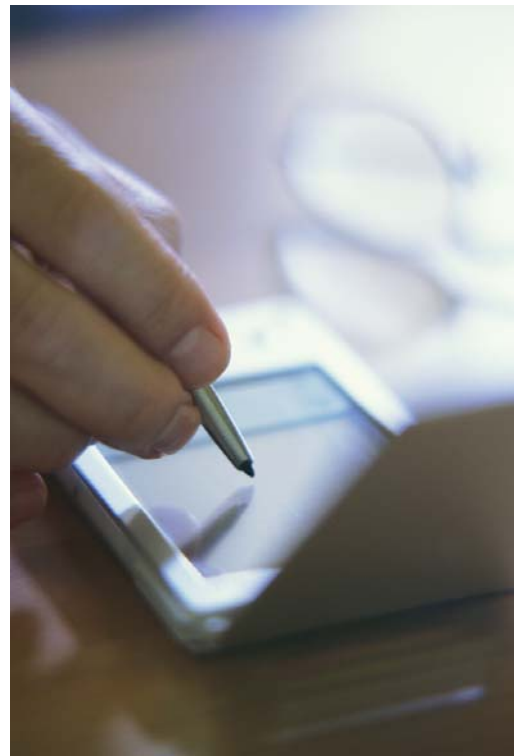


# Status of Health Information Technology in South Dakota: Focus on Electronic Health Records in Physician Offices



**June 2008**

## Purpose and Overview

This project is designed to help facilitate the adoption of electronic health records (EHRs) by South Dakota physicians. The purpose of the project is to improve patient safety and enhance quality and efficiency within the health care system.

The project will help physician practices:

- 1) Evaluate their readiness to adopt an EHR;
- 2) Evaluate their current workflow and business processes to identify opportunities to improve these areas for a more successful transition to an electronically based system; and
- 3) Learn more about health information technologies (HITs) that enhance systems of medical care.

## Preface

This report summarizes the state of electronic health record (EHR) adoption of physician office practices in South Dakota as of November 2007. The survey and analysis work has been conducted by the scientists of the Creighton University Health Services Research Program (CHRP) in cooperation with the South Dakota State Medical Association.

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## Introduction

The adoption of Electronic Health Records (EHRs) is regarded as key to patient safety and health care quality improvement in medical practice. Adoption of the use of EHRs has taken on increased importance with the Office of the National Coordinator for Health Information Technology encouraging universal implementation by 2014. National research has estimated that between 17 and 25% of physician practices are currently utilizing EHRs and that EHR implementation differs considerably when taking into account size of practice.<sup>1</sup> Twelve percent of smaller practices (five or fewer physicians) report using an EHR compared to 19% of practices with more than ten physicians. A recent state survey in Massachusetts found that practices with greater numbers of physicians were more likely to have EHRs already implemented.<sup>2</sup> Use of EHRs was also more pronounced in hospital-based practices, or those practices involved in medical resident teaching.<sup>1,3</sup>

Evidence is still accumulating about the true impact of EHRs on patient safety and health care quality. There is much to be learned about the environmental, organizational, cultural, financial, and professional practice-related information surrounding the adoption of health information technology (HIT), with a focus on EHRs.

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<sup>1</sup> Jha AK, Ferris TG, Donelan K, et al. How common are electronic health records in the United States? A summary of the evidence. [*Health Aff*] 2006; 25: w496-507.

<sup>2</sup> Simon SR, Kaushal R, Cleary PD, Jenter CA, Volk LA, Poon EG, Orav EJ, Lo HG, Williams DH, Bates DW. Correlates of electronic health record adoption in office practices: A statewide survey. [*J. Am. Med. Assoc.*] 2007; 14: 110-117.

<sup>3</sup> Grans D, Krlewski J, Hammons T, Dowd B. Medical Groups' Adoption of Electronic Health Records And Information Systems. [*Health Aff*] 2005; 24: 1323-33.

The purpose of this project is:

- 1) To further our understanding of the factors that influence HIT adoption with a focus on EHRs
- 2) To describe the state of EHR adoption and its implications and,
- 3) To describe the physician profile based on their stage of adoption

This report is intended to inform health professionals, policy makers, scientists, and other stakeholders about these findings. The results are being used to design education about EHR adoption for health professionals and policy makers in the state of South Dakota. Patterns of adoption may help policy makers further advance educational efforts and resource decisions involved in health information exchange and infrastructure development. New findings may help health professionals in their decision-making processes about the adoption of HIT. Detailed findings involve the use of HIT applications, and the technology framework that supports them, with a focus on the electronic health record.

## Methods

A cross-sectional survey entitled, *Enhancing Clinical Practices Through the Adoption of Health Information Technology*, was distributed to South Dakota physicians in October and November of 2007 using a modified Dillman technique. The state of South Dakota licensure database was the primary record source to identify physicians. The project explored the use of various forms of health information technologies, with a specific focus on the adoption and use of EHRs from three stages of adoption: presently using an EHR, planning for use, and have no plans to implement an EHR.

## Physician Demographics

Surveys were distributed to 2,217 South Dakota licensed physicians who had a mailing address in South Dakota or an adjacent state. Three hundred forty-three (343) physicians completed the survey and confirmed that they maintain ambulatory care practices in South Dakota.

**Table 1. Physician Demographics** (n=332)<sup>1</sup>

<b>Distribution of respondents by age category</b>		
	n	%
28-37 years	57	17.2
38-47 years	72	21.7
48-57 years	131	39.5
58-67 years	56	16.9
68-77 years	15	4.5
78-79 years	1	0.3

<b>Distribution of respondents by number of years in practice</b>		
	n	%
1 - 9 years	84	25.3
10-19 years	94	28.3
20-29 years	100	30.1
30-39 years	44	13.3
40-47 years	10	3.0

<sup>1</sup> Responses that total less than 343 within a category indicate that not all respondents answered the question

Table 1 displays the physician demographics. The average respondent has been in practice for 17.9 years. There were 27% female and 73% male respondents. Nearly all respondents were White/Caucasian (91.8%), followed by Asian (4.5%), Hispanic or Latino (0.6%), and Black/African-American (0.6%).

## Practice Demographics

**Table 2. Practice Demographics**

<b>Primary area(s) of practice of the respondents (n=343)</b>		
	<i>n</i>	%
General Family Practice	112	32.7
Internal Medicine Sub-specialties	37	10.8
Surgical Sub-specialties	35	10.2
General Internal Medicine	31	9.0
Obstetrics/Gynecology	31	9.0
General Pediatrics	28	8.2
General Surgery	25	7.3
Psychiatry	16	4.7
Emergency Medicine	8	2.3
Ophthalmology	7	2.0
Pediatric Sub-specialties	7	2.0
Cardiology	6	1.7
Dermatology	4	1.2
Non-primary Care Other	13	3.8

<b>Practice type (n=348)<sup>1</sup></b>		
	<i>n</i>	%
Free standing, independent practice	163	47.5
Hospital/health system	125	36.4
Rural health clinic	24	7.0
Health center	15	4.4
Med school faculty practice plan	5	1.5
Other	16	4.7

<b>Ownership status of the respondent to primary practice (n=336)<sup>2</sup></b>		
	<i>n</i>	%
Employee (salaried)	176	52.4
Full Owner	87	25.9
Part Owner	71	21.1
Other	2	0.6

<sup>1</sup> Responses greater than 343 indicate multiple category selections by respondents

<sup>2</sup> Responses that total less than 343 within a category indicate that not all respondents answered the question

## Number of Practice Locations

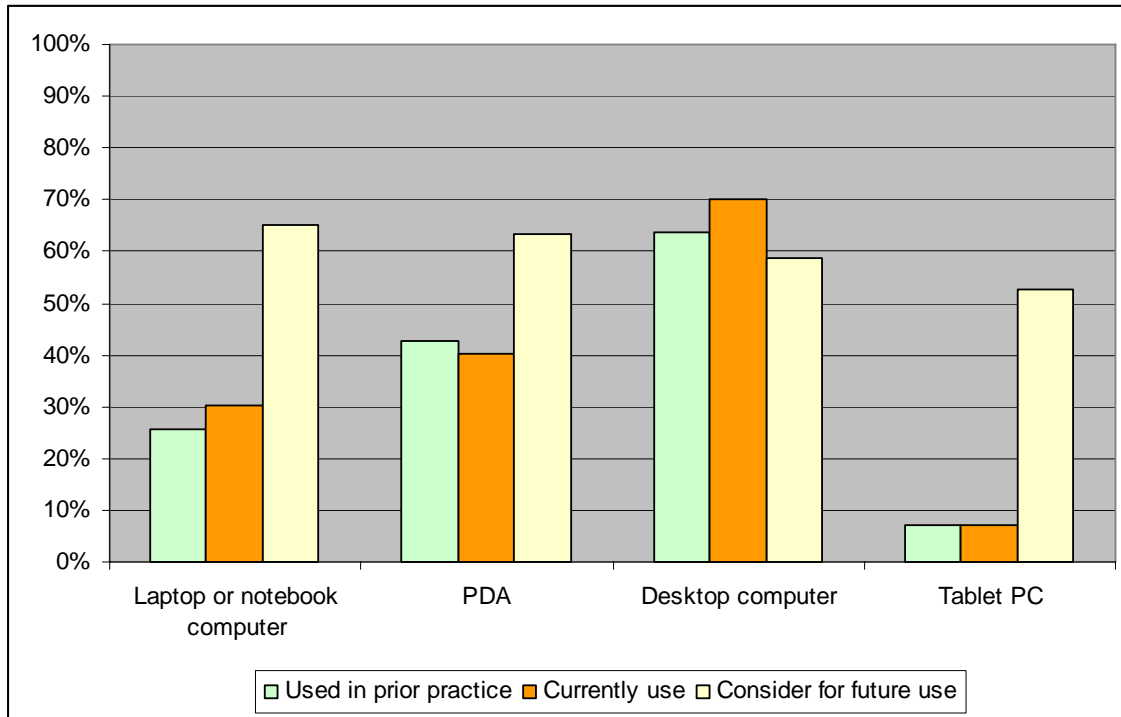
Over 52% of physicians see outpatients from one office location, with an average of 1.6 office locations per physician overall.

## Mid-level Providers in Physician Practices

Physicians reported a strong presence of mid-level providers in their practices. Fifty-five percent of physicians reported physician assistants were utilized in their practice. Additionally, 49% of the physicians reported working with nurse practitioners. These data suggest that EHR education for these mid-level providers should be based in the context of the physician model.

## Use of Computing Devices in Medical Practices

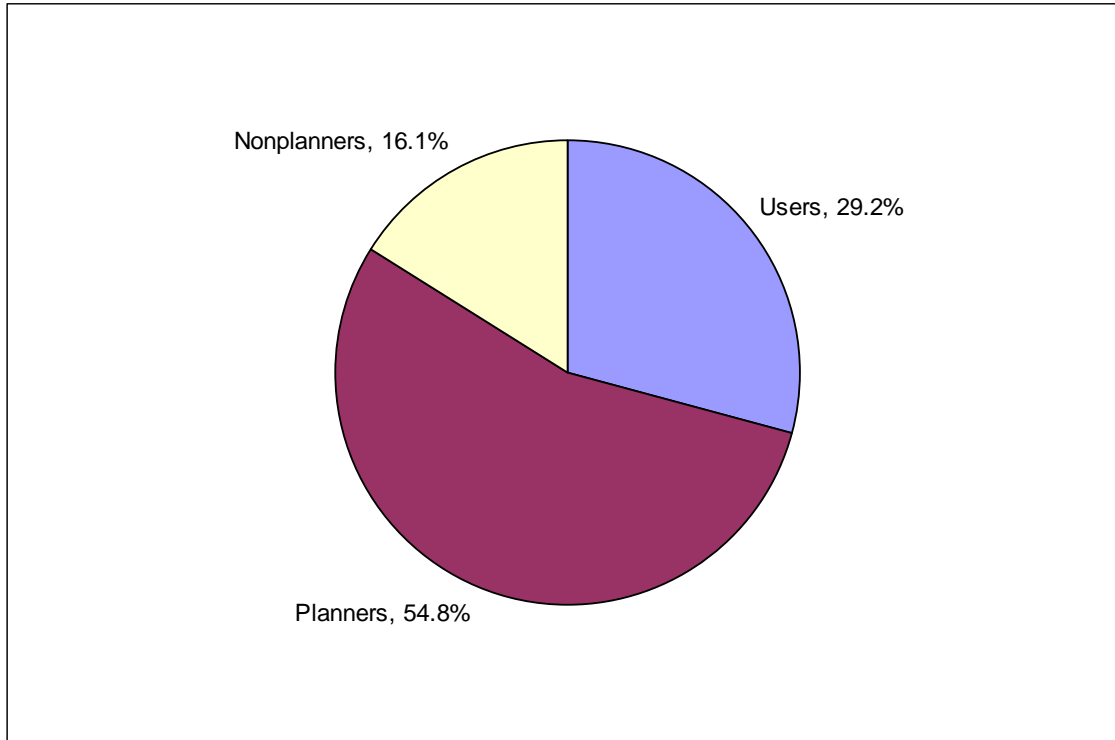
**Figure 1. Prior, Current, and Future Use of HIT for Patient Care**



Physicians' experiences with HIT are displayed in Figure 1. While the most common HIT used were desktop computers, about 40% of physicians also reported using personal digital assistants (PDA) and 30% reported using laptop computers. The data indicate those who have used a particular technology in prior practice continue using it. Most respondents report they would consider using all four technologies in the future.

## Stage of Electronic Health Record Adoption

**Figure 2. Electronic Health Record Status**

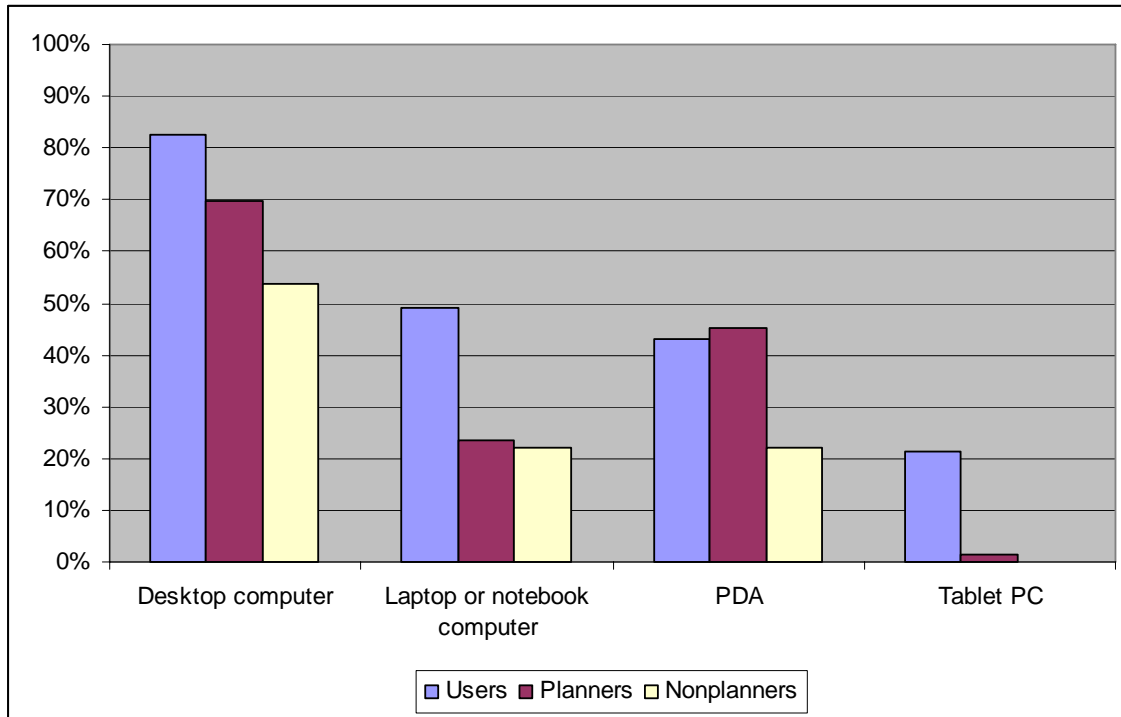


The data displayed in Figure 2 shows EHR adoption status in physicians' practices. Approximately 29% of physicians routinely use an EHR (labeled "Users"), 55% are in some stage of planning to implement an EHR system (labeled "Planners"), and 16% have no plans for adoption (labeled "Nonplanners").

For the remainder of the report, EHR users will be referred to as "users," EHR planners will be referred to as "planners," and those with no plans to implement an EHR will be referred to as "nonplanners."

## Computing Devices and Computer Applications

**Figure 3. Current Use of HIT for Patient Care**



EHR users are more likely to use desktop computers, laptop/notebook computers, and tablet PCs as compared to planners, who are more likely to use these technologies compared to nonplanners. Roughly the same proportion of EHR users and planners utilize PDAs compared to nonplanners.

**Table 3. Computer Applications Currently in Use for Patient Care**

<b>Applications</b>	<b>Users n = 98 (%)</b>	<b>Planners n = 184 (%)</b>	<b>Nonplanners n = 54 (%)</b>
Identify and maintain a patient record	98.0	31.0	20.4
Manage allergy and adverse reaction list	93.9	19.6	5.6
Manage patient history	91.8	20.1	9.3
Manage medication list	91.8	16.3	7.4
Manage clinical notes	90.8	21.2	9.3
Manage patient demographics	88.8	42.9	25.9
Capture external clinical documents (e.g. lab results, radiographic images, medication prescribed by external source)	87.8	40.8	42.6
Manage problem list	85.7	13.0	7.4
Provide services via South Dakota Telehealth Network	8.2	10.3	3.7
Communication (other providers, pharmacy, staff)	78.6	33.7	11.1
Order diagnostic tests	73.5	15.8	13.0
Generate and record patient-specific instructions	72.4	16.3	18.5
View patient hospital records from office or home	69.4	48.4	31.5
Clinical task assignments and routing (assignment and delegation of tasks to others)	68.4	10.3	7.4
Present alerts, notifications or reminders for disease management, preventative services, and wellness	65.3	12.5	13.0
Rules-driven financial and administrative coding assistance	61.2	19.0	33.3
Track patient names for inpatient visits	59.2	38.6	35.2
Support for medication or immunization administration or supply	58.2	22.3	7.4
View disease or immunization registry entries	54.1	23.4	9.3
Clinical decision support system guidelines updates	40.8	27.2	18.5
View patients' own Personal Health Record	25.5	6.0	3.7

Table 3 displays applications that are available through a variety of HITs. The data indicates that the utilization of these applications is more likely when a physician uses an EHR.

**Figure 4. Daily Use of Computing Devices for Clinical Functions**

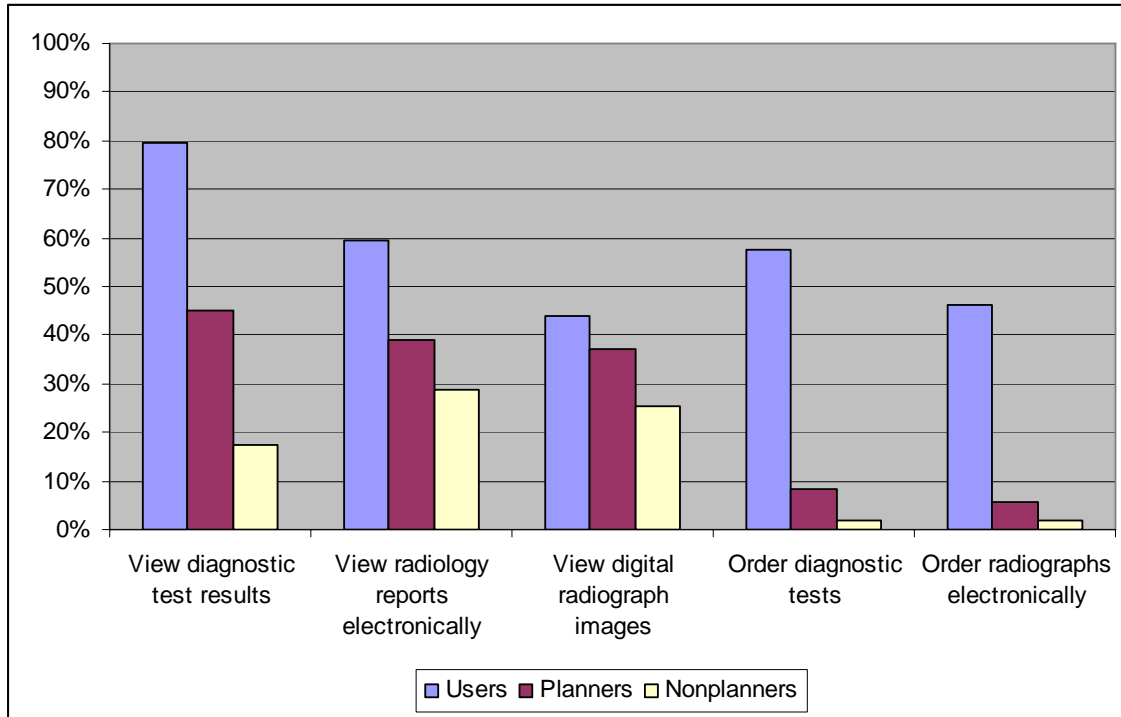


Figure 4 illustrates use of computing devices for various clinical functions. Physicians utilize the viewing functions of their various computing devices more than ordering functions. Users are utilizing viewing and ordering functions on their computing devices more often than both planners and nonplanners.

**Figure 5. Administrative Computer Applications Currently in Use**

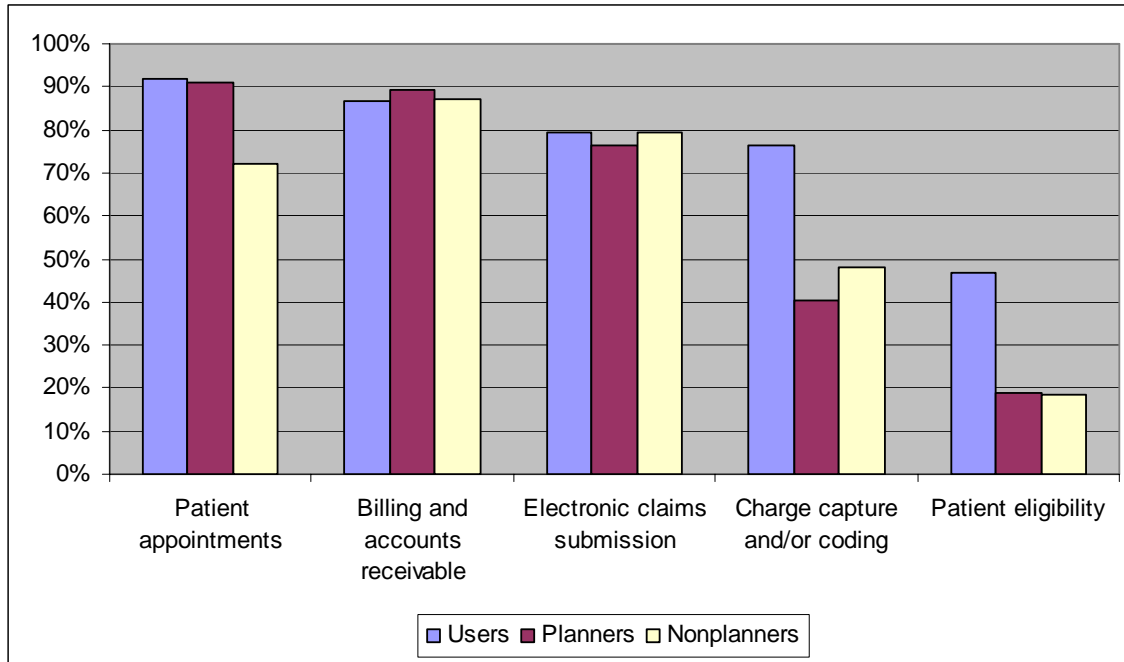


Figure 5 illustrates administrative applications performed using various computing devices. Compared to patient care applications in Table 3, administrative applications appear to be utilized more frequently across all three groups, and are less dependent on stage of EHR adoption.

**Figure 6. Prescribing Process Computer Application Use**

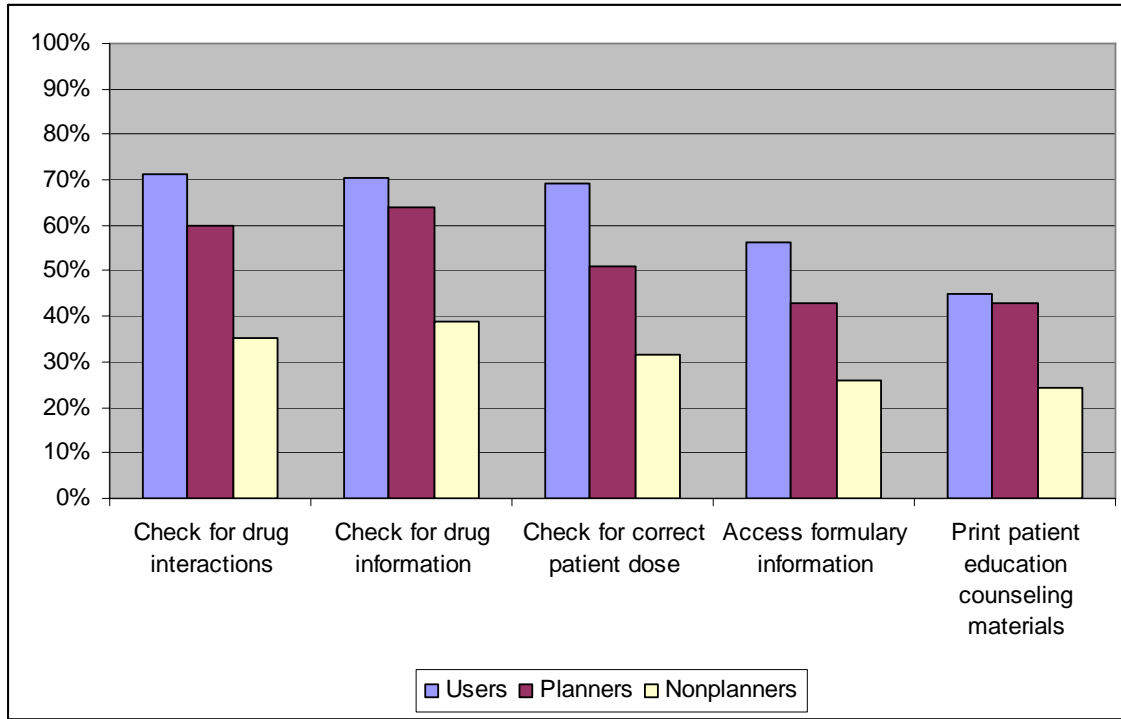


Figure 6 shows the basic applications used to find information and assist with clinical decisions in the prescribing process. Similar to the trends shown in Table 3, EHR users utilize these functions more than planners and nonplanners.

**Figure 7. Prescription Generation**

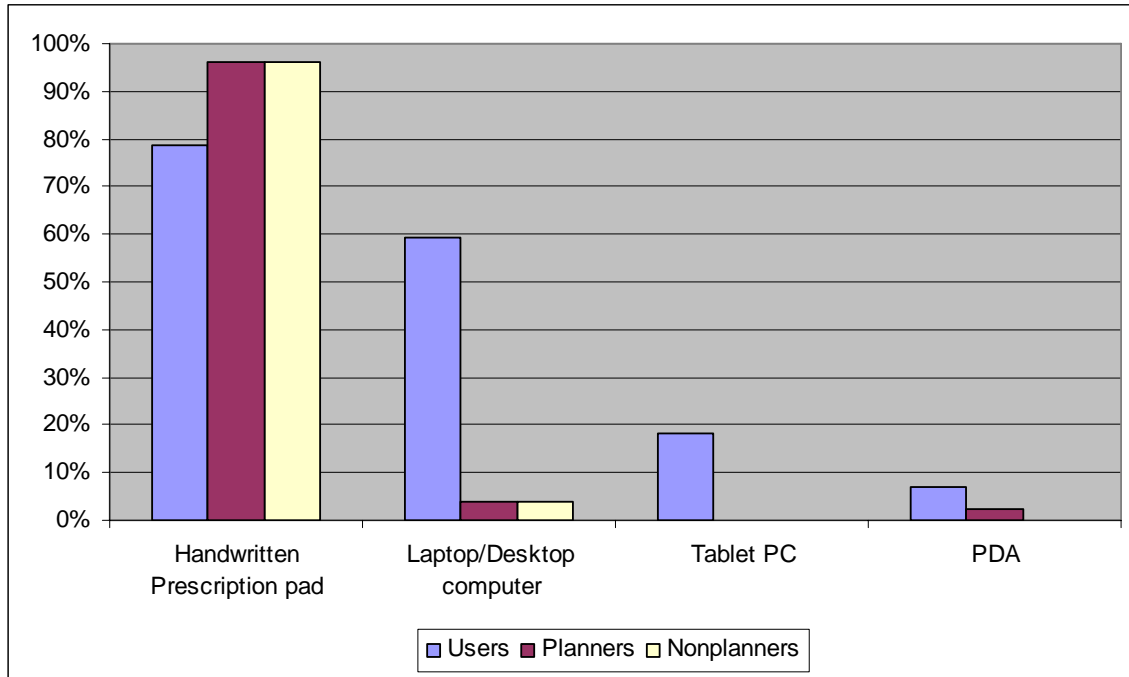


Figure 7 displays physician responses to the method of prescription generation used in their practices. Regardless of EHR implementation stage, more than 75% of physicians report that they use handwritten prescription pads. Users are less likely to handwrite prescriptions as compared to planners and nonplanners. EHR users are more likely to use a laptop or desktop computer to generate prescriptions. PDAs are generally not being used to generate prescriptions by physicians regardless of stage of EHR adoption.

**Figure 8. Prescription Delivery or Transmission to Pharmacy**

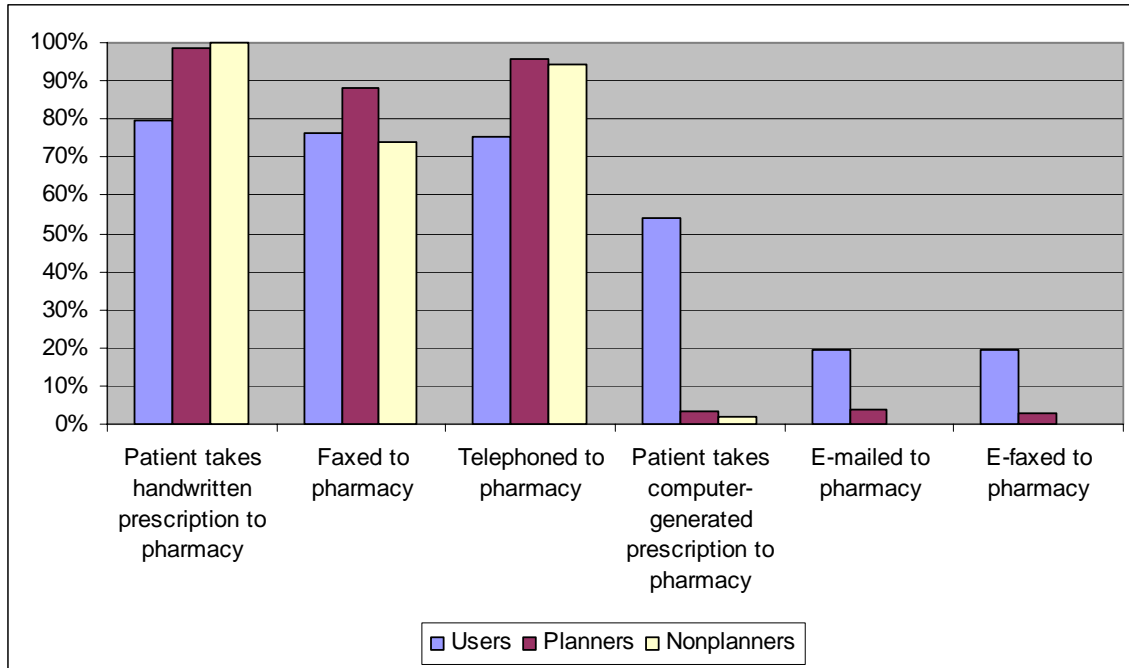


Figure 8 displays methods physicians use to deliver or transmit prescriptions to pharmacies. Traditional methods of prescription delivery or transmission to pharmacies predominate. Over 50% of EHR users have their patients take a computer-generated prescription to the pharmacy. There is potential for growth in e-prescribing by physicians across all three stages of EHR adoption. Additional data indicates that 10% of users report receiving a patient’s electronic active prescription list from the pharmacy daily, while almost none of the planners and nonplanners has this capability.

## EHR Users and EHR Planners

*Figure 9. Stage of EHR System Selection for Planners*

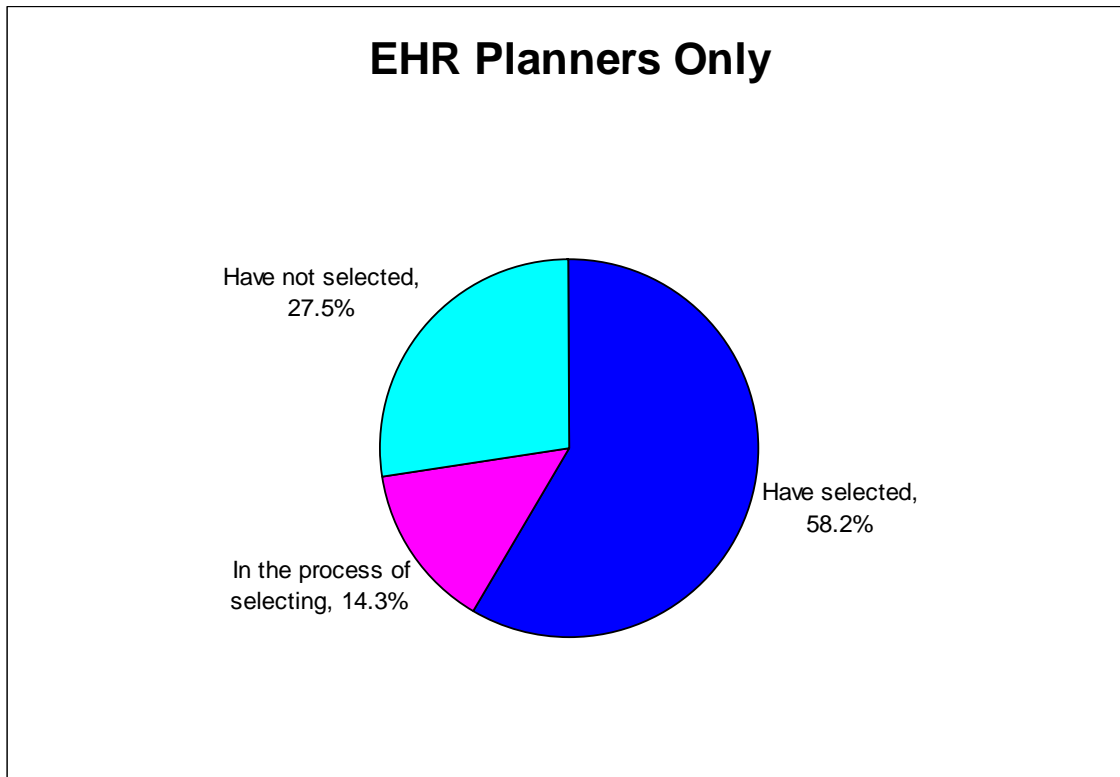


Figure 9 shows the stage of EHR system selection for planners. Over half of physicians who reported they were planning to implement an EHR system in the future have selected an EHR product.

**Figure 10. Length of Time Using an EHR System for Users**

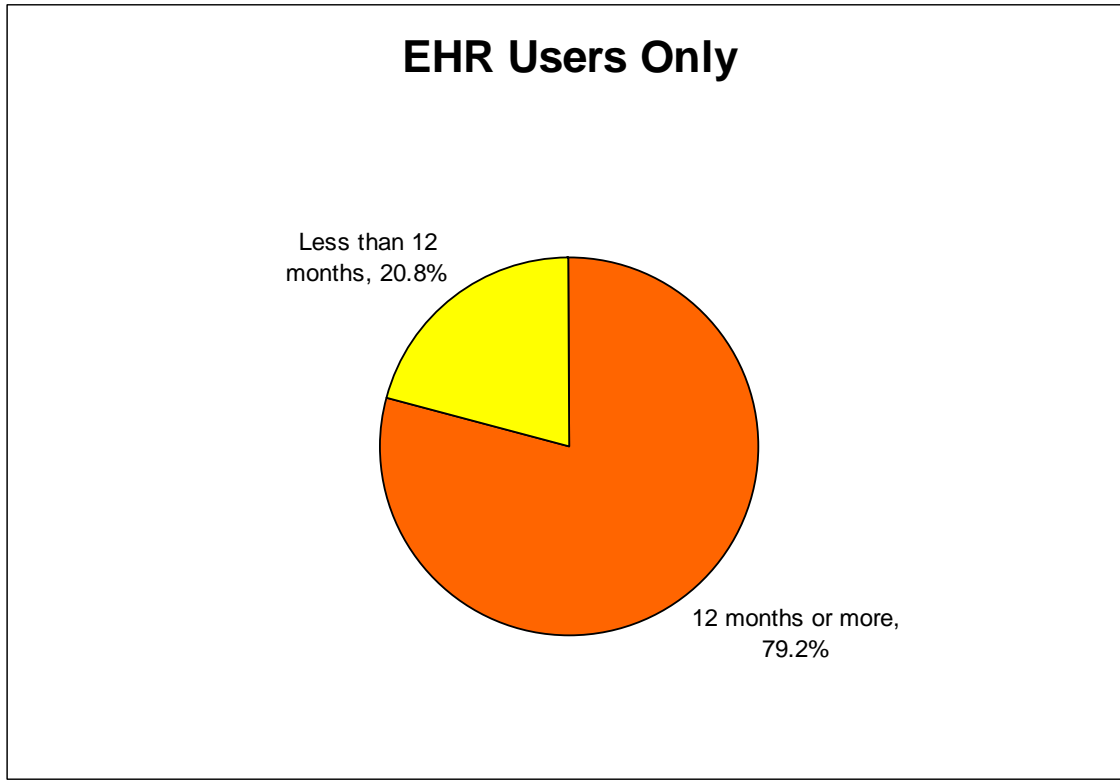


Figure 10 shows that 79% of users have had their EHR for longer than 12 months and 21% of users implemented their EHR in the last year.

**Table 4. Availability of Clinical Functions in an EHR**

Clinical Functions	Users <sup>1</sup> n=98 (%)	Planners <sup>2</sup> n=184 (%)
Patient demographics	99.0	94.0
Visit/encounter notes	93.9	93.5
Physical exam/review of systems	91.8	94.0
Current medication history	90.8	94.6
Past medical history	90.8	98.9
Patient medications/prescriptions	88.8	98.4
Procedure/operative notes	87.8	93.5
Presenting complaint	86.7	91.3
Problem lists	80.6	92.9
Receive radiology/imaging results electronically	73.5	96.7
Integration with practice billing system	72.4	85.9
Receive laboratory results from a reference lab	69.4	98.4
Immunization tracking	68.4	79.9
Send orders for prescriptions	66.3	81.5
Send orders for tests	64.3	78.8
Print patient education materials	63.3	87.0
Drug interaction and contraindication warnings	60.2	89.1
Consult/report from specialists	59.2	90.2
Send prescriptions electronically	59.2	85.9
Drug reference information	52.0	78.8
Referrals to specialists	43.9	72.8
Drug formularies	43.9	77.2
Exchange patient data with hospitals	42.9	83.2
Exchange patient data with pharmacies	33.7	77.2
Clinical guidelines and protocols	32.7	74.5
Exchange patient data with other physician practices	31.6	78.3
Exchange patient data with laboratory	30.6	73.4
Exchange patient data with radiographic imaging facilities	30.6	73.4
Public health reporting	9.2	56.5

<sup>1</sup> Users actually have available

<sup>2</sup> Planners would like available

In Table 4 the clinical functions available on an EHR that are *expected* by planners were compared to the *actual* clinical functions reported by users. While most clinical functions are both wanted and available, the comparison of responses between planners and users suggest that there are gaps in interoperability. For example, sending prescriptions electronically to the pharmacy and exchanging patient data with hospitals demonstrates this problem.

**Figure 11. Time Preferences for Data Entry into an EHR**

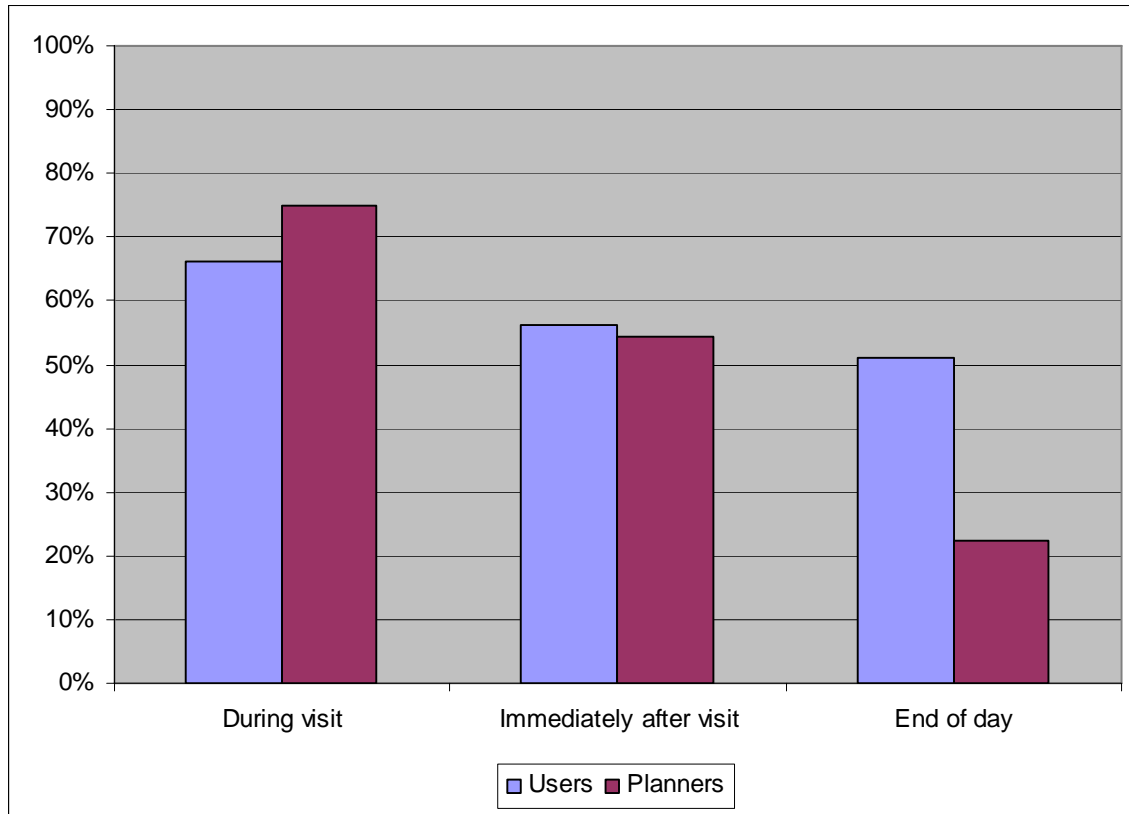


Figure 11 displays the time of day when planners preferred to enter patient data, compared to the time of day that users actually entered patient data. Most planners preferred entering data either during or immediately after a patient visit. Users reported entering data into an EHR throughout the day. As planners shift to becoming users, expectations regarding documentation workflow are likely not going to be met.

## Related Issues

Physicians would like unlimited access to an EHR regardless of location. However, EHR access as reported by users is often limited: 96.9% have access in their office; 65.3% have access in their home; 64.3% have access in the hospital; and, 8.2% have access in the nursing home.

A large portion of planners (69%) and users (52%) are unfamiliar with Regional Health Information Organizations (RHIO). Less than 20% indicated they plan to participate in a RHIO. Much of this low intention is likely explained by the general lack of knowledge that physicians have about RHIOs.<sup>4</sup>

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<sup>4</sup> Galt, K.A., Berens, D., Paschal, K. Survey of health professions organization leadership: security and privacy barriers to health information interoperability. State of Nebraska Health Information Security and Privacy Report Number 2, March 2, 2007. Accessible at: <http://chrp.creighton.edu>.

## EHR Users

### Implementation Experience

Users implemented their EHRs through a variety of approaches. Fifty-three percent used a participatory process involving everyone in the office; 36% used a vendor installed EHR and were given a basic overview by the vendor; 40% were trained by an information technology (IT) professional who implemented the EHR until it worked well; and 6% used an alternative process.

Overall, 79% of users have had their EHR for 12 months or more and 76% consider themselves to be fully operational. Reasons stated for prolonged adoption included voluntary participation in EHR implementation by the organization, limited integration, geographic limitation of integration (e.g. not all clinics in a system have an EHR), and the complexity of applications available.

**Figure 12. Time Needed to Implement an EHR**

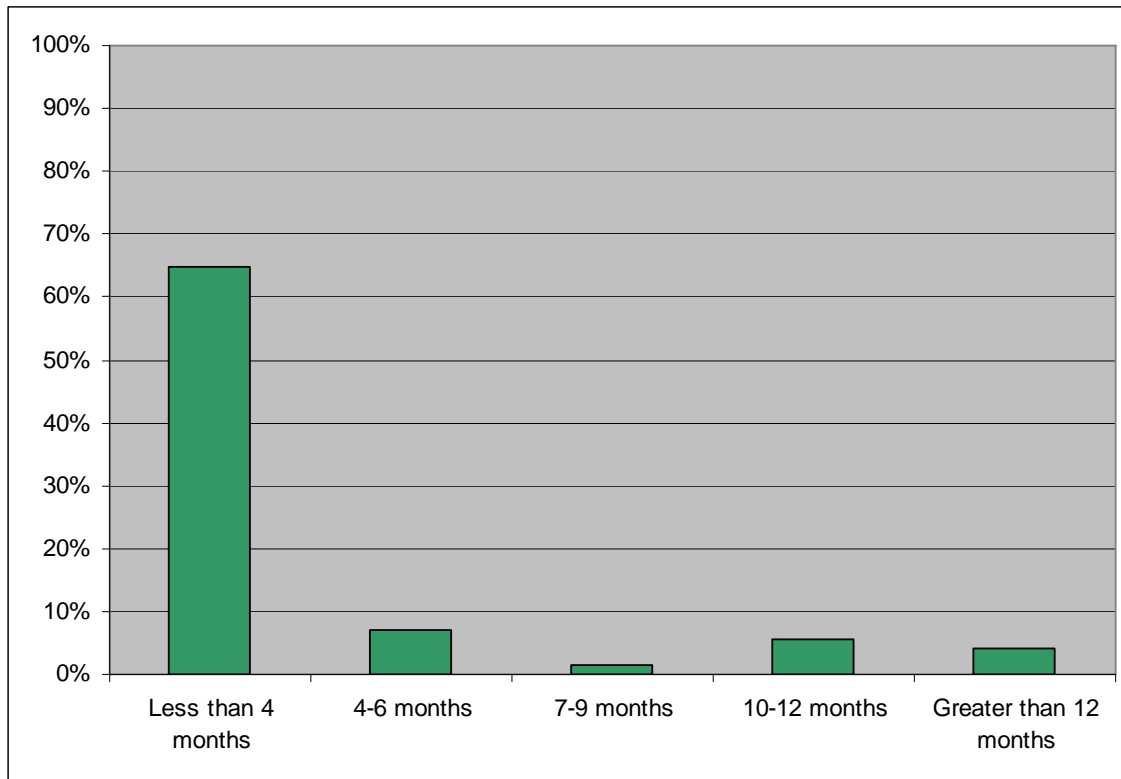


Figure 12 shows the length of time necessary for users to install and operationalize their EHR. Over 64% of users took less than four months to complete this process. It is possible that EHR implementation was staged over a long period of time (i.e., the EHR may have been installed and operationalized with additional functions to be added in the future).

Eighty percent of users were using a billing and scheduling module provided by their EHR vendor. The remaining 20% were likely doing these same functions electronically, but using a separate program. For those physician practices using a separate program for billing and scheduling, the results indicated 1) their EHR systems may not be fully comprehensive; 2) the billing and scheduling modules included with EHR may not be user-friendly; or 3) a change in existing billing and scheduling systems is cumbersome and requires additional resources and training. For those physicians who were not using a billing and scheduling module included with their EHR, over half (69%) have interfaced their existing module with their EHR.

## EHR User Recommendations

Eighty-seven percent of users would recommend their EHR system to their colleagues. There are over 40 different EHR systems reported in use in South Dakota.

## Additional Considerations for EHR Adoption

**Table 5. Perceived Barriers to Adoption of EHRs**

Critical/Major Barrier	Users n=98 (%)	Planners n=184 (%)	Nonplanners n=54 (%)
Start-up financial costs	32.7	53.8	77.7
Ongoing financial costs	21.4	50.0	63.0
Cannot afford to convert historic medical record data into the EHR	8.2	30.5	62.9
Poor return on investment	33.7	35.9	53.7
Lack of uniform standards	13.3	38.0	53.7
Technical limitations with systems	15.3	31.0	50.0
Lack of technical support	13.3	29.3	42.6
Lack of time to acquire knowledge about EHRs	15.3	21.8	42.6
Loss of productivity	24.5	32.6	40.8
Personal skepticism	6.2	13.0	40.8
Unable to evaluate, compare and select the appropriate EHR system	11.2	21.8	37.1
Security and privacy concerns	8.2	13.0	31.5
Office staff skepticism	10.2	17.4	31.5
Colleague skepticism	18.4	26.1	24.1
Lack of computer skills in the office	7.1	10.9	18.5

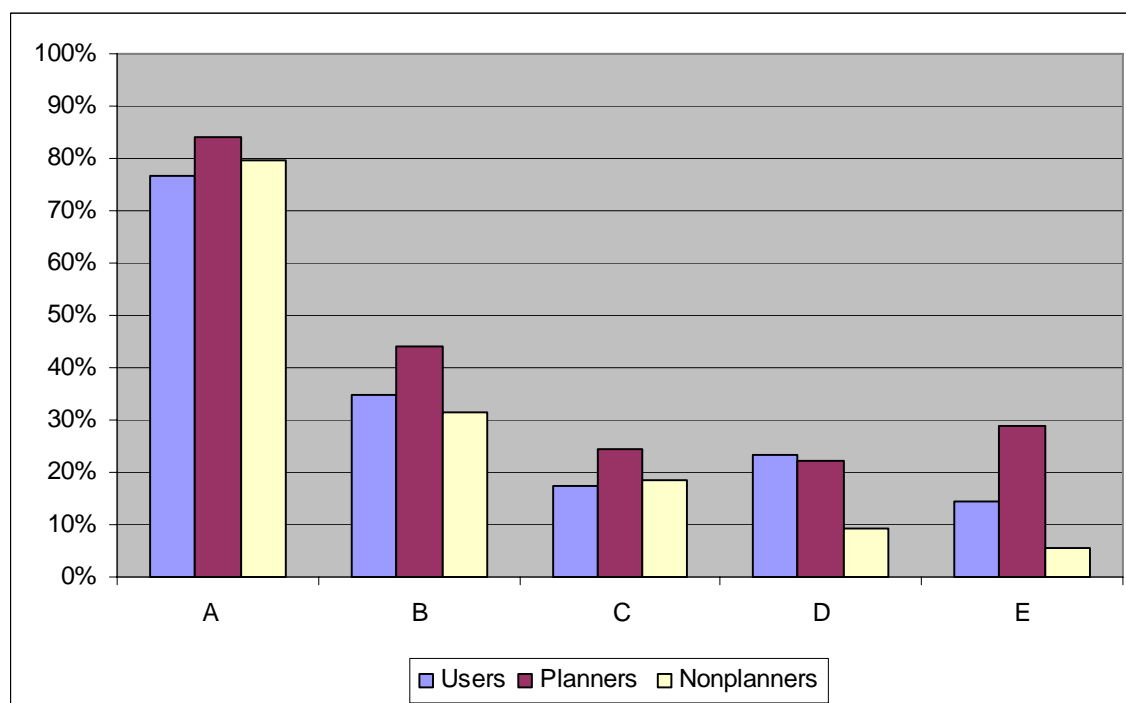
Table 5 displays the percentage of users, planners and nonplanners that rated each barrier as either critical or major. Nonplanners perceived more barriers than planners who perceived more barriers than users for all categories except colleague skepticism. Financial concerns were the major barriers for all groups. Interoperability issues such as lack of uniform standards and technical limitations with systems were also significant barriers to adoption of EHRs. Groups were less concerned about skepticism of office personnel and existing computer skills in the office.

## *Primary Care Physician Weekly Outpatient Visits by State of EHR Adoption*

The average weekly outpatient visits by primary care physicians was explored across the EHR adoption groups. This metric is often used as an indicator of workload and productivity. Users report an average of 81 patient care visits/week (n = 50), planners report an average of 86 patient care visits/week (n=117), and non-planners report 78 average care visits/week (n=30). We did not study the impact of non-response bias that may be associated with heavy patient care workload (i.e., it may be possible that physicians with a very heavy workload did not believe they had adequate time to respond to this survey).

While it is of interest to compare across the four major primary care practice types (i.e. general/family practice, general internal medicine, general pediatrics, and obstetrics/gynecology), to determine if there are differences in visits, there were insufficient sample sizes received from the latter three to make a statistically significant comparison.

**Figure 13. Observed or Experienced Patient Safety Incidents in the Last Three Months**



- A** A patient’s medical record(s), test results, or other relevant clinical information were not available to me at the patient’s visit.
- B** Tests or procedures had to be repeated because findings were unavailable for interpretation at the time of the patient’s visit.
- C** A patient experienced a problem following discharge from a hospital because his/her physician did not receive needed information from the hospital in a timely manner.
- D** Patient follow up was missed for an abnormal test result.
- E** A patient received the wrong drug, wrong dose, or experienced a preventable medication error.

Figure 13 displays five patient safety incidents that physicians either directly observed or experienced over the past three months. The results are consistent with the perception that interoperability is not yet seamless in practice (Table 5). This may lead to a number of problems related to information management and exchange. In general planners and users are experiencing and observing more system-of-care related problems than nonplanners. The most frequent problem for all three groups is the lack of availability of needed clinical information at the time of the patient’s visit, i.e., having an EHR has not resolved this problem. Further exploration is needed.

## HIT Access, Support, Training, and Decision-Making

**Figure 14. Location of Desktop Computers**

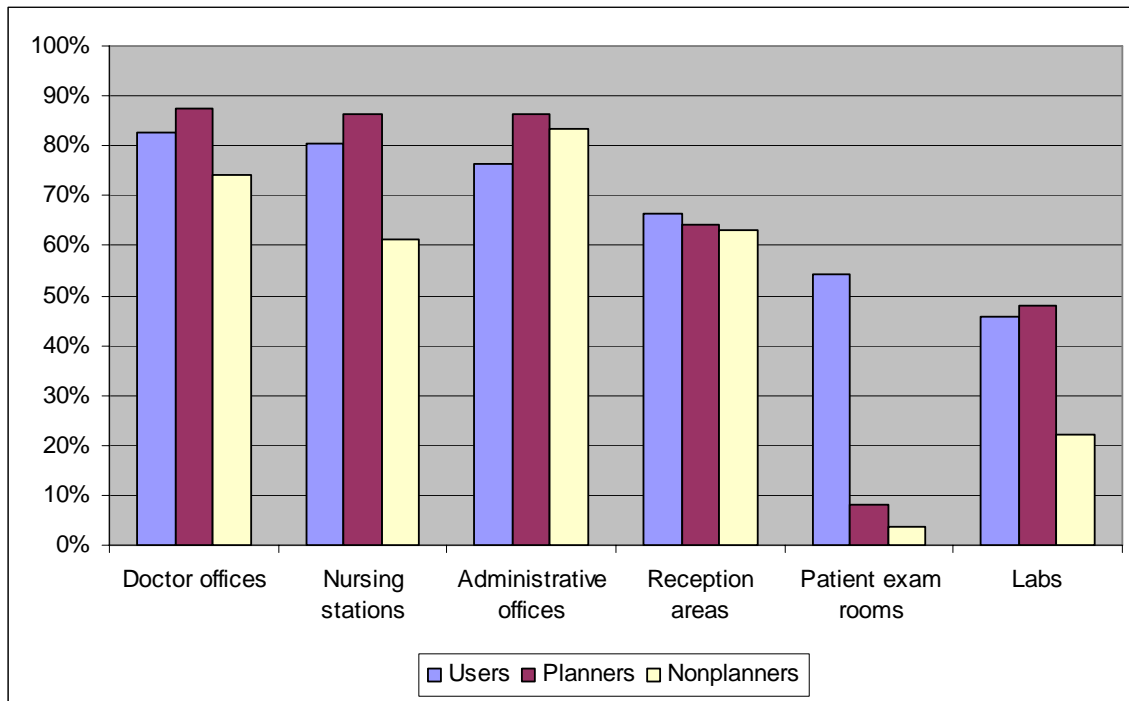


Figure 14 displays the location of desktop computers in physician practices. Most physicians report desktop computers in their administrative offices regardless of stage of EHR adoption. Fewer computers are located in patient exam rooms. However, compared to nonplanners and planners, more users have desktop computers located in patient exam rooms.

**Figure 15. Internet Access for Providers**

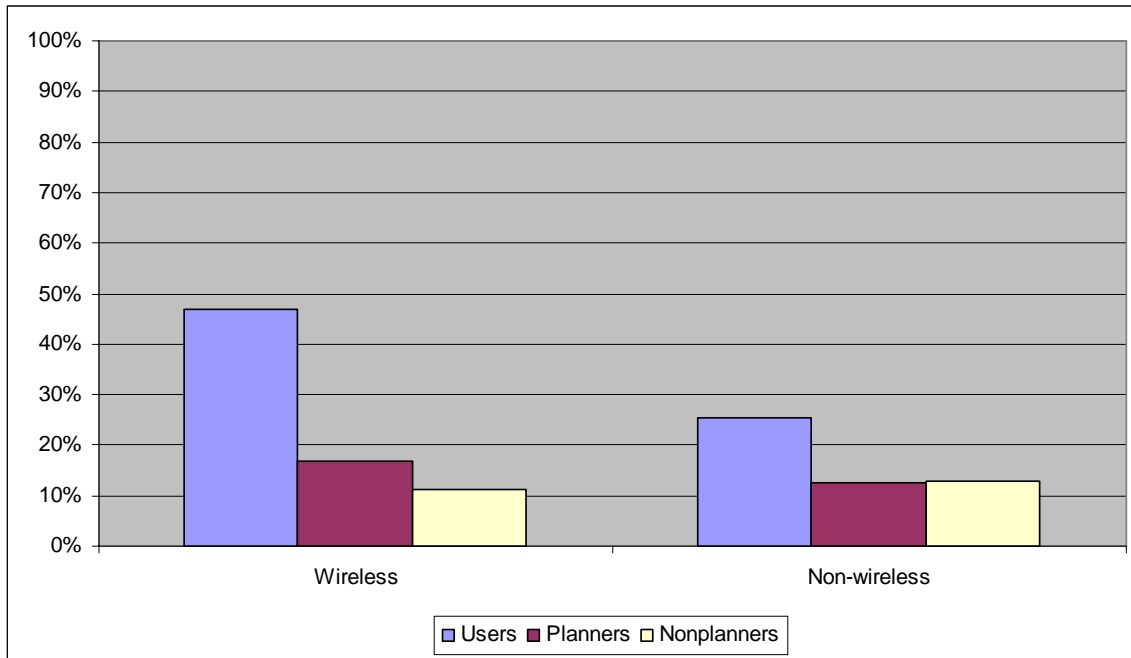


Figure 15 displays providers' access to the internet in their practices. Users were likely to have some type of internet access. Wireless access was dominant over non-wireless access for users. Both wireless and wired internet access were equally available for planners and nonplanners.

**Figure 16. EHR Training Approaches**

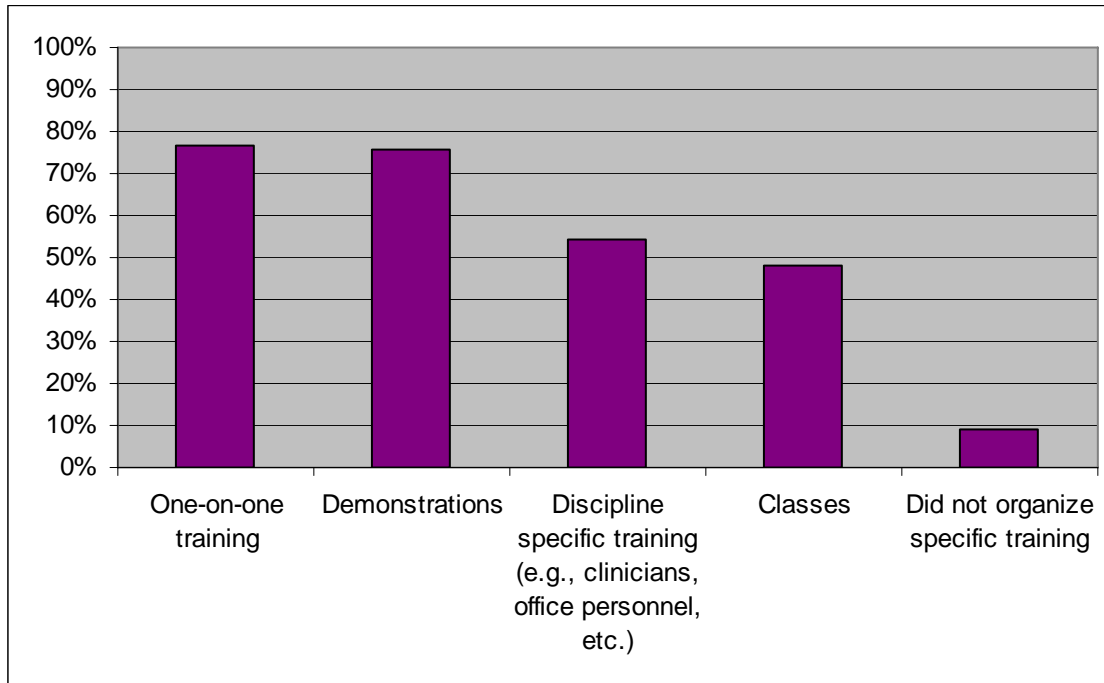


Figure 16 illustrates the various training approaches provided by users to their office professionals and staff. More than 90% offered organized training.

Users who have had their systems for less than a year reported more on-going training than users who have had their systems for over a year (65% vs. 72%). This finding indicates a substantial need for on-going training.

## Related Support Issues

For 40% of users, no additional staff was hired to support the EHR. Of the 60% of users who hired additional staff, 62% hired 1-3 additional people.

In addition to adequate access, support for HIT use is also important. Results show that users (61.2%) were more likely to have in-house computer and IT support compared to planners (39.1%) and nonplanners (27.8%). Nonplanners (64.8%) were more likely to outsource their computer and IT support compared to planners (51.1%) and users (28.6%).

## Decision-Making

Data indicates the engagement of multiple people in the decision-making process for purchasing new technology. Physician involvement is highest for nonplanners and decreases for planners and users.

## Summary and Conclusions

### Highlights

- Nearly all physicians would like to use desktop computers, laptop/notebook computers, tablet PCs and PDAs in their future practice. In today's environment nearly all physicians are using desktop computers while use of other technologies is not as prevalent.
- Status of EHR adoption in South Dakota:
  - EHR Users represent 29% of physicians in office practices
  - EHR Planners represent 55% of physicians in office practices
  - EHR Nonplanners represent 16% of physicians in office practices
- EHR users are more likely to use patient care computer applications than nonusers.
- Administrative computer applications are used equally by physician practices regardless of stage of EHR adoption.
- Most prescriptions are still generated using a handwritten prescription pad for all stages of EHR adoption. EHR users have a tendency to use laptop or desktop computers more than nonusers to generate prescriptions. Traditional methods of prescription delivery to pharmacies still predominate.
- EHR planners' expectations regarding clinical functions available on EHRs is greater than the functions actually available in current EHR systems.
- The main barriers to EHR adoption are financial and interoperability.
- Directly observed or experienced patient safety incidents were higher for EHR users compared to nonusers. This observation is counterintuitive to our expectations, ie., that the adoption of EHR will lead to improved safety. One explanation for this finding is that there are substantial problems in information management and exchange related to the interoperability requirements of an EHR. Additional research is needed in this area.

Education is a sound approach to informing and assisting physicians with the decisions and transition to EHR use. Key areas of education include improving the financial knowledge and understanding of EHRs and physician practices, the added clinical functionality that is observed by those who use EHRs, the value of EHR in the short and long term based upon the type of practice that physicians have, the impact of an EHR on workflow and efficiency based upon the type of practice a physician has, and the perceptions that develop about patient safety and quality of care when EHRs are used. If physicians are made aware, they will be better equipped to handle these challenges and manage their daily practice and patient care.

## Appendix A: Geographic Considerations of EHR Adoption

### Purpose and Overview

Figures 17, 18, and 19 show counties where physicians reported either using an EHR, planning to implement an EHR, or having no plans to implement an EHR respectively. The county shadings indicate the number of physicians in each category. Most counties actually had physician respondents who were in more than one of these categories. Table 6 provides the descriptive data that is an overview of the distribution of respondents by EHR adoption status for each county. The county population and number of physicians in the county is provided to facilitate interpretation and comparison.

These maps are one tool for use in deciding how resources are allocated to facilitate adoption and implementation of EHR systems by South Dakota physicians. When interpreting these maps, we caution they represent only responding physicians. Therefore, no assumptions can be made for any particular county appearing to have physicians only in one stage. Counties not shaded may represent incomplete information. Additionally, shaded counties may only represent a percentage of the physicians in that county.

Users tended to be located in larger population centers across the state. Those in the planning stage of EHR implementation represented the largest group of reporting physicians and were located throughout the state particularly in the Eastern half. The larger cities often had physicians in all three categories.

**Table 6: Reference Data for Maps**

County Map Reference	Name	Population 2005 <sup>1</sup>	No. of Physicians by County <sup>2</sup>	Physician Response Rate	Users <sup>3</sup>	Planners <sup>3</sup>	Nonplanners <sup>3</sup>
1	Aurora	2,988	0	NA	NA	NA	NA
2	Beadle	16,062	21	24%	1	1	3
3	Bennett	3,536	0	NA	0	1	0
4	Bon Homme	7,048	6	50%	2	0	1
5	Brookings	29,181	26	31%	0	7	1
6	Brown	34,832	86	23%	5	7	8
7	Brule	5,254	5	60%	0	3	0
8	Buffalo	2,031	1	0%	0	0	0
9	Butte	9,684	5	40%	1	1	0
10	Campbell	1,679	0	NA	NA	NA	NA
11	Charles Mix	9,277	6	50%	0	3	0
12	Clark	4,007	0	NA	NA	NA	NA
13	Clay	13,384	11	18%	0	1	1
14	Codington	26,140	55	33%	10	6	2
15	Corson	4,311	0	NA	NA	NA	NA
16	Custer	7,944	9	11%	0	1	0
17	Davison	18,865	42	17%	0	5	2
18	Day	5,962	2	50%	0	1	0
19	Deuel	4,344	3	0%	0	0	0
20	Dewey	6,028	2	0%	0	0	0
21	Douglas	3,315	1	100%	0	1	0
22	Edmunds	4,247	2	0%	0	0	0
23	Fall River	7,615	15	13%	1	0	1
24	Faulk	2,524	1	100%	0	1	0
25	Grant	7,654	8	25%	0	2	0
26	Gregory	4,595	6	33%	0	2	0
27	Haakon	2,176	3	0%	0	0	0
28	Hamlin	5,694	0	NA	NA	NA	NA
29	Hand	3,490	3	67%	0	2	0
30	Hanson	3,232	0	NA	NA	NA	NA
31	Harding	1,215	0	NA	NA	NA	NA
32	Hughes	16,750	27	33%	8	1	0
33	Hutchinson	7,947	7	71%	0	3	2
34	Hyde	1,613	0	NA	NA	NA	NA
35	Jackson	2,936	0	NA	NA	NA	NA
36	Jerauld	2,237	2	100%	0	2	0

<sup>1</sup> US Census Data for Counties, Data Source: ESRI Data & Maps 2006 StreetMap USA (DVD), dtl\_cnty.\* files located usa\census directory, data derived from US Census, ESRI.

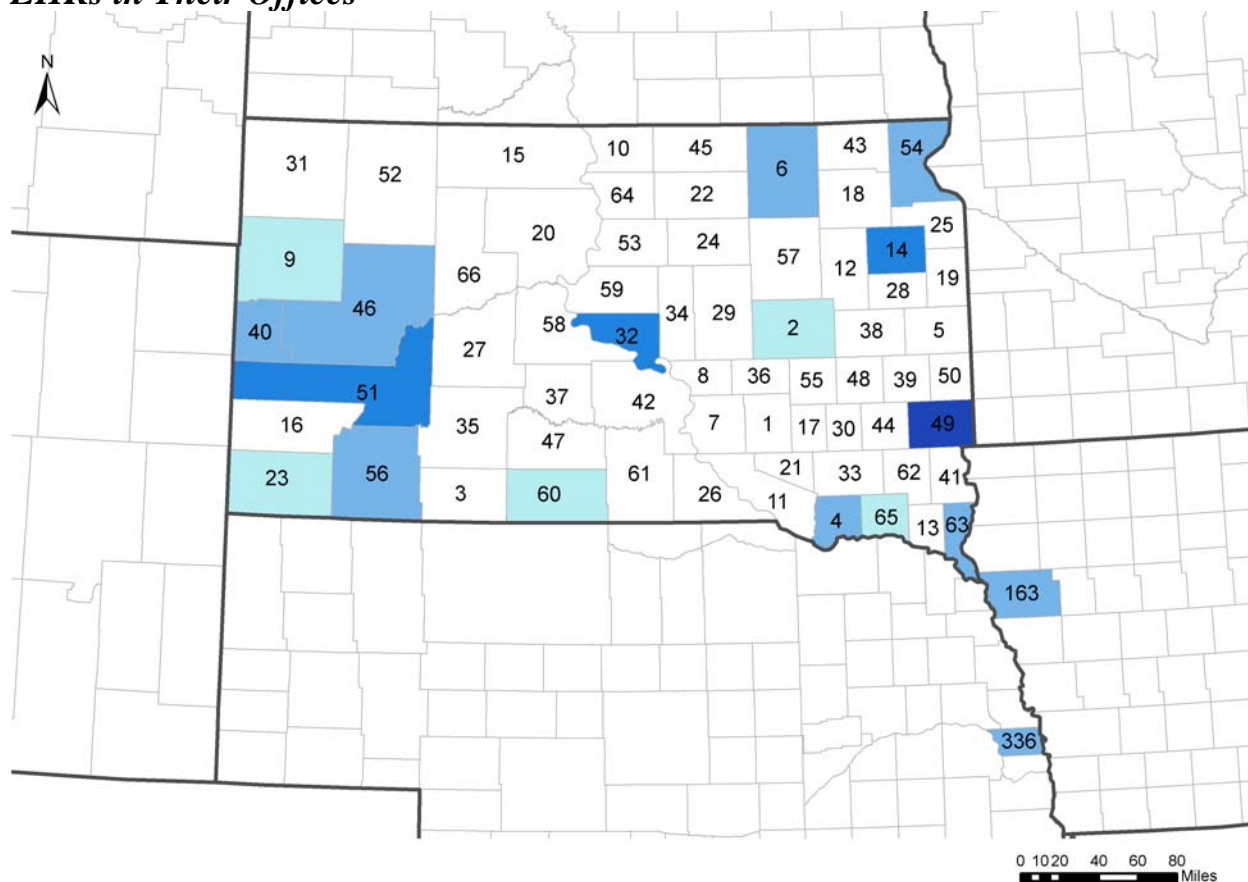
<sup>2</sup> Number of Physicians per county; South Dakota Board of Medical and Osteopathic Examiners Licensing Board, Physician Listing, Retrieved July 30 2007, <http://www.state.sd.us/doh/>.

<sup>3</sup> Data obtained from *Enhancing Clinical Practices Through the Adoption of Health Information Technology*, Creighton Health Services Research Program (CHRP).

**Table 6: Reference Data for Maps (Continued)**

37	Jones	1,126	0	NA	NA	NA	NA
38	Kingsbury	5,676	5	0%	0	0	0
39	Lake	11,366	9	44%	0	2	2
40	Lawrence	22,543	50	16%	2	6	0
41	Lincoln	33,343	10	0%	0	0	0
42	Lyman	3,898	0	NA	NA	NA	NA
43	Marshall	4,460	3	0%	0	0	0
44	McCook	5,988	2	0%	0	0	0
45	McPherson	2,609	3	33%	0	0	1
46	Meade	25,946	27	22%	4	1	1
47	Mellette	2,063	0	NA	NA	NA	NA
48	Miner	2,644	0	NA	NA	NA	NA
49	Minnehaha	162,633	730	16%	36	71	11
50	Moody	6,430	2	0%	0	0	0
51	Pennington	92,757	293	17%	12	29	10
52	Perkins	3,400	0	NA	0	0	1
53	Potter	2,440	2	0%	0	0	0
54	Roberts	10,095	7	57%	2	1	1
55	Sanborn	2,610	0	NA	NA	NA	NA
56	Shannon	13,199	4	75%	3	0	0
57	Spink	6,932	4	50%	0	2	0
58	Stanley	2,838	1	0%	0	0	0
59	Sully	1,621	0	NA	NA	NA	NA
60	Todd	9,214	6	33%	1	0	1
61	Tripp	6,233	7	57%	0	1	3
62	Turner	8,801	6	17%	0	1	0
63	Union	13,266	59	14%	5	2	1
64	Walworth	5,650	7	43%	0	3	0
65	Yankton	21,799	85	18%	1	12	2
66	Ziebach	2,577	0	NA	NA	NA	NA
97	Dubuque (Iowa)	90,781	2	50%	1	0	0
163	Woodbury (Iowa)	103,097	77	4%	3	0	0
336	Douglas (Nebraska)	486,119	28	11%	3	0	0
364	Lincoln (Nebraska)	35,181	1	100%	0	1	0
416	Emmons (North Dakota)	3,890	2	50%	0	1	0

**Figure 17. County Location of Responding Physicians Who Have Implemented EHRs in Their Offices<sup>1</sup>**



<sup>1</sup>The numbers on the map correlate to the county numbers in Table 6 to provide additional data on the respective county.

**Legend**

County Count EHR Users

- 0
- 1
- 2-5
- 6-12
- 13-85

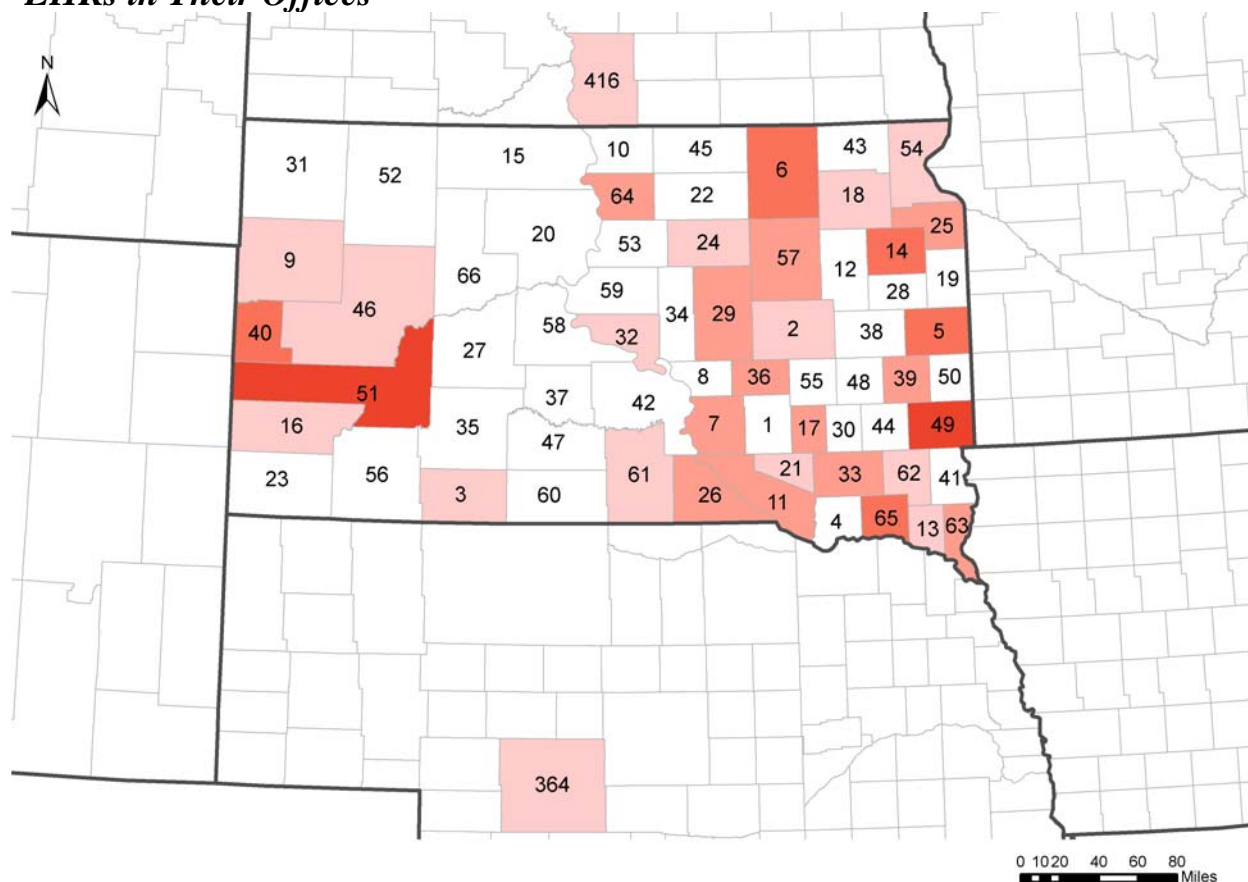
The map represents 16% of licensed South Dakota physicians who confirmed that they maintain ambulatory care practices in South Dakota. Physicians who have a primary practice in a bordering state who reported seeing patients from South Dakota are also included.

Figure 17 is a map showing the distribution of responding physicians that reported current use of EHRs. While it is noted that only responding physicians are indicated, this map in conjunction with data on the number of physicians per county (see Table 6) gives some idea of the amount of EHR use in each county. Many of these counties also had physicians reporting they were in the planning stage (see Figure 18) of EHR implementation. The counties in the surrounding states that also had South Dakota licensed physicians responding are included in this display.

Cartography: Ted Kasha, Creighton Health Services Research Program <http://chrp.creighton.edu> Updated 2008-05-06

Data Source: *Enhancing Clinical Practices Through the Adoption of Health Information Technology*, Creighton Health Services Research Program (CHRP)

**Figure 18. County Location of Responding Physicians Who Plan to Implement EHRs in Their Offices<sup>1</sup>**



<sup>1</sup>The numbers on the map correlate to the county numbers in Table 6 to provide additional data on the respective county.

**Legend**

County Count EHR Planners

- 0
- 1
- 2-5
- 6-12
- 13-119

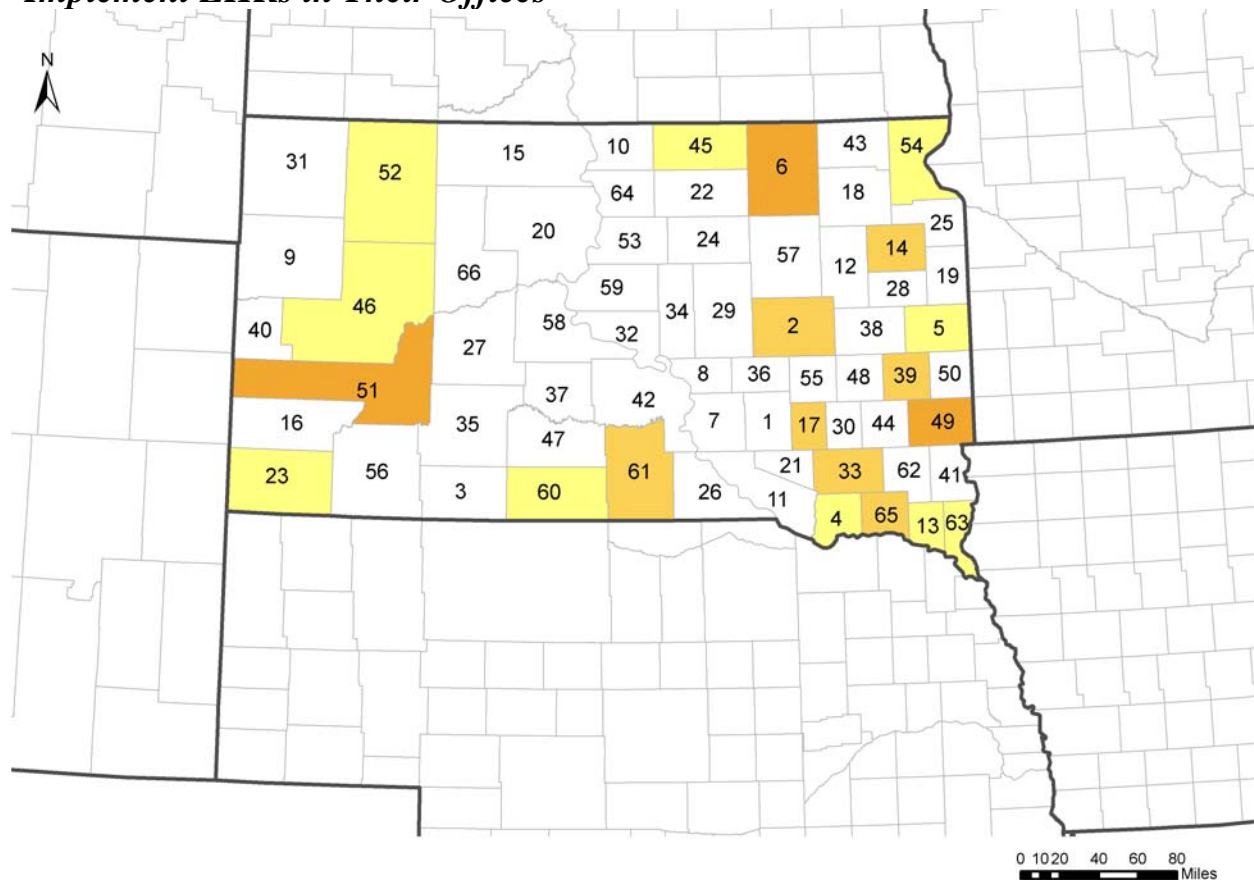
The map represents 16% of licensed South Dakota physicians who confirmed that they maintain ambulatory care practices in South Dakota. Physicians who have a primary practice in a bordering state who reported seeing patients from South Dakota are also included.

Figure 18 is a map showing the distribution of responding physicians in the planning stage of EHR implementation. Figure 18, in comparison with Figures 17 and 19, has more counties highlighted, indicating there were more reporting physicians in the planning stages. While it is noted that only responding physicians are indicated, this map in conjunction with data on the number of physicians per county (see Table 6) gives some idea of the number of physicians planning to implement an EHR in each county. The counties in the surrounding states that also had South Dakota licensed physicians responding are included in this display.

Cartography: Ted Kasha, Creighton Health Services Research Program <http://chrp.creighton.edu> Updated 2008-05-06

Data Source: *Enhancing Clinical Practices Through the Adoption of Health Information Technology*, Creighton Health Services Research Program (CHRP)

**Figure 19. County Location of Responding Physicians Who Do Not Plan to Implement EHRs in Their Offices<sup>1</sup>**



<sup>1</sup>The numbers on the map correlate to the county numbers in Table 6 to provide additional data on the respective county.

**Legend**

County Count EHR No Plan

- 0
- 1
- 2-5
- 6-12
- 13-49

The map represents 16% of licensed South Dakota physicians who confirmed that they maintain ambulatory care practices in South Dakota. Physicians who have a primary practice in a bordering state who reported seeing patients from South Dakota are also included.

Figure 19 is a map showing the distribution of physicians that had no plans to implement EHRs. This map has the fewest counties highlighted when compared to Figures 17 and 18. Many of these counties also had physicians who reported being in the user and planning stage of EHR implementation. While it is noted that only responding physicians are indicated, this map in conjunction with data on the number of physicians per county (see Table 6) gives some idea of the number of physicians who have no plan to implement an EHR in each county. The counties in the surrounding states that also had South Dakota licensed physicians responding are included in this display.

Cartography: Ted Kasha, Creighton Health Services Research Program <http://chrp.creighton.edu> Updated 2008-05-06

Data Source: *Enhancing Clinical Practices Through the Adoption of Health Information Technology*, Creighton Health Services Research Program (CHRP)