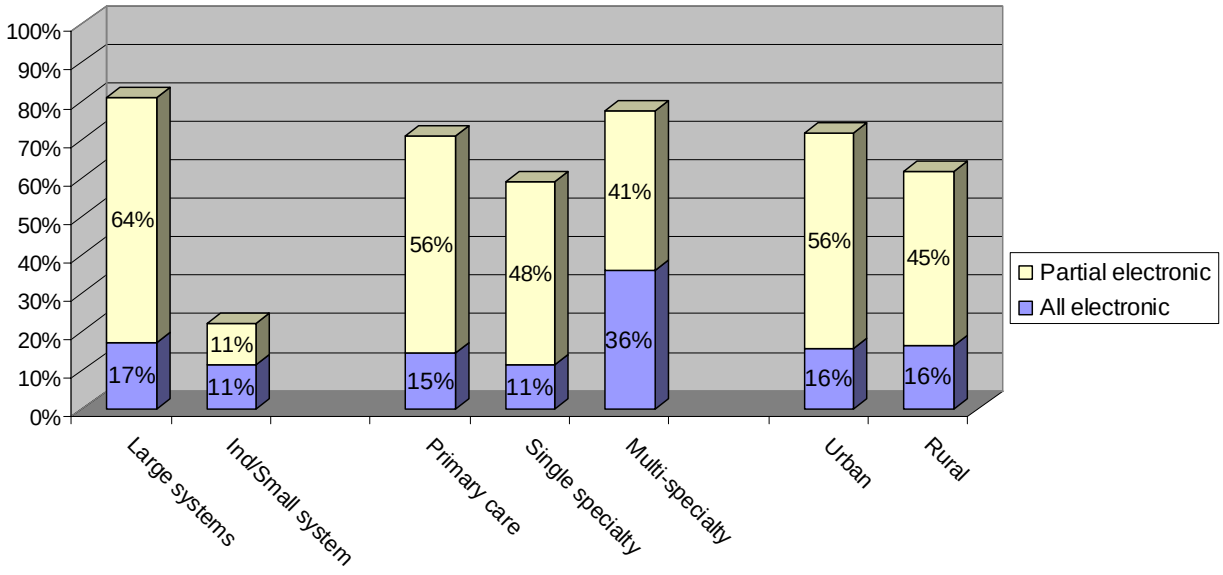

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
64%
17%
11%
11%
56%
15%
48%
11%
41%
36%
56%
16%
45%
16%
Large systems
Ind/Small system
Primary care
Single specialty
Multi-specialty
Urban
Rural
Partial electronic
All electronic

Table 6. Practice locations using an EMR—by breakouts									
Breakout	**N**	**Yes, all electronic**		**Yes, part paper and part electronic**		**No**		**Don't know**	
Large systems	743	128	17%	473	64%	142	19%		
Ind/Small systems	177	20	11%	19	11%	137	77%	1	1%
Primary Care	410	60	15%	230	56%	120	29%		
Single specialty	203	23	11%	96	47%	83	41%		
Multi-specialty	128	46	36%	53	41%	29	23%		
Urban	651	102	16%	365	56%	183	28%	1	
Rural	262	43	16%	119	45%	100	38%		

Proportion of Physicians with an EMR

We multiplied the number of physicians reported at each practice site by the responses to the question about having an electronic medical record to obtain the number of physicians with access to electronic medical records statewide. Respondents to both questions represented 6,170 physicians. Approximately 36% of the physicians represented by the respondents had fully electronic medical records and 47% had partially electronic medical records.

These percentages are an overestimate due to the higher response rate from large systems. While 39% of large-system physicians had fully electronic records, only 14% of physicians from independent and small-system practices did. In contrast, 63% of small-system and independent site physicians lacked any electronic record, compared to 11% of large-system physicians ($p < .001$).

Table 7. Physicians with Electronic Medical Records						
	Physicians represented	% physicians	Large systems	Large systems physician %	Ind/small systems	small systems physician %
All electronic	2247	36.4%	2154	39%	88	14%
Partially electronic	2900	47.0%	2749	50%	150	23%
No electronic records	1022	16.6%	608	11%	410	63%
Don't know	1				1	
Total	6170		5511	100%	649	100%

Vendors of Electronic Medical Records

One hundred thirty-three or 89% of the respondents indicated their EMR system was vendor-provided, and 15 of 148 or 10% of the respondents reported using an in-house developed EMR system. (Forty-one (41) sites use an in-house system certified by the Certification Commission for Health Information Technology (CCHIT), and these sites were included in the count of vendor-provided EMR users.) In a few cases, interviewers found that a reply of "fully electronic

medical records" indicated a non-upgradeable and non-interoperable word processing-based system.

Four hundred eleven (411) or 83% of sites stating they had partially converted to electronic medical records listed a system provided by a commercial vendor, implying at least some level of comprehensive and potentially interoperable functions. In a small number of interviews, a response indicating partially electronic records referred to use of a single-function record such as the Wisconsin Immunization Registry.

The great majority of system vendors cited are currently in business and are certified or active in obtaining CCHIT certification of newer versions of their EMR systems.

Plans To Implement a New EMR

Forty-eight percent (48%) of respondents who currently have no electronic medical record said they plan to install a system in the next 3 years while 40% did not plan to and 12% did not know (n = 241). None of the sites that currently have fully or partially electronic medical records stated an intent to replace their system in the next 3 years, but most did not respond to this question (n= 63).

Availability and Use of Specific EMR Functions

Sites stating they use an EMR were asked which of several EMR functions were installed on their EMR system and which were actually used by the practice site. For each function, the respondents were asked to choose among four responses: "Yes (and used)," "Yes (but not used)," "No," or "Don't know."

EMR ePrescribing Functions

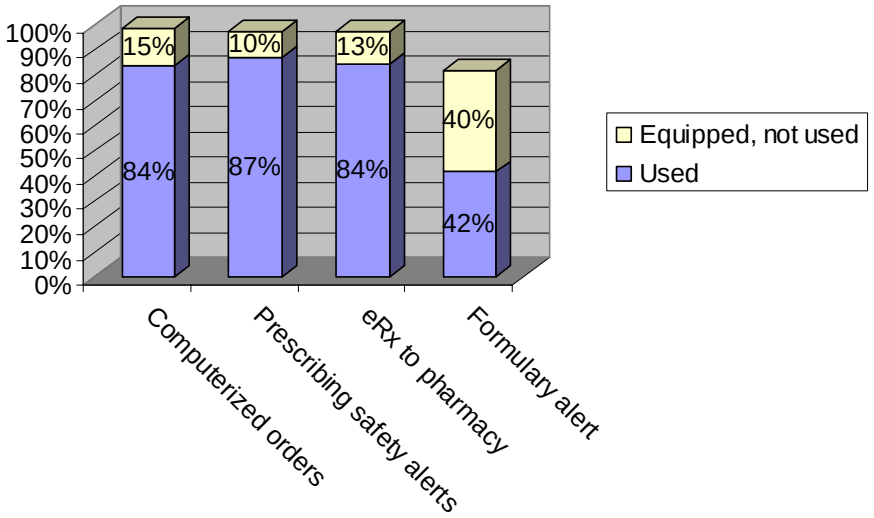
We asked respondents to indicate whether their EMR system included the following four separate ePrescribing functions and whether each function was used:

- Computerized orders for prescriptions (Computerized Orders)
- Warnings of drug interactions or contraindications (Safety Alerts)
- Prescriptions sent electronically to the pharmacy (E-transmission to Pharmacy)
- Prescriptions checked electronically against formularies (Formulary Alert)

As summarized in Table 8, most respondents' EMR systems came equipped with all four functions. A high proportion of sites equipped with EMR systems reported actually using these functions except for formulary alerts (49% of those equipped did not use this function). It is possible the lower use of formulary alerts reflects the need to enter or import formulary data repeatedly into the application.

Table 8. ePrescribing Functions								
Responses	**Yes (and used)**		**Yes (but not used)**		**No**		**Don't know**	
Computerized Orders n = 490	411	84%	72	15%	6	1%	1	
Safety Alerts n = 489	427	87%	49	10%	9	2%	4	1%
eRx to Pharmacy n = 490	413	84%	65	13%	9	2%	1	
Formulary Alert n = 490	204	42%	198	40%	66	13%	22	4%

Figure 12. Proportion of sites with EMR equipped with and using ePrescribing Functions



System-size, specialty, and urban/rural breakouts are summarized in Table 9.

Large-systems respondents were significantly more likely ($p < .001$) than independent and small-system sites to indicate availability and use of safety alerts and electronic transmission of prescriptions to the pharmacy.

Primary care sites were significantly more likely ($p < .001$) to indicate they use computerized orders for prescription orders, safety alerts, electronic transmission of prescriptions to the pharmacy, and formulary alerts than other specialty types.

Table 9. ePrescribing Functions—Equipped and Used							
	Multi-Specialty *n = 128*	**Primary Care Only** *n = 410*	**Specialty Only** *n = 203*	**Large Systems** *n = 743*	**Ind/Small Systems** *n = 177*	**Urban** *n = 651*	**Rural** *n = 262*
Computerized orders for prescriptions	65/80 81%	239/255 94% †	69/89 78%	380/449 85%	29/38 76%	277/345 80%	127/138 92%
Safety Alerts	75/79 95% ‡	246/255 96% ‡	68/89 76%	403/449 90% *	22/37 59%	295/344 86%	125/138 91%
ERx to Pharmacy	70/80 88%	238/255 93%	67/89 75%	389/449 87% *	22/38 58%	283/345 82%	123/138 89%
Formulary Alert	19/80 24%	136/255 53% †	39/89 44%	189/449 42%	14/38 37%	157/345 46%	46/138 33%

† - "Primary Care Only" more likely ($p < .001$) than "Multi-Specialty Care" and "Specialty Care Only"
‡ - "Multi-Specialty Care" and "Primary Care Only" more likely ($p < .001$) than "Specialty Care Only"
* - "Large Systems" more likely ($p < .001$) than "Independent and Small Systems"

EMR Diagnostic Test Functions

We asked respondents to indicate whether their EMR system included each of the following diagnostic test functions and whether each function was used:

- Computerized orders for tests (CPOE)
- Test orders sent electronically to other departments
- Lab results
- Out of range lab levels highlighted
- Imaging results
- Electronic images returned

Results are summarized in Table 10 and Figure 13.

Table 10. Diagnostic Test Functions								
Responses	**Yes (and used)**		**Yes (but not used)**		**No**		**Don't know**	
Computerized orders for tests n = 490	325	66%	137	28%	26	5%	2	
Test orders sent electronically to other departments n = 488	211	43%	183	38%	91	19%	3	1%
Lab results n = 490	478	98%	6	1%	4	1%	2	
Out of range lab levels highlighted n = 489	467	96%	3	1%	9	2%	10	2%
Imaging results n = 489	366	75%	8	2%	111	23%	4	1%
Electronic images returned n = 475	268	56%	53	11%	149	31%	5	1%

A very high proportion of EMR users reported having each of these diagnostic test functions, and they were used by a majority of respondents so equipped. However, a large proportion of those equipped for computerized orders for tests (30%) and test orders sent electronically to other departments (46%) did not use this function. As summarized in Table 11, rural EMR-

equipped sites were significantly more likely than urban sites to order tests and transmit the orders using an EMR system, and primary care sites were more likely than other specialty types to use computerized orders for tests and to view images online (all p<.001). Large-system sites were significantly more likely (p<.001) to electronically display laboratory results and highlight out-of-range laboratory tests than independent and small-system sites.

Figure 13. Proportion of sites with EMR equipped with and using Diagnostic Test Functions

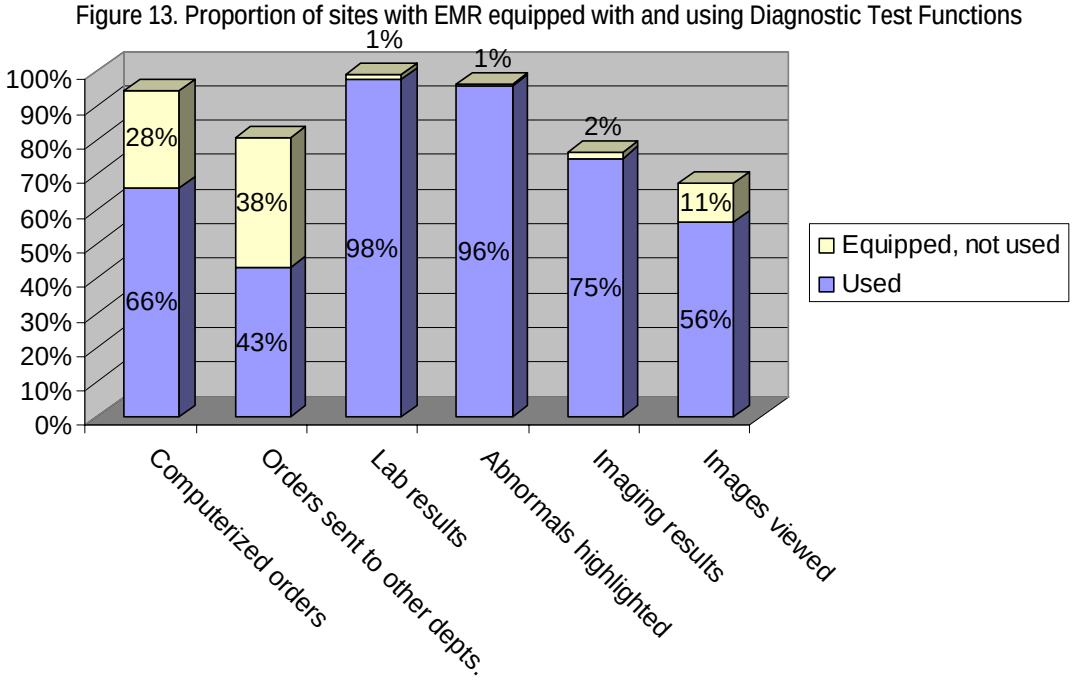


Table 11. Diagnostic Test Functions—Equipped and Used							
	Multi-Specialty *n = 128*	**Primary Care Only** *n = 410*	**Specialty Only** *n = 203*	**Large Systems** *n = 743*	**Ind/Small Systems** *n = 177*	**Urban** *n = 651*	**Rural** *n = 262*
Computerized orders	60/80 75% †	203/255 80% †	43/89 48%	298/449 66%	24/38 63%	210/345 61%	108/138 78%
Orders sent to other departments	58/79 73%‡	105/254 41%	30/89 34%	188/448 42%	20/37 54%	127/343 37%	78/138 57% ††
Lab results	78/80 98%	251/255 98%	83/89 93%	449/449 100% *	28/38 74%	339/345 98%	132/138 96%
Abnormals highlighted	72/79 91%	248/255 97%	81/89 91%	449/449 100% *	16/37 43%	330/344 96%	130/138 94%
Imaging results	62/79 78%	191/255 75%	55/89 62%	347/449 77%	17/37 46%	254/344 74%	106/138 77%
Images viewed	50/78 64% †	171/252 68% †	35/89 39%	256/435 59%	11/37 30%	188/334 56%	74/134 55%

† - "Multi-Specialty Care" and "Primary Care Only" more likely (p < .001) than "Specialty Care Only"
‡ - "Multi-Specialty Care" more likely (p < .001) than "Primary Care Only" and "Specialty Care Only"
* - "Large Systems" more likely (p < .001) than "Independent and Small Systems"
†† - "Rural Clinics" more likely (p < .001) than "Urban Clinics"

EMR Clinical Narrative, Decision Support, and Public Health Reporting Functions

We asked respondents to indicate whether their EMR system included each of the following functions and whether each function was used:

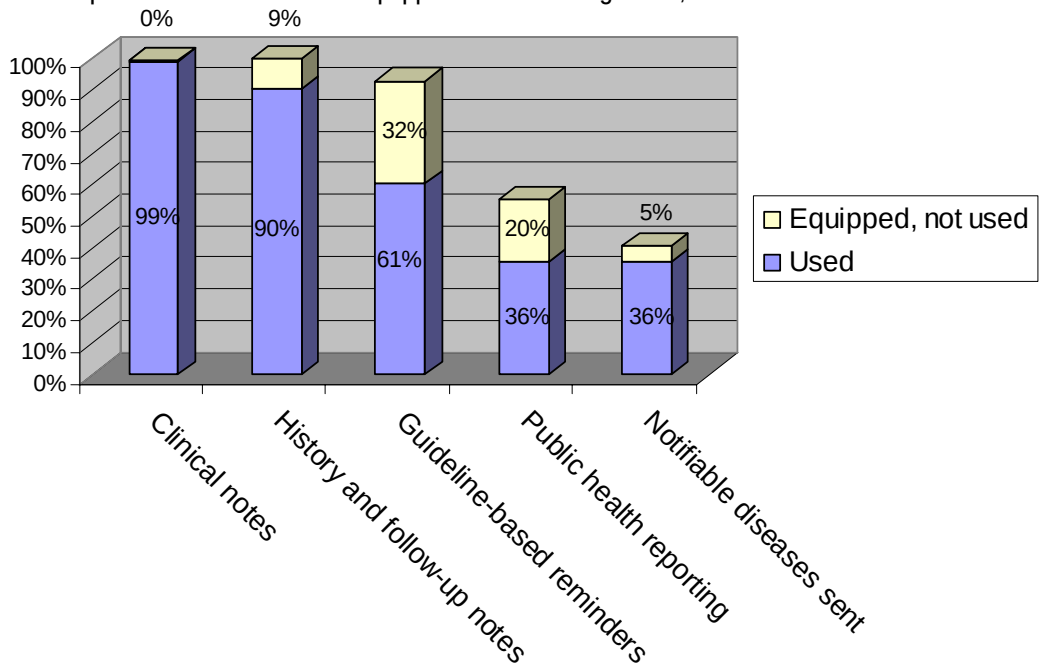
- Clinical notes
- Medical history and follow-up notes
- Reminders for guideline-based interventions and screening tests
- Public health reporting
- Notifiable disease reports sent electronically to public health organizations

Results are summarized in Table 12 and Figure 14.

Table 12. Notes, Reminders, and Public Health Functions

Responses	Yes (and used)		Yes (but not used)		No		Don't know	
Clinical notes n = 490	486	99%	1	0%	2	0%	1	0%
History and follow-up notes n = 490	443	90%	46	9%	0	0%	1	0%
Guideline-based reminders n = 484	293	61%	157	32%	12	2%	22	5%
Public health reporting n = 487	174	36%	95	20%	128	26%	90	18%
Notifiable diseases sent n = 472	169	36%	23	5%	188	40%	92	19%

Figure 14. Proportion of sites with EMR equipped with and using Notes, Reminders and Public Health Functions



Nearly all respondents using an EMR system used the system to record clinical notes, past medical history, and follow-up notes.

While many EMR users were equipped to receive guideline-based reminders for interventions or screening tests, 35% did not use this function. As summarized in Table 13, large-system sites,

primary care sites and rural sites were significantly more likely (p<.001) to report being equipped with and using this function.

Approximately half the sites' EMR systems were equipped to facilitate public health reporting, and 41% could report notifiable diseases electronically. Electronic reporting of notifiable diseases was used significantly more often (p<.001) in primary care sites, large-system sites, and rural sites, while electronic public health reporting was statistically more likely (p<.001) in primary care sites.

Table 13. Notes, Reminders and Reporting—Equipped and Used

	Multi-Specialty *n = 128*	Primary Care Only *n = 410*	Specialty Only *n = 203*	Large Systems *n = 743*	Ind/Small Systems *n = 177*	Urban *N = 651*	Rural *n = 262*
Clinical Notes	79/80 99%	255/255 100%	86/89 97%	448/449 100% *	35/38 92%	342/345 99%	137/138 99%
History and follow-up notes	78/80 98% ††	252/255 99% ††	75/89 84%	404/449 90%	37/38 97%	302/345 88%	134/138 97%
Guideline-based reminders	42/74 57%	189/255 74% †	43/89 48%	283/449 63% *	10/32 31%	193/339 57%	94/138 68%‡
Public health reporting	21/79 27%	126/253 50% †	17/89 19%	168/449 37%	6/35 17%	101/343 29%	68/137 50%
Notifiable diseases sent electronically	16/75 21%	126/245 51% †	17/86 20%	168/433 39% *	1/37 3%	96/344 28%	68/121 56% ‡

† - "Primary Care Only" more likely (p < .001) than "Multi-Specialty Care" and "Specialty Care Only"
†† - "Multi-Specialty Care" and "Primary Care Only" more likely (p < .001) than "Specialty Care Only"
* - "Large Systems" more likely (p < .001) than "Independent and Small Systems"
‡ - "Rural Clinics" more likely (p < .001) than "Urban Clinics"

Other EMR Functions

We asked respondents to indicate whether their EMR system included each of the following functions and whether each function was used:

- Continuity of Care Record (CCR) creation summarizing a patient's information
- Chronic disease management
- Referral tracking
- Communications to and from patients

Results are summarized in Table 14 and Figure 15.

Table 14. Other EMR Functions

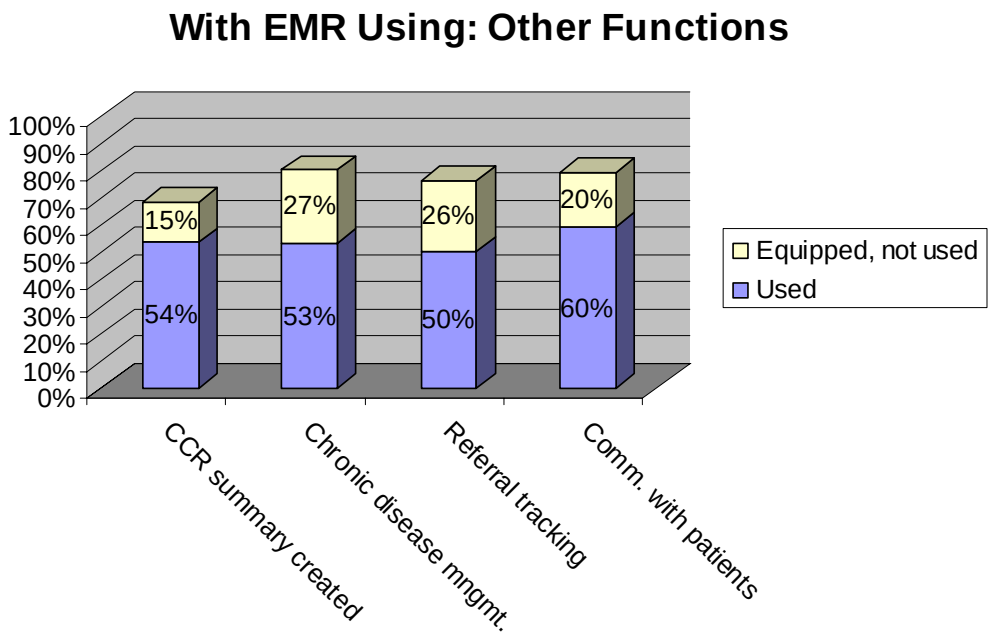
Responses	Yes (and used)		Yes (but not used)		No		Don't know	
CCR Summary created n = 488	262	54%	72	15%	82	17%	72	15%
Chronic disease mgmt. n = 483	258	53%	130	27%	27	6%	68	14%
Referral tracking n = 488	245	50%	127	26%	48	10%	68	14%
Comm. with patients n = 489	291	60%	97	20%	98	20%	3	1%

Sixty-nine percent (69%) of sites equipped with an EMR system stated their system could produce a Continuity of Care Record (a standardized snapshot of clinical care information suitable for sending to a consulting physician or other provider of care) and most used this function.

Eighty percent (80%) of sites reported their EMR system facilitated chronic disease management, but 34% did not use this function.

Referral tracking and facilitated communications with patients were also provided by a majority of the sites' EMR systems. However large proportions of those so equipped do not use the referral tracking (34%) or the communications with patients (25%) functions.

Figure 15. Proportion of sites with EMR equipped with and using other functions



As summarized in Table 15, primary care sites were statistically more likely ($p<.001$) to be equipped with and use the electronic continuity of care record summary function than multi-specialty or specialty sites. Primary care only sites and multi-specialty sites were more likely to be equipped with an electronic chronic disease management function. Electronic communication with patients was more likely to be used ($p<.001$) in multi-specialty and primary care sites than in specialty sites and in rural vs. urban sites.

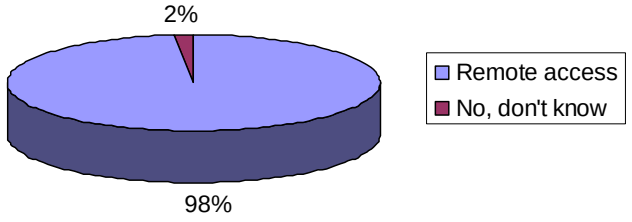
Table 15. Other Functions—Equipped and Used							
	Multi-Specialty *n = 128*	**Primary Care Only** *n = 410*	**Specialty Only** *n = 203*	**Large Systems** *n = 743*	**Ind/Small Systems** *n = 177*	**Urban** *n = 651*	**Rural** *n = 262*
CCR summary created	39/79= 49%	165/254= 65% *	29/89= 33%	243/449= 54%	17/36= 47%	157/343= 46%	99/138= 72%
Chronic disease management	45/74= 61% †	172/254= 68% †	21/89= 24%	245/449= 55%	12/31= 39%	155/338= 46%	97/138= 70%
Referral tracking	40/79= 51% †	167/254= 66% †	26/89= 29%	225/449= 50%	19/36= 53%	162/343= 47%	80/138= 58%
Communication with patients	56/80= 70% †	192/254= 76% †	32/89= 36%	268/449= 60%	21/37= 57%	165/344= 48%	119/138= 86%‡

* - "Primary Care Only" more likely (p < .001) than "Multi-Specialty Care" and "Specialty Only Care"
† - "Multi-Specialty Care" and "Primary Care Only" more likely (p < .001) than "Specialty Care Only"
‡ - "Rural Clinics" more likely (p < .001) than "Urban Clinics"

EMR Remote Access

Ninety-eight percent (98%) of respondents with EMR systems reported that they could access patient information offsite (for example, during hospital rounds or at night on-call), which facilitates continuity of care. Large-system clinics were more likely (p<.001) to have this function (100%) than small-system and independent sites (82%).

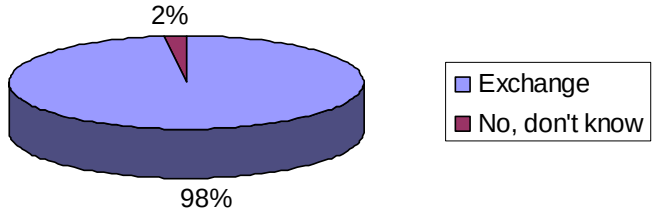
Figure 16. Can Remotely Access EMR



EMR Data Exchange with Practice Management Systems

Ninety-eight percent (98%) of respondents with EMR systems reported that the medical record and practice management systems could exchange data. This can reduce the need for redundant data entry and facilitate chronic disease management, patient reminders, and other functions. Large-system clinics were more likely (p<.001) to have this function (100%) than small-system and independent sites (82%).

Figure 17. EMRs Exchange with PMS



Impact of EMR: Post-implementation Perceptions and Pre-implementation Predictions

Respondents who reported being equipped with EMR systems at their sites were asked to rate the impact on a variety of practice functions. Sites that had not yet implemented an EMR system were asked to predict the impact of an EMR system on the same items:

- Clinical decision-making
- Practice workflow and productivity
- Patient communication
- Prescription management
- Clinician access to patient information
- Medical records management operating costs
- Systems to prevent errors or oversights affecting care safety or quality
- Competitive position of practice in the marketplace
- Chronic disease management

Possible responses included: Substantially Worse, Slightly Worse, No Impact, Slightly Better, or Substantially Better. Results are displayed in Figure 18 below.

A majority of current EMR users stated the EMR system improved (Slightly Better or Substantially Better) each of the functions shown in Figure 18, ranging from 51% who stated it improved competitive position of the practice, to 99% who felt it improved clinician access to patient information.

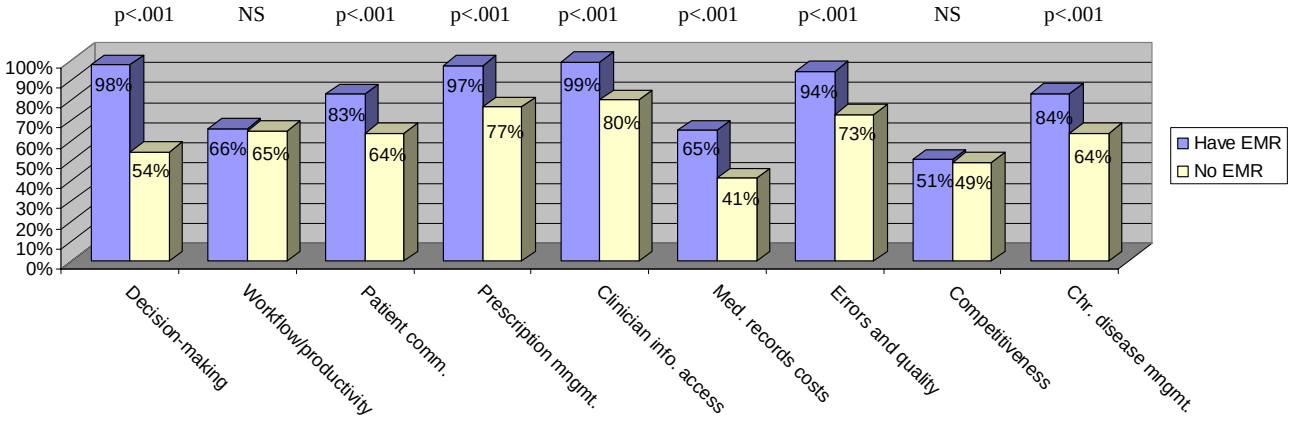
A majority of those who have not yet installed an EMR system predict that one would improve functioning in all areas except medical records management operating costs (41% predicted improvement) and competitiveness of the practice in the marketplace (49% predicted improvement).

Current EMR users rated each item more positively than the predictions of those who have not yet installed an EMR system. This difference was statistically significant ($p<.001$) for all items except practice workflow and productivity, and competitiveness in the marketplace.

Among practices that have already installed EMR systems, primary care sites and rural sites noted greater improvement on multiple items than specialty-only and urban practices ($P<.001$) while there was little difference between large-system sites compared to independent and small-system sites.

In sum, both EMR users and non-users have a net positive impression of the impact of an EMR on many aspects of their practice. Those using the EMR are more likely to describe a positive impact than non-users are to predict one.

Figure 18. Percent Stating EMR made each function Slightly Better or Substantially Better (sites with an EMR) or would make each function Slightly Better or Substantially Better (sites with no EMR installed to date)



Barriers: Real and Imagined

Respondent sites using an EMR were asked to rate a list of barriers they actually encountered during EMR implementation. Those respondents who were not yet using an EMR were asked to rate the same barriers in terms of current or future installation. The barriers queried were:

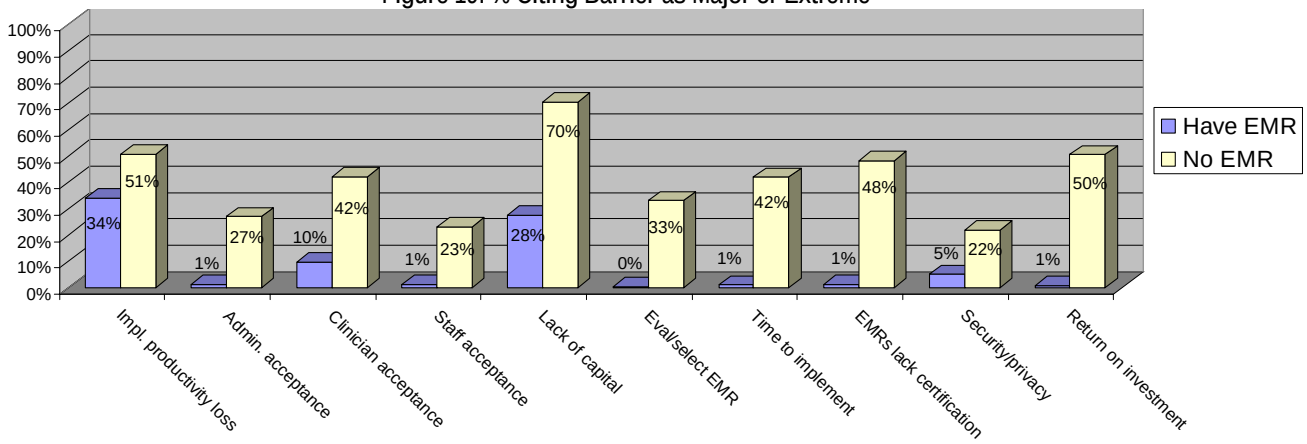
- Concern about loss of productivity during implementation
- Lack of acceptance by administration
- Lack of acceptance by clinicians
- Lack of acceptance by staff
- Lack of capital
- Insufficient knowledge to evaluate, compare, and select an appropriate EMR
- Insufficient time to select, contract, install, and implement the EMR
- Lack of EMR certification or standardization
- Security or privacy concerns
- Overall projected return on investment

Answer options included Not a Barrier (No Impact), Minor Barrier (Complicated Installation), Major Barrier (Delayed or Made Implementation Difficult), or Extreme Barrier (Significant Delay or Significantly Threatened Implementation).

As illustrated in Figure 19, a minority of sites currently using an EMR cited any of the barriers as Major or Extreme, ranging from 0% for "The knowledge to evaluate, compare, and select an EMR" to 34% for "Concerns about productivity during implementation." In all cases, barriers perceived by those who had not yet installed an EMR were significantly greater (p<.001) than those experienced by sites with an EMR in place.

The lack of capital was cited by 70% of sites still lacking an EMR as a Major or Extreme Barrier and was also cited by 28% of those sites currently using an EMR. Interestingly, the Major or Extreme barrier cited most often by practices with an EMR already installed was the impact on practice productivity during implementation (34%).

Figure 19. % Citing Barrier as Major or Extreme

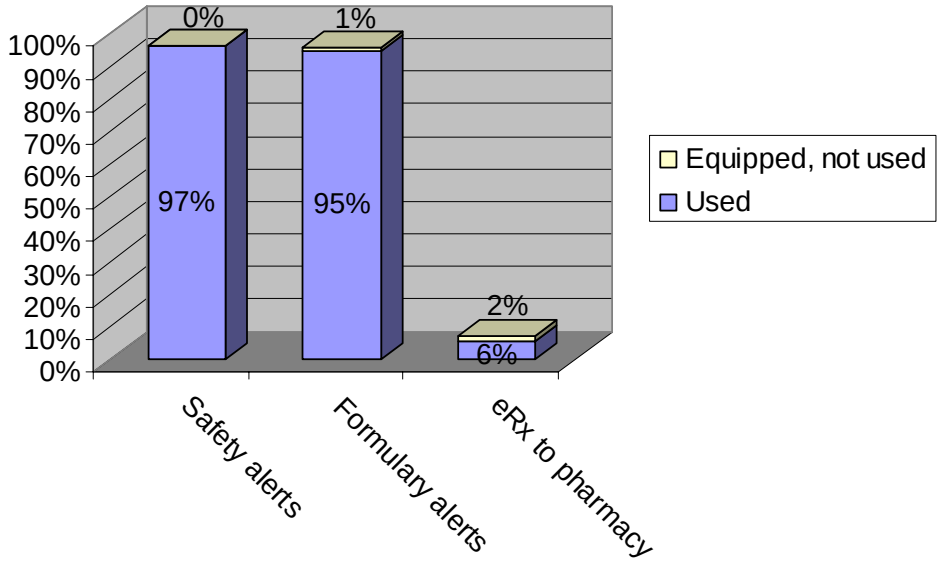


Small-system and independent sites that had installed an EMR system rated the following barriers as significantly greater (p<.001) than did large-system respondents: Administrative acceptance; Insufficient knowledge to evaluate, compare, and select an appropriate EMR; Insufficient time to select, contract, install, and implement an EMR; and Lack of EMR certification or standardization.

Free-standing ePrescribing

Nineteen percent (19%) of practice sites responded that they have a free-standing ePrescribing system, separate from their electronic medical record system. Primary care-only sites were significantly more likely (p<.001) to use a free-standing ePrescribing system than other clinic sites. Almost all use their systems for checking prescriptions electronically against formularies and receiving warnings of drug interactions or contraindications. However, in contrast to ePrescribing functions integrated into an EMR system, very few of these systems (8%) currently allow electronic transmission of prescriptions to pharmacies.

Figure 20. Free-standing ePrescribing

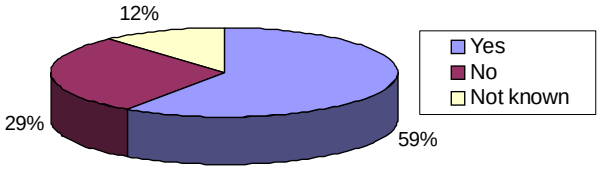


Outcomes Reporting and Pay for Performance

Fifty-nine percent (59%) of sites responded that performance measures on the practice are made available to the public, while 29% did not report performance and 12% did not know. Primary care sites (76%) were significantly more likely (p<.05) to report performance measures than other specialty types (67%) as were large-system sites (77%) verses independent and small-system sites (28%) (p<.001).

Table 16. Performance measures publicly reported		
Yes	383	59%
No	187	29%
Don't know	75	12%
Responses	645	

Figure 21. Performance measures publicly reported

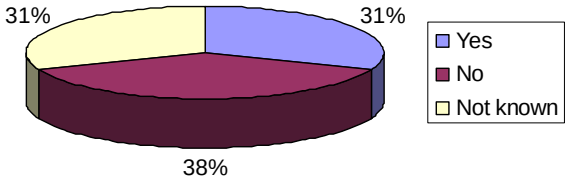


Thirty-one percent (31%) of respondents said performance measures were used by health plans to levy financial rewards or penalties on the practice. Thirty-eight percent (38%) received no incentives on performance measures, and 31% did not know.

Large-system clinics were more likely (p<.001) to receive incentives based on performance (50%) than smaller-system or independent clinics (31%). Similarly primary care sites (59%) were more likely (p<.01) to receive performance incentives than other specialty types (43%).

Table 17. Paid/penalized for Performance		
Yes	201	31%
No	243	38%
Don't know	200	31%
Responses	644	

Figure 22. Paid/Penalized for performance



Electronic Data Exchange

Clinic managers were asked to identify the organization types with which their practices currently exchange (send or receive) patient data electronically. In defining "patient information," the question specifically included patient-specific information whether or not it was stripped of personal identifiers, e.g., data exchange for quality or safety measurement projects. Electronic exchange was defined as data files sent on electronically readable media by mail, e-mail, uploading or remote printer, but NOT fax or voice telephone. Results are displayed in Table 18, and Figures 23 and 24.

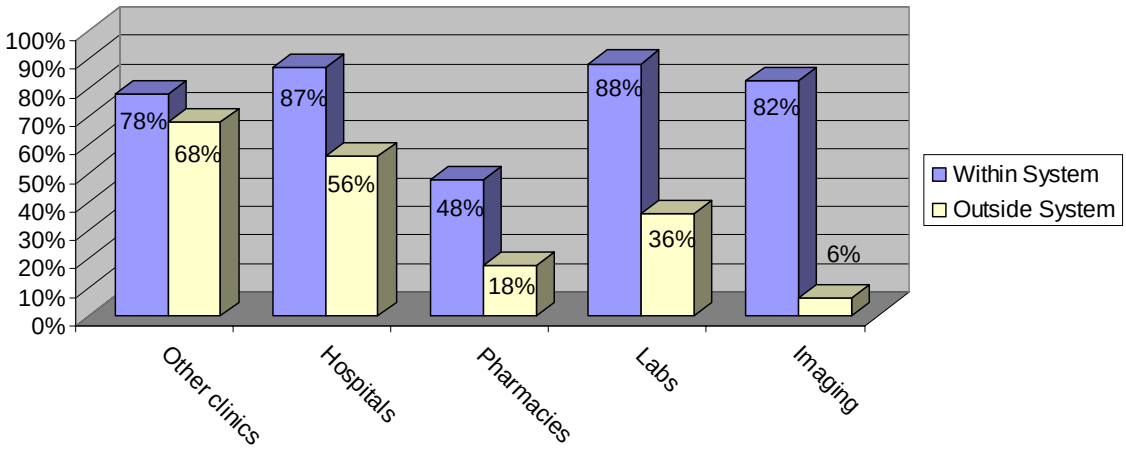
Respondent sites exchange information electronically with many different partners, ranging from a high of 88% with laboratories within the same organization, to a low of 6% with imaging providers outside the same organization. The most common exchange partners include laboratories, hospitals, imaging providers, and other practices within the same organization; practices and hospitals in other organizations; public health and vital statistics agencies; quality collaboratives; claims clearinghouses; and chronic care registries (all greater than 50% of respondents).

Interestingly there is relatively little exchange directly with pharmacies either within or outside the same organization. Electronic transmission of prescriptions is hoped to reduce the rate of errors due to handwriting interpretation and data re-entry, and to facilitate faster identification of both safety and formulary conflicts.

Sites were also asked to identify the priority they place on being able to exchange the same information electronically with the same list of organization types (Table 18). In general these paralleled the current exchange practice, except that many providers place a high priority on electronic exchange with pharmacies (inside and outside their own organization) and with patients, which contrast to the relatively low current level of exchange with these partners. On the other hand, sites expressed lower priority on exchange with public health and vital statistics agencies and quality initiatives, although the level of exchange with these organizations is actually fairly high.

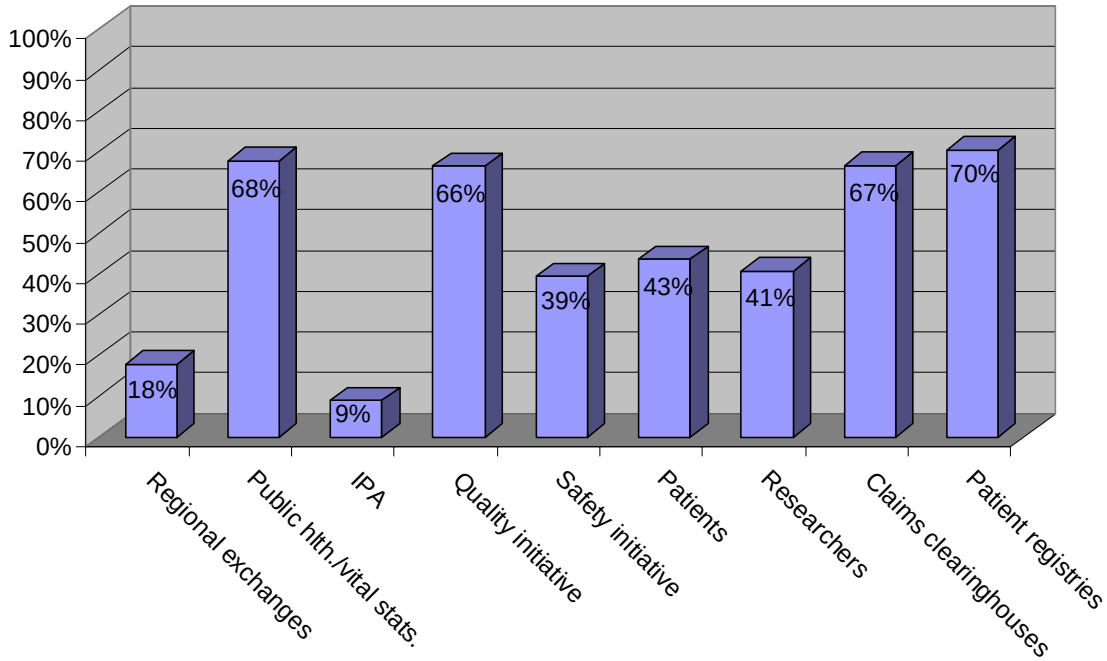
Table 18. Organization types with which practices exchange patient data electronically (including de-identified data)								
Organization Type	**Yes**	**Percent**	**Priority Low – to- High**					
			N	**1**	**2**	**3**	**4**	**5**
Other practices within your system n=559	434	78%	523	8%	1%	3%	6%	81%
Hospitals within your system n=559	487	87%	512	7%	1%	4%	4%	85%
Pharmacies within your system n=559	266	48%	507	6%	1%	7%	15%	71%
Laboratories within your system n=559	494	88%	528	6%	1%	5%	7%	81%
Imaging providers within you system n=559	461	82%	524	6%	1%	5%	8%	80%
Practices outside your system n=559	380	68%	544	10%	12%	30%	33%	16%
Hospitals outside your system n=559	313	56%	548	8%	9%	27%	39%	17%
Pharmacies outside your system n=559	99	18%	545	8%	3%	27%	22%	40%
Laboratories outside your system n=559	199	36%	546	8%	3%	26%	36%	27%
Imaging providers outside your system n=559	35	6%	546	8%	5%	49%	32%	6%
Regional or community health information exchanges n=559	100	18%	531	11%	18%	38%	12%	20%
Public health or vital statistics agencies n=559	379	68%	546	11%	18%	40%	16%	15%
Independent Provider Association or similar organization n=559	50	9%	543	30%	39%	15%	10%	6%
Quality collaborative or initiative n=559	371	66%	542	9%	23%	17%	23%	27%
Safety collaborative or initiative n=559	220	39%	541	10%	6%	16%	39%	30%
Patients n=559	243	43%	528	10%	2%	6%	11%	70%
Researchers n=559	227	41%	540	24%	11%	16%	26%	23%
Claims clearinghouse n=559	372	67%	541	7%	5%	25%	6%	56%
Patient registries (e.g., chronic disease, immunization, implantable devices registries) n=559	393	70%	542	9%	1%	12%	41%	37%

Figure 23. Sites Exchange Data Electronically – Internal versus External Exchange Partners



Practices are more likely to exchange information with laboratories, imaging, hospitals, and other practices within their system than outside their system. The out-of-system deterrent is most significant with diagnostic information, especially medical imaging.

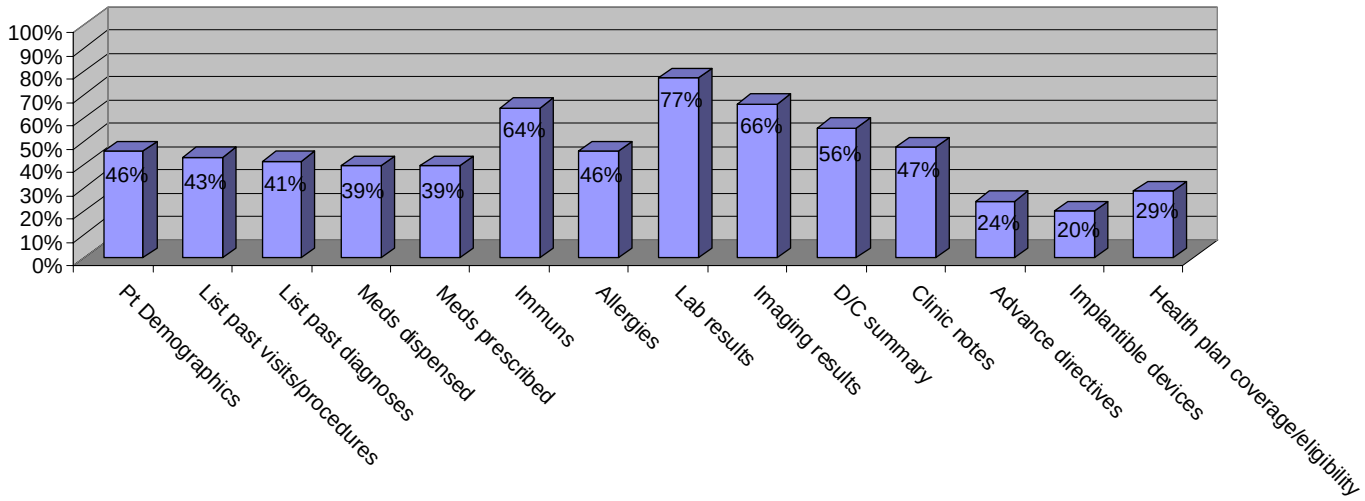
Figure 24. Other Sites Participating in Electronic Data Exchange



Electronic View at Point of Service

Clinic managers were asked to identify the types of information originating from electronic exchange with external (other organization) partners that clinicians at their site can now access electronically during patient care. Clinicians at respondent sites are most often able to view laboratory results, imaging results, immunizations, and discharge summaries from other organizations (77%, 66%, 64%, and 56% respectively). As summarized in figure 25, responses for all other types of information were under 50%.

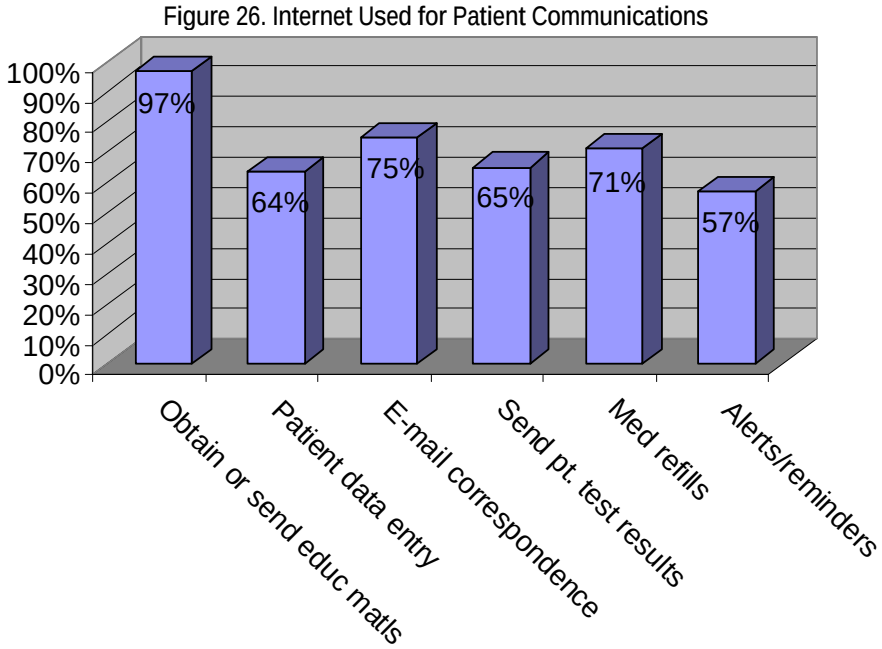
Figure 25. Electronic View at Point of Service



Internet Used for Patient Communications

Sites were asked if they used Internet for several patient communication activities. Ninety-seven percent (97%) of respondents use the Internet to obtain or send educational materials, and 75% are using it for patient e-mail correspondence to or from clinicians (e-Visits).

Figure 26. Internet Used for Patient Communications



Large-system sites were significantly more likely than small system and independent sites ($p<.001$) to use the Internet for all of these functions. Primary care practice sites were more likely ($p<.001$) than specialty-only practices to use the Internet for these patient communication purposes except for obtaining or sending patient education materials and sending alerts and reminders. Rural sites were significantly more likely than urban sites to use the Internet for these (<.001) except for obtaining or sending patient education materials and medication refill management.

Table 19. Internet Used for Patient Communications				
Activity	**Yes**	**Percent**	**Large system**	**Ind/Small system**
Obtain or send patient education materials n=367	356	97%	308	47
Patient data entry (e.g., home monitoring or questionnaires) n=367	234	64%	231	3
E-mail correspondence to or from clinicians (e-Visits) n=367	274	75%	251	22
Providing patients with test results n=367	239	65%	231	8
Medication refill management n=367	261	71%	251	10
Patient alerts or reminders n=367	209	57%	202	7

Comparisons with Other Studies

Comparing Wisconsin's performance with other states' and national adoption of HIT is currently difficult given the wide variation of measures used, definitions of terms, and the survey sampling and collection techniques. To help minimize some of these issues, the Wisconsin survey was heavily based on the 2005 National Ambulatory Medical Care Survey (NAMCS) (so responses to similar items may be compared).[5] However, the NAMCS is sampled on a physician basis, while the Wisconsin survey was addressed to entire practices or systems for completion by practice or information system administrators. Nevertheless, NAMCS is the most currently appropriate available benchmark for comparison. NAMCS 2005 reported that 25% of physicians used some form of electronic medical record (11% a fully electronic health record and 13% a partially electronic record). Wisconsin in 2006-2007 appears to be somewhat ahead of national adoption rates in 2005, with an estimated 83% of physicians using at least a partially electronic record system. This is likely an overestimate because of low response rates from smaller systems and independent practices; however, even in independent practices and those affiliated with small systems, 14% of physicians had access to fully electronic records and 23% to partially electronic records (for large-system sites the numbers were 39% and 50% respectively). Analyzing by the number of practice sites (not physicians) while weighting the average for the proportion of large- and small-system sites, about 13% of practices are equipped with fully electronic records, while 41% used at least a partially electronic medical record system. Thus, by multiple measures, Wisconsin in 2006-2007 appears to be well ahead of the national average in 2005.

Both the NAMCS and the Medical Group Management Association has shown a distinctly higher level of EMR adoption in larger group practices than in smaller and solo offices, similar to our own survey.[6] The Wisconsin Medical Society reports a substantially higher proportion of Wisconsin's practicing physicians are members of larger group practices than the national average.[7] This may be a major factor that accounts for higher-than-national rates of EMR adoption.

A collaboration between the Robert Wood Johnson Foundation, George Washington University Medical Center, and the Massachusetts General Hospital recently addressed the difficulty of using currently available studies to draw conclusions about trends over time or from between different surveys.[8] Such analysis is important if studies like this one will accurately and meaningfully inform policy development. Thus, our own survey instrument and strategy may need to be revised to permit even greater comparability with other efforts and to assure valid trends over time within Wisconsin.

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[5] CDC, National Center for Health Statistics, Electronic Medical Record Use by Office-Based Physicians: United States, 2005. http://www.cdc.gov/nchs/products/pubs/pubd/hestats/electronic/electronic.htm
[6] Gans DN, Kralewski JE, Hammons T, Dowd B. Medical groups' adoption of electronic health records and information systems. *Health Affairs*. 2005; 24(5):1323–1333.
[7] Cited in the Wisconsin eHealth Action Plan, 2006 (available from http://ehealthboard.dhfs.wisconsin.gov/actionplan2006-12.pdf, accessed September 9, 2007) p. 19.
[8] Robert Wood Johnson Foundation. Health Information Technology in the United States: The Information Base for Progress. 2006, (Available from http://www.rwjf.org/files/publications/other/EHRReport0609.pdf. Accessed September 9, 2007).

Conclusions

- The best estimate is that 13% of Wisconsin medical practice sites have implemented fully electronic medical records, and another 41% use some combination of electronic and paper records. This appears to be a higher percentage than in recent national surveys. The high rate of EMR implementation in sites belonging to large multi-site health care systems (17% fully electronic records and 64% partially electronic records), combined with the higher than average proportion of clinicians practicing in such large systems, probably partially accounts for Wisconsin's advanced rate of EMR implementation.
- Over a third (36%) of physicians represented by respondents currently use fully electronic medical records. However, this reflects the over-representation of large systems in our results. Over 63% of physicians in independent practices and sites associated with small systems lack even partially electronic records.
- There are many disparities in the rate of adoption of an EMR, with large multi-site systems having much higher rates than independent practices and small-system sites. Multi-specialty practice sites are also more likely than primary care-only or subspecialty only sites to have implemented an EMR system. While many rural sites offer fully electronic records, almost 40% have no electronic records, compared to 28% of urban sites.
- Forty-eight percent (48%) of sites that do not currently use electronic records plan to implement them in the next 3 years; however, 40% have no such plans.
- High-speed Internet access is an important prerequisite for many health information technology functions. Ninety-five percent (95%) of sites stated they currently use high-speed Internet connections. Sites affiliated with large systems are more likely to have high-speed Internet than independent and small-system sites. There was no significant difference in current high-speed Internet use between urban and rural sites. However, this does not exclude the possibility that some rural sites are currently unable to obtain access to high-speed Internet.
- Both current EMR users and non-users see multiple benefits to EMR adoption. Current users rate these benefits more highly than those who have not yet implemented an EMR system. A high proportion of current EMR users report improvements in all practice functions queried. Non-users do not predict the same level of improvement.
- The greatest barrier to EMR implementation cited by practice sites without an EMR system is lack of capital. Other significant barriers include the predicted impact on productivity during implementation, doubt about the return on investment, the lack of EMR certification, clinician acceptance, and the time needed to implement the EMR. Those sites that have already adopted an EMR rated all barriers considerably lower in severity than those described by non-adopters. Whether this reflects exaggerated perceptions of barriers by non-adopters, or reflects a true difference in the challenges faced by adopters and non-adopters, cannot be known. Those that have completed an EMR implementation cited productivity loss during adoption and lack of capital as their largest obstacles. Independent sites and those operated by small systems were significantly more likely to cite the following as major or extreme barriers to adoption compared to large-system sites: administrative acceptance; insufficient knowledge to evaluate, compare, and select an appropriate EMR; insufficient time to select, contract, install, and implement an EMR; and lack of EMR certification or standardization. This subset of barriers should probably be addressed in efforts to increase adoption rates in these practices.

- Many installed functions of an EMR system currently go unused by a substantial proportion of EMR-equipped sites. Thus, the full safety and efficiency benefits of EMR adoption may not be fully realized. Large-system practice sites and primary care sites tend to use more of these functions than independent, small-system, and specialty-care sites.
- Clinical sites place high priority on exchanging prescription information electronically between prescribers and pharmacies but relatively little actual exchange currently occurs. Thus, while there is strong demand for ePrescribing, some challenges apparently interfere with its realization.
- Nearly 60% of sites say they publicly report performance measures, and almost a third state they receive performance-based economic incentives. However, many respondents did not know if public reporting or incentives were in effect.
- A majority of respondents reported using Internet for several types of practice-patient communications, including obtaining and sending educational materials, collecting information from patients, e-mail correspondence, notifying patients of test results, medication refills, and offering reminders to patients. Large-system sites were more likely to use Internet for these functions, and the high proportion of those using these methods probably reflects the over-representation of large-system sites among respondents.

In summary, efforts to achieve universal adoption of electronic records, electronic health information exchange, and the use of information technology to improve health care can benefit from a relatively strong base of technology deployment and experience in Wisconsin ambulatory care practices. Continued progress may require addressing unique barriers and perceptions among smaller health care organizations. Additional study is needed to understand and overcome barriers to some high-priority goals, such as the electronic transmission and handling of prescriptions. This study provides a baseline from which to measure future progress.

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Attachment A

Governor's eHealth Care Quality and Patient Safety Board
Electronic Health Information Survey
Physician Office

1 *Please enter*
Date survey completed:

2 **Please enter the information below. If preprinted, please make corrections where appropriate.**

2a **Legal Name of Practice:**

2b **Address:**

2c **City:**

2d **State:** WI

2e **Zip Code:**

2f **Telephone Number:**

2g **Fax Number:**

3 **Name of person completing this survey:**

3a **Telephone number (if different from above):**

3b **E-mail address:**

4 **Is your practice location owned or managed by a larger group practice or integrated delivery system?**
Check one box

- ☐ No
- ☐ Yes *If yes, please provide 4a and 4b*

  4a Group or system name:

  4b Total number of ambulatory sites in this group or system:
- ☐ Don't know

5 **Which of the following best describes your facility?**
Check one box

- ☐ Free-standing medical office or group medical practice
- ☐ Community Health Center or Federally Qualified Health Center look-alike
- ☐ Hospital outpatient department
- ☐ Federal government facility
- ☐ Emergency department

6	**Which of the following best describes the practice at this location?** *Check one box*
	☐ Solo practice
	☐ Single-specialty practice
	☐ Multi-specialty practice

7	**Specialties represented at this location:** *Check all that apply*
7a	☐ Family practice
7b	☐ Primary care internal medicine
7c	☐ Primary care pediatrics
7d	☐ Obstetrics and gynecology
7e	☐ Surgical specialties other than OB/GYN
7f	☐ Cardiology
7g	☐ Endocrinology
7h	☐ Other medical subspecialties
7i	☐ Pediatric subspecialties
7j	☐ Other *If other, please specify:*

8	**Practice size:**
8a	How many physicians practice at this location?
8b	How many mid-level providers (i.e., nurse practitioners, physician assistants, and nurse midwives) practice at this location?

9	**Please select the following that applies to your practice location:** *Check one box*
	☐ No Internet connection
	☐ Connect to Internet by telephone modem (dial-in connection)
	☐ Connect to Internet by DSL, cable, Ethernet or other high speed connection

10	**Does your practice location SUBMIT CLAIMS electronically (electronic billing)?** *Check one box*
	☐ No
	☐ Yes
	☐ Don't know

11	**Does your practice location have an ELECTRONIC practice management system (PMS)?** *Check one box*	
	☐ No	**SKIP TO QUESTION 13**
	☐ Yes	**GO TO QUESTION 12**
	☐ Don't know	**SKIP TO QUESTION 13**

12	**Please provide the following details about your PMS:**
12a	Vendor name:
12b	Product name:
12c	Version:

13	**Does your practice location use ELECTRONIC MEDICAL RECORDS (EMR), not including billing records?** *Check one box*	
	☐ Yes, all electronic	**GO TO QUESTION 14**
	☐ Yes, part paper and part electronic	**GO TO QUESTION 14**
	☐ No	**SKIP TO QUESTION 20**
	☐ Don't know	**SKIP TO QUESTION 20**

14	**Please provide the following details about your EMR.**
14a	Vendor name:
14b	Product name:
14c	Version:
14d	Go-live date (Month and Year)

15 **Please indicate whether your EMR includes each of the following functions and if it is used.**

	Check one box for each item	**Yes (and used)**	**Yes (but not used)**	**No**	**Don't know**
15a	Patient demographic information	☐	☐	☐	☐
15b	Computerized orders for prescriptions	☐	☐	☐	☐
15b1	Warnings or alerts of drug interactions or contraindications	☐	☐	☐	☐
15b2	Prescriptions sent electronically to the pharmacy	☐	☐	☐	☐
15b3	Prescriptions checked electronically against formularies	☐	☐	☐	☐
15c	Computerized orders for tests	☐	☐	☐	☐
15c1	Test orders sent electronically to other departments	☐	☐	☐	☐
15d	Lab results	☐	☐	☐	☐
15d1	Out of range lab levels highlighted	☐	☐	☐	☐
15e	Imaging results	☐	☐	☐	☐
15e1	Electronic images returned	☐	☐	☐	☐
15f	Clinical notes	☐	☐	☐	☐
15f1	Medical history and follow-up notes	☐	☐	☐	☐
15g	Reminders for guideline-based interventions/screening tests	☐	☐	☐	☐
15h	Public health reporting	☐	☐	☐	☐
15h1	Notifiable diseases sent electronically	☐	☐	☐	☐
15j	Continuity of Care Record (CCR) creation summarizing a patient's information?	☐	☐	☐	☐

15k	Chronic disease management	☐	☐	☐	☐
15l	Referral tracking	☐	☐	☐	☐
15m	Communications to and from patients	☐	☐	☐	☐

16 **Do physicians have access to the EMR when away from the practice site (for example, during night call)?**
Check one box

☐ No

☐ Yes

☐ Don't know

17	**Does your EMR system exchange information electronically with your billing or management systems?** *Check one box*
	☐ No
	☐ Yes
	☐ Don't know

18	**Please select the answer that best describes the impact of your electronic medical record (EMR) system on the following:**					
	Check one box per item	**Substantially Worse**	**Slightly Worse**	**No Effect**	**Slightly Better**	**Substantially Better**
18a	Clinical decision-making	☐	☐	☐	☐	☐
18b	Practice workflow and productivity	☐	☐	☐	☐	☐
18c	Patient communication	☐	☐	☐	☐	☐
18d	Prescription management	☐	☐	☐	☐	☐
18e	Clinician access to patient information	☐	☐	☐	☐	☐
18f	Medical records management operating costs	☐	☐	☐	☐	☐
18g	Systems to prevent errors or oversights affecting care safety or quality	☐	☐	☐	☐	☐
18h	Competitive position of practice in the marketplace	☐	☐	☐	☐	☐
18i	Chronic disease management	☐	☐	☐	☐	☐

19	**Please identify the significance of the following as barriers to your EMR implementation:**				
	Check one box per barrier	**Not a Barrier** *No Impact*	**Minor Barrier** *Complicated Implementation*	**Major Barrier** *Delayed or made implementation difficult*	**Extreme Barrier** *Significant delay or significantly threatened implementation*
19a	Concern about loss of productivity during implementation	☐	☐	☐	☐
19b	Lack of acceptance by administration	☐	☐	☐	☐
19c	Lack of acceptance by clinicians	☐	☐	☐	☐

19d	Lack of acceptance by staff	☐	☐	☐	☐
19e	Lack of capital	☐	☐	☐	☐
19f	Insufficient knowledge to evaluate, compare and select an appropriate EMR	☐	☐	☐	☐
19g	Insufficient time to select, contract, install and implement the EMR	☐	☐	☐	☐
19h	Lack of EMR certification or standardization	☐	☐	☐	☐
19i	Security or privacy concerns	☐	☐	☐	☐
19j	Overall projected return-on-investment	☐	☐	☐	☐

IF YOU COMPLETED QUESTIONS 14-19, SKIP TO QUESTION 23

20	**Please select the answer that best describes the impact you believe an electronic medical record (EMR) would have on the following items in your practice:**					
	Check one box per item	**Substantially Worse**	**Slightly Worse**	**No Effect**	**Slightly Better**	**Substantially Better**
20a	Clinical decision-making	☐	☐	☐	☐	☐
20b	Practice workflow and productivity	☐	☐	☐	☐	☐
20c	Patient communication	☐	☐	☐	☐	☐
20d	Prescription management	☐	☐	☐	☐	☐
20e	Clinician access to patient information	☐	☐	☐	☐	☐
20f	Medical records management costs	☐	☐	☐	☐	☐
20g	Systems to prevent errors or oversights affecting care safety or quality	☐	☐	☐	☐	☐
20h	Competitive position of practice in the marketplace	☐	☐	☐	☐	☐
20i	Chronic disease management	☐	☐	☐	☐	☐

21	**Please estimate the significance of the following as barriers to future EMR implementation in your practice:**				
	Check one box per barrier	**Not a Barrier** *No Impact*	**Minor Barrier** *Complicated Implementation*	**Major Barrier** *Delayed or made implementation difficult*	**Extreme Barrier** *Significant delay or significantly threatened implementation*
21a	Concern about loss of productivity during implementation	☐	☐	☐	☐
21b	Lack of acceptance by administration	☐	☐	☐	☐
21c	Lack of acceptance by clinicians	☐	☐	☐	☐
21d	Lack of acceptance by staff	☐	☐	☐	☐
21e	Lack of capital	☐	☐	☐	☐
21f	Insufficient knowledge to evaluate, compare and select an appropriate EMR	☐	☐	☐	☐
21g	Insufficient time to select, contract, install and implement the EMR	☐	☐	☐	☐

21h	Lack of EMR certification or standardization	☐	☐	☐	☐
21i	Security or privacy concerns	☐	☐	☐	☐
21j	Overall projected return-on-investment	☐	☐	☐	☐

22	**Are there plans for installing a new EMR system or replacing the current system in your practice location within the next 3 years?** *Check one box*
	☐ No
	☐ Yes
	☐ Don't know

23	**Please provide the following information about free standing e-Prescribing systems**				
	Check one box for each item	**Yes (and used)**	**Yes (but not used)**	**No**	**Don't know**
23a	Does your practice location have an ePrescribing system separate from your medical record system?	☐	☐	☐	☐
23b	Does it offer warnings of drug interactions or contraindications?	☐	☐	☐	☐
23c	Can prescriptions be checked electronically against formularies?	☐	☐	☐	☐
23d	Can prescriptions be sent electronically to pharmacies?	☐	☐	☐	☐

24	**Are performance measures on your practice available to the public?** *(Check one box)*
	☐ No
	☐ Yes
	☐ Don't know

25	**Are performance measures on your practice used by health plans to levy financial rewards or penalties?** *(Check one box)*
	☐ No
	☐ Yes
	☐ Don't know

For Questions 26 and 27: Electronic exchange includes data files sent on electronically readable media by mail, e-mail, uploading or remote printer, but NOT fax or telephone).

26	**Please identify any organization types with which your practice exchanges (sends or receives) patient data electronically (including information from which patient identifiers are removed):** *Check all that apply*
26a	☐ Other practices within your system
26b	☐ Hospitals within your system
26c	☐ Pharmacies within your system

26d	☐ Laboratories within your system
26e	☐ Imaging providers within your system
26f	☐ Practices outside your system
26g	☐ Hospitals outside your system
26h	☐ Pharmacies outside your system
26i	☐ Laboratories outside your system
26j	☐ Imaging providers outside your system
26k	☐ Regional or community health information exchanges
26l	☐ Public health or vital statistics agencies
26m	☐ Independent Provider Association or similar organization
26n	☐ Quality collaborative or initiative
26o	☐ Safety collaborative or initiative
26p	☐ Patients
26q	☐ Researchers
26r	☐ Claims clearinghouse
26s	☐ Patient registries (e.g., chronic disease, immunization, implantable device registries)

27	**Please identify the priority you place on being able to send or receive information electronically to the following types of organizations, with 1 being the lowest priority and 5 being the highest priority:**					
		Low		**…**		**High**
27a	Other practices within your system	**1**	**2**	**3**	**4**	**5**
27b	Hospitals within your system	**1**	**2**	**3**	**4**	**5**
27c	Pharmacies within your system	**1**	**2**	**3**	**4**	**5**
27d	Laboratories within your system	**1**	**2**	**3**	**4**	**5**
27e	Imaging providers within your system	**1**	**2**	**3**	**4**	**5**
27f	Practices outside your system	**1**	**2**	**3**	**4**	**5**
27g	Hospitals outside your system	**1**	**2**	**3**	**4**	**5**
27h	Pharmacies outside your system	**1**	**2**	**3**	**4**	**5**
27i	Laboratories outside your system	**1**	**2**	**3**	**4**	**5**
27j	Imaging providers outside your system	**1**	**2**	**3**	**4**	**5**
27k	Regional or community health information exchanges	**1**	**2**	**3**	**4**	**5**
27l	Public health or vital statistics agencies	**1**	**2**	**3**	**4**	**5**
27m	Independent Provider Association or similar organization	**1**	**2**	**3**	**4**	**5**
27n	Quality collaborative or initiative	**1**	**2**	**3**	**4**	**5**
27o	Safety collaborative or initiative	**1**	**2**	**3**	**4**	**5**
27p	Patients	**1**	**2**	**3**	**4**	**5**
27q	Researchers	**1**	**2**	**3**	**4**	**5**

27r	Claims clearinghouse	**1**	**2**	**3**	**4**	**5**
27s	Patient registries (e.g., chronic disease, immunization, implantable device registries)	**1**	**2**	**3**	**4**	**5**

28	**Please identify information clinicians at your site can now access electronically during patient care that originates from exchange with EXTERNAL organizations:** *Check all that apply*
28a	☐ Patient demographics
28b	☐ List of past visits and procedures
28c	☐ List of past diagnoses (from claims)
28d	☐ Medications dispensed
28e	☐ Medications prescribed
28f	☐ Immunizations
28g	☐ Allergies
28h	☐ Laboratory results
28i	☐ Imaging results
28j	☐ Discharge summaries from hospitals or emergency rooms
28k	☐ Clinic notes or records
28l	☐ Patient advance directives
28m	☐ Implantable medical devices
28n	☐ Health plan coverage and service eligibility

29	**Please indicate whether your site uses Internet for any of the following patient communication activities:** *Check all that apply*
29a	☐ Obtain or send patient education materials
29b	☐ Patient data entry (e.g, home monitoring or questionnaires)
29c	☐ E-mail correspondence to or from clinicians (e-Visits)
29d	☐ Providing patients with test results
29e	☐ Medication refill management
29f	☐ Patient alerts or reminders.