

**EHRNebraska**

*Enhancing Clinical Practices Through the Adoption  
of Health Information Technology in Nebraska*



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



**March 2008**

## About the EHRNebraska Project

### Purpose and Overview

The EHRNebraska project is designed to help facilitate the adoption of electronic health records (EHRs) by Nebraska 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.



## EHRNebraska Research Team:

Amy A. Abbott Ph.D.(c), RN  
Assistant Professor  
Creighton University  
Creighton Health Services Research Program  
School of Nursing

Dawn Andersen, BS  
Director of Training and Education  
Medical Practice Solutions

James D. Bramble, Ph.D.  
Associate Professor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Andjela Drincic, M.D.  
Assistant Professor  
Creighton University  
Creighton Health Services Research Program  
School of Medicine

Kevin T. Fuji, Pharm.D.  
Research Fellow and Assistant Instructor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Kimberly A. Galt, Pharm.D.  
Associate Dean for Research, Professor and  
Director, Creighton Health Services Research Program  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

David Ginsburg  
President  
PrivaPlan Associates, Inc.



*Advocating for Physicians and the Health of all Nebraskans*

David Glover, ACHE  
President  
DKG Consultants, Inc.

Sandy Johnson, BS  
Executive Vice President  
Nebraska Medical Association/Foundation

Ted A. Kasha, BS, MIS  
Data Analyst  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Dale Mahlman, BS  
Executive Vice President  
Nebraska Medical Association/Foundation

Laura Meyers, BS  
Executive Director of Development  
DKG Consultants, Inc.

Karen A. Paschal, PT, DPT, MS  
Associate Professor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Mark V. Siracuse, Pharm.D., Ph.D.  
Assistant Professor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Carolyn Smith  
President  
Medical Practice Solutions



## Preface

This report summarizes the state of electronic health record (EHR) adoption of physician office practices in Nebraska as of July 2007. The survey and analysis work has been conducted by the scientists of the Creighton University Health Services Research Program (CHRP) under contract with the Nebraska Medical Association with involvement from all members of the EHR Nebraska implementation team.

The authors of this report:

Kimberly A. Galt, Pharm.D.  
Associate Dean for Research, Professor and  
Director, Creighton Health Services Research Program  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Andjela Drincic, M.D.  
Assistant Professor  
Creighton University  
Creighton Health Services Research Program  
School of Medicine

Karen A. Paschal, PT, DPT, MS  
Associate Professor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Ted A. Kasha, BS, MIS  
Data Analyst  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

James D. Bramble, Ph.D.  
Associate Professor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Mark V. Siracuse, Pharm.D., Ph.D.  
Assistant Professor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

Amy A. Abbott Ph.D.(c), RN  
Assistant Professor  
Creighton University  
Creighton Health Services Research Program  
School of Nursing

Kevin T. Fuji, Pharm.D.  
Research Fellow and Assistant Instructor  
Creighton University  
Creighton Health Services Research Program  
School of Pharmacy and Health Professions

A complete copy of this report is available at the following websites:

EHRNebraska website: <http://ehrnebraska.org/interact/> and CHRP website: <http://chrp.creighton.edu>

Printed versions of this report may be requested from:  
CHRP – 2500 California Plaza, Boyne 143, Omaha, NE 68178



*Acknowledgement of sponsors:* This project is sponsored by the grant “Enhancing Clinical Practices through the Adoption of Health Information Technology in Nebraska” from the Nebraska Medical Association/Foundation, and in part by grant no. 1P20 HS015816 Galt, K.A., (PI) Building Research Infrastructure Capacity from the Agency for Healthcare Research and Quality (AHRQ). Thanks to Ms. Jamie Barbee for preparation of this report.

## List of Tables

- Table 1. Physician Demographics
- Table 2. Practice Demographics
- Table 3. Computer Applications Currently in Use for Patient Care
- Table 4. Availability of Clinical Functions in an EHR
- Table 5. Perceived Barriers to Adoption of EHRs
- Table 6. Reference Data for Maps

## List of Figures

- Figure 1. Prior, Current, and Future Use of HIT for Patient Care
- Figure 2. Electronic Health Record Status
- Figure 3. Current Use of HIT for Patient Care
- Figure 4. Daily Use of Computing Devices for Clinical Functions
- Figure 5. Administrative Computer Applications Currently in Use
- Figure 6. Prescribing Process Computer Application Use
- Figure 7. Prescription Generation
- Figure 8. Prescription Delivery or Transmission to Pharmacy
- Figure 9. Stage of EHR System Selection for Planners
- Figure 10. Length of Time Using an EHR System for Users
- Figure 11. Time Preferences for Data Entry into an EHR
- Figure 12. Time Needed to Implement an EHR
- Figure 13. Average Number of Weekly Outpatient Visits
- Figure 14. Observed or Experienced Patient Safety Incidents in the Last Three Months
- Figure 15. Location of Desktop Computers
- Figure 16. Internet Access for Providers
- Figure 17. EHR Training Approaches
- Figure 18. County Location of Responding Physicians Who Have Implemented EHRs in Their Offices
- Figure 19. County Location of Responding Physicians Who Plan to Implement EHRs in Their Offices
- Figure 20. County Location of Responding Physicians Who Do Not Plan to Implement EHRs in Their Offices

# Table of Contents

About the EHRNebraska Project .....	i
Preface.....	iii
List of Tables .....	iv
List of Figures .....	v
Introduction.....	1
Methods.....	1
Physician Demographics.....	2
Practice Demographics .....	3
Use of Computing Devices in Medical Practices.....	5
Stage of Electronic Health Record Adoption.....	6
Computing Devices and Computer Applications.....	7
Electronic Health Records Users and Electronic Health Records Planners.....	14
Electronic Health Records Users .....	18
Additional Considerations for Electronic Health Records Adoption.....	20
Health Information Technology Access, Support, Training, and Decision-Making .....	23
Summary and Conclusions .....	26
Appendix A: Geographic Considerations of Electronic Health Record Adoption .....	27



## 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 10 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.

---

<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, Kralewski 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 Nebraska. 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 physicians in Nebraska between June and August of 2007 using a modified Dillman technique. The state of Nebraska licensure database was the primary record source to identify physicians. Data was supplemented from the Health Professions Tracking Center and the Nebraska Medical Association. 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

There were 612 physicians who completed the survey of a potential 1,315 who confirmed that they maintain ambulatory care practices in Nebraska.

**Table 1. Physician Demographics**  
**Distribution of respondents by age category**

<i>Age Category (n=609)<sup>a</sup></i>	<i>n</i>	<i>%</i>
28-37 years	90	14.8
38-47 years	144	23.6
48-57 years	230	37.8
58-67 years	115	18.9
68-77 years	27	4.4
78-87 years	3	0.5

**Distribution of respondents by number of years in practice**

<i>Range of years category (n = 600)<sup>a</sup></i>	<i>n</i>	<i>%</i>
1 - 9 years	147	24.5
10-19 years	167	27.8
20-29 years	193	32.2
30-39 years	76	12.7
40-49 years	13	2.2
50-57 years	4	0.7

<sup>a</sup> Responses that total less than 612 for the sum within a category indicate that not all respondents answered the question

Table 1 displays the physician demographics for respondents. The average respondent has been in practice for 18.3 years. There were 26% female and 74% male respondents. Nearly all respondents were White/Caucasian (91.0%), followed by Asian (4.4%), Hispanic or Latino (2.2%), and Black/African-American (1.0%).

**Practice Demographics**

**Table 2. Practice Demographics**  
**Primary area(s) of practice of the respondents**

<i>Area of practice (n=612)</i>	<i>n</i>	<i>%</i>
General Family Practice	197	32.2
Surgical Sub-specialties	75	12.2
Internal Medicine Sub-specialties	55	9.0
General Pediatrics	53	8.7
Obstetrics/Gynecology	48	7.8
General Internal Medicine	47	7.7
General Surgery	37	6.0
Ophthalmology	26	4.2
ENT	13	2.1
Dermatology	12	2.0
Cardiology	9	1.5
Emergency Medicine	9	1.5
Neurology	8	1.3
Non-primary Care Other	35	5.7

**Practice type**

<i>Category (n=629)<sup>b</sup></i>	<i>n</i>	<i>%</i>
Free standing, independent practice	365	59.6
Hospital/health system	128	20.9
Med school faculty practice plan	67	10.9
Rural health clinic	33	5.4
Health center	17	2.8
Other	19	3.1

**Ownership status of the respondent to primary practice**

<i>Full Owner (n=609)<sup>a</sup></i>	<i>n</i>	<i>%</i>
Employee (salaried)	259	42.5
Full Owner	186	30.5
Part Owner	155	25.5
Other	9	1.5

<sup>a</sup> Responses that total less than 612 within a category indicate that not all respondents answered the question

<sup>b</sup> Responses greater than 612 indicate multiple category selections by respondents

## Number of Practice Locations

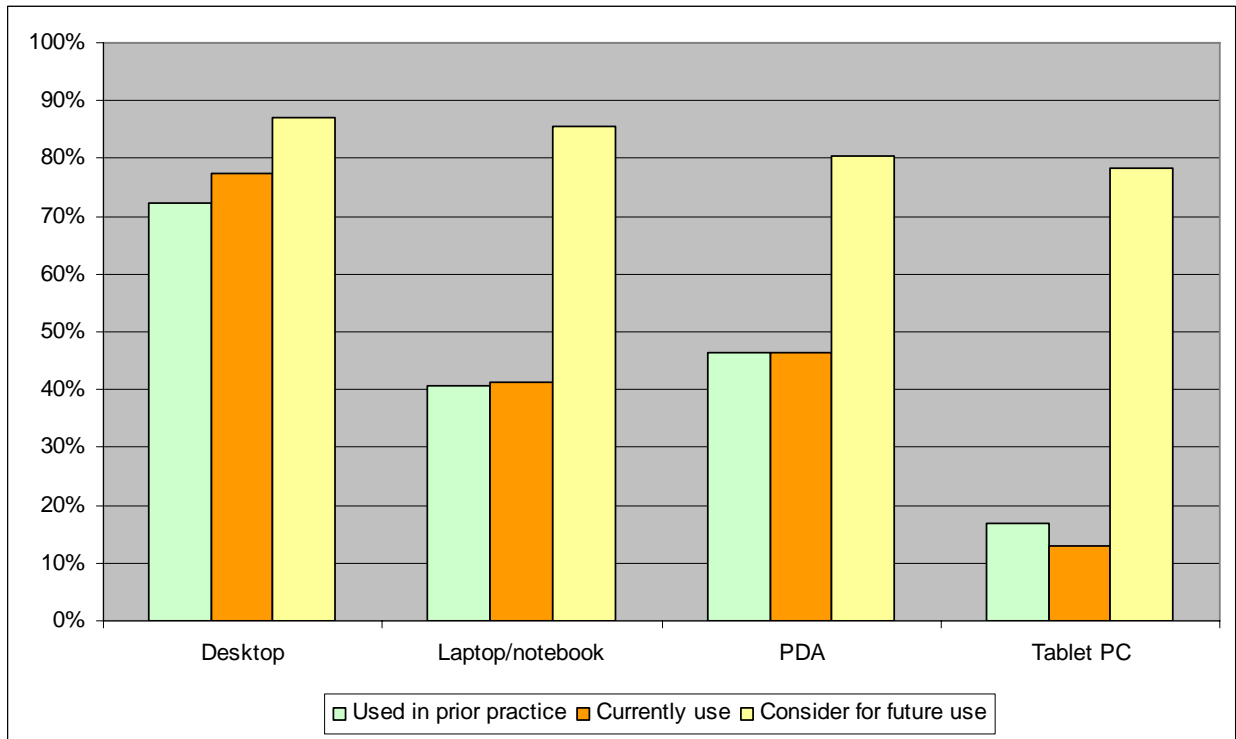
Over 54% of physicians see outpatients from one office location, with an average of 1.9 office locations per physician overall.

## Mid-level Providers in Physician Practices

Physicians reported a strong presence of mid-level providers in their practices. Forty-two percent of physicians reported that physician assistants were utilized in their practice. Additionally, 35% 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

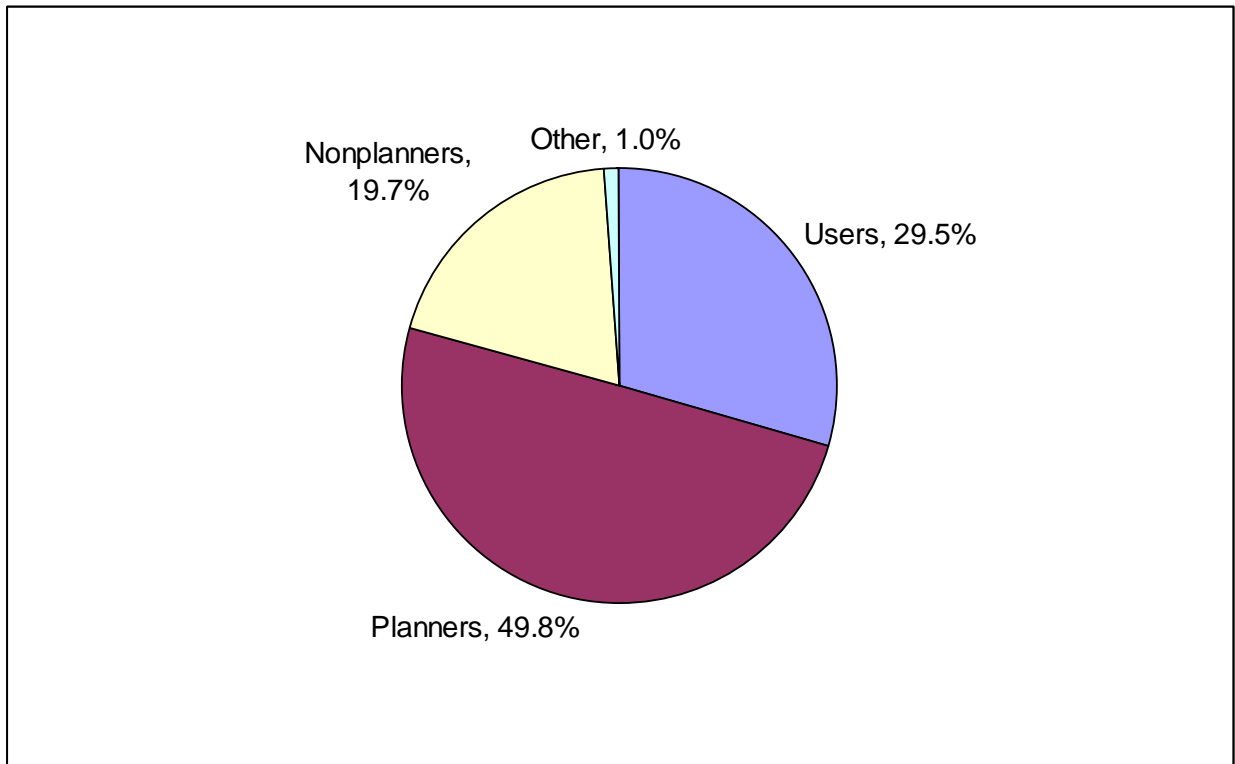
**Figure 1. Prior, Current, and Future Use of HIT for Patient Care**



Physicians' experiences with HIT are displayed in Figure 1. While the most common HIT used were desktop computers, a little less than half of physicians also reported using personal digital assistants (PDA) and laptop computers. The data indicate that 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**

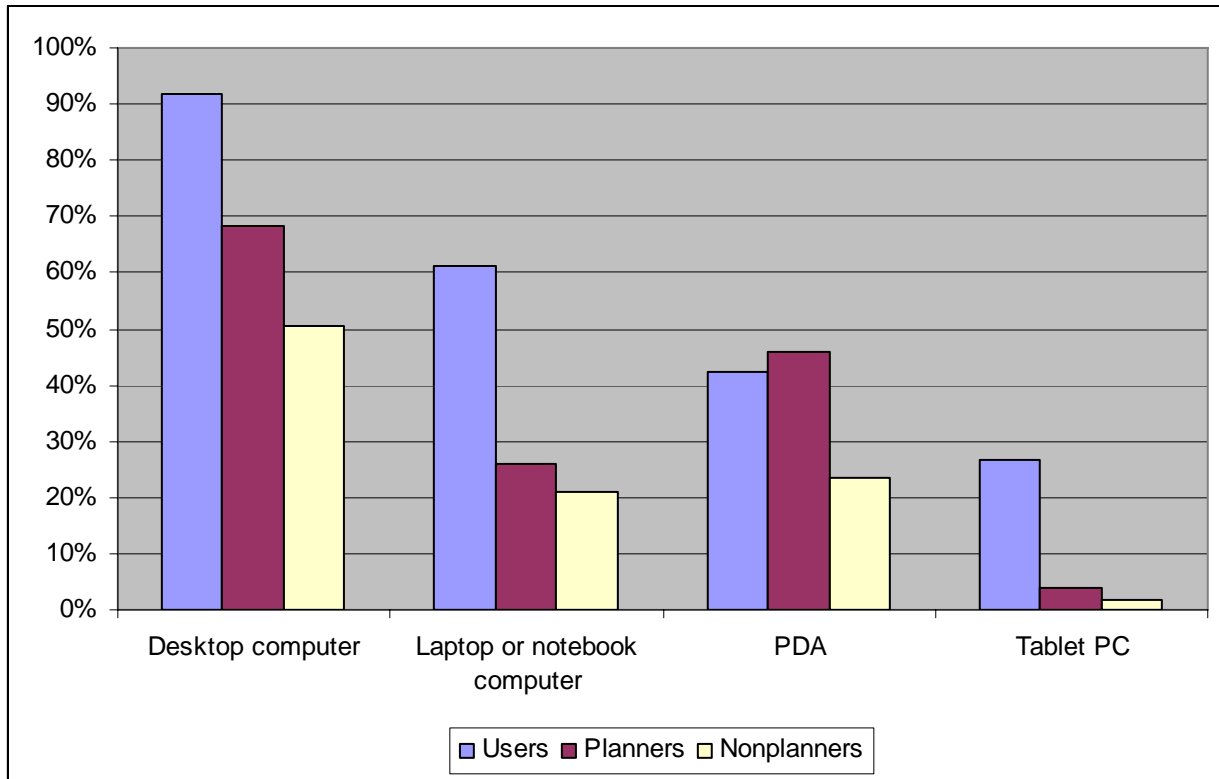


The data is displayed in Figure 2 shows EHR adoption status in physicians' practices. Approximately 30% of physicians routinely use an EHR (labeled "Users"), 50% are in some stage of planning to implement an EHR system (labeled "Planners"), and 20% have no plans for adoption (labeled "Nonplanners").

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 PC's 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 PDA's (personal digital assistants) compared to nonplanners.

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

<b>Applications</b>	<b>Users n = 180 (%)</b>	<b>Planners n = 301 (%)</b>	<b>Nonplanners n = 119 (%)</b>
Identify and maintain a patient record	99.4	32.9	26.1
Manage patient history	96.1	15.9	8.4
Manage clinical notes	95.6	19.3	11.8
Manage patient demographics	95.0	64.5	55.5
Manage allergy and adverse reaction list	92.8	16.6	7.6
Manage medication list	91.7	15.9	8.4
Manage problem list	86.7	11.3	5.9
Capture external clinical documents (e.g. lab results, radiographic images, medication prescribed by external source)	81.1	39.9	13.4
Communication (other providers, pharmacy, staff)	76.7	28.2	13.4
View patient hospital records from office or home	75.0	48.5	27.7
Order diagnostic tests	74.4	19.6	10.1
Generate and record patient-specific instructions	70.6	16.9	10.1
Clinical task assignments and routing (assignment and delegation of tasks to others)	68.9	10.0	5.0
Track patient names for inpatient visits	63.3	34.6	23.5
Present alerts, notifications or reminders for disease management, preventative services, and wellness	61.1	10.6	5.9
View disease or immunization registry entries	55.6	6.6	3.4
Rules-driven financial and administrative coding assistance	52.8	26.9	30.3
Support for medication or immunization administration or supply	48.9	12.3	5.0
Clinical decision support system guidelines updates	42.8	21.3	9.2
View patients' own Personal Health Record	20.0	4.7	2.5
Provide services via Nebraska Telehealth Network	6.1	3.0	0.0

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**

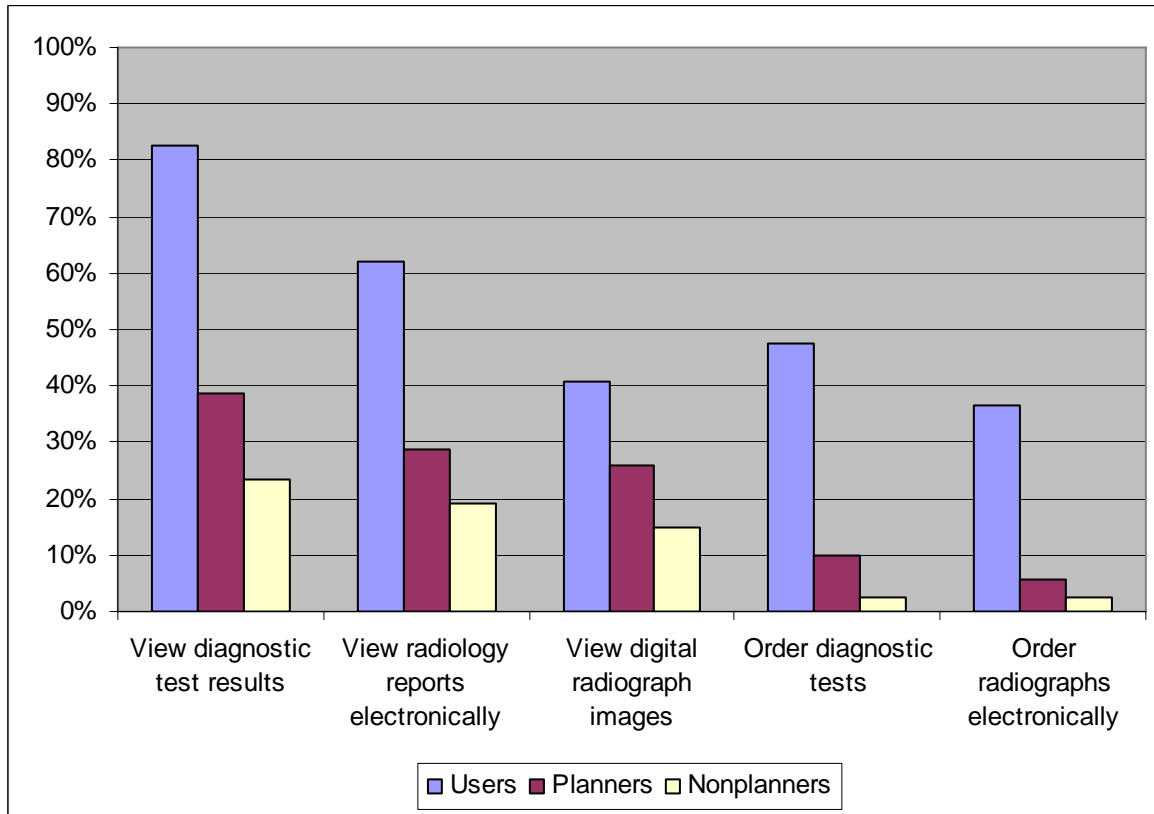


Figure 4 illustrates use of computing devices for various clinical functions. Physicians utilize the viewing functions of their various computing devices more than ordering functions. Users are utilizing viewing and ordering functions on their computing devices more often than both planners and nonplanners.

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

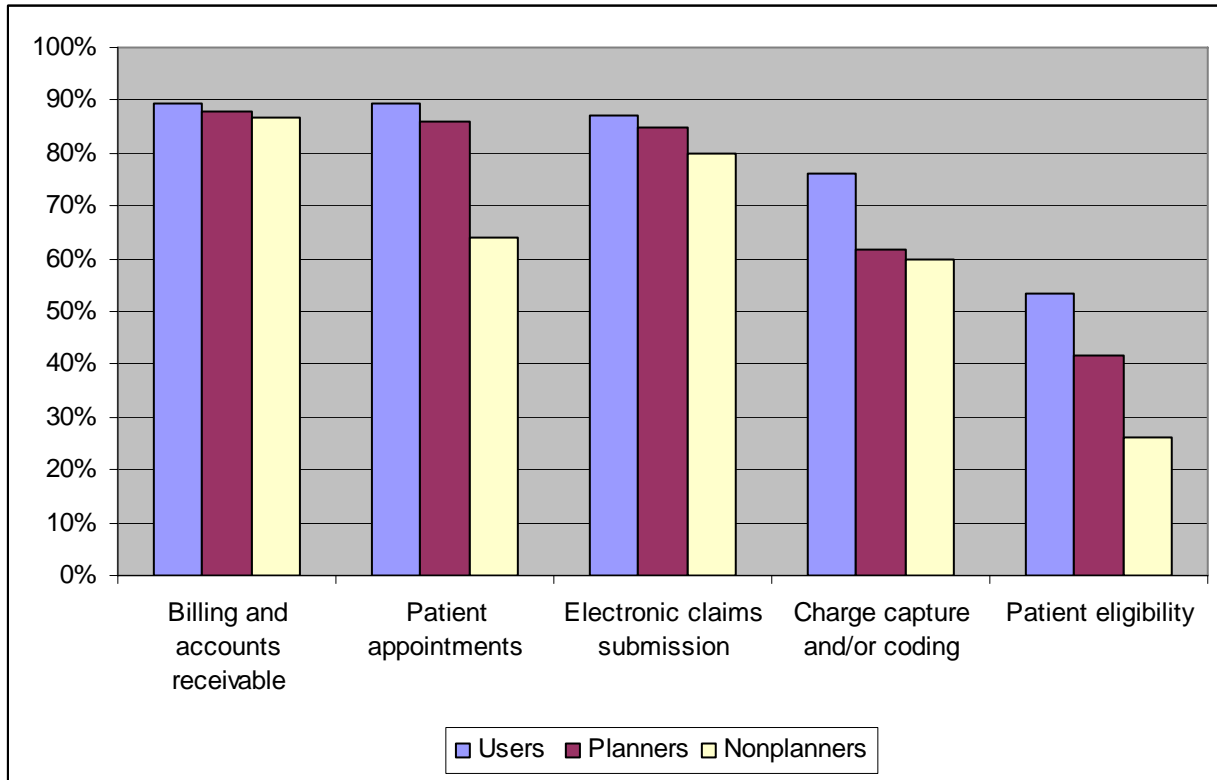


Figure 5 illustrates administrative applications performed using various computing devices. Compared to patient care applications in Table 3 administrative applications appear to be utilized more frequently across all three groups, and are less dependent on stage of EHR adoption.

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

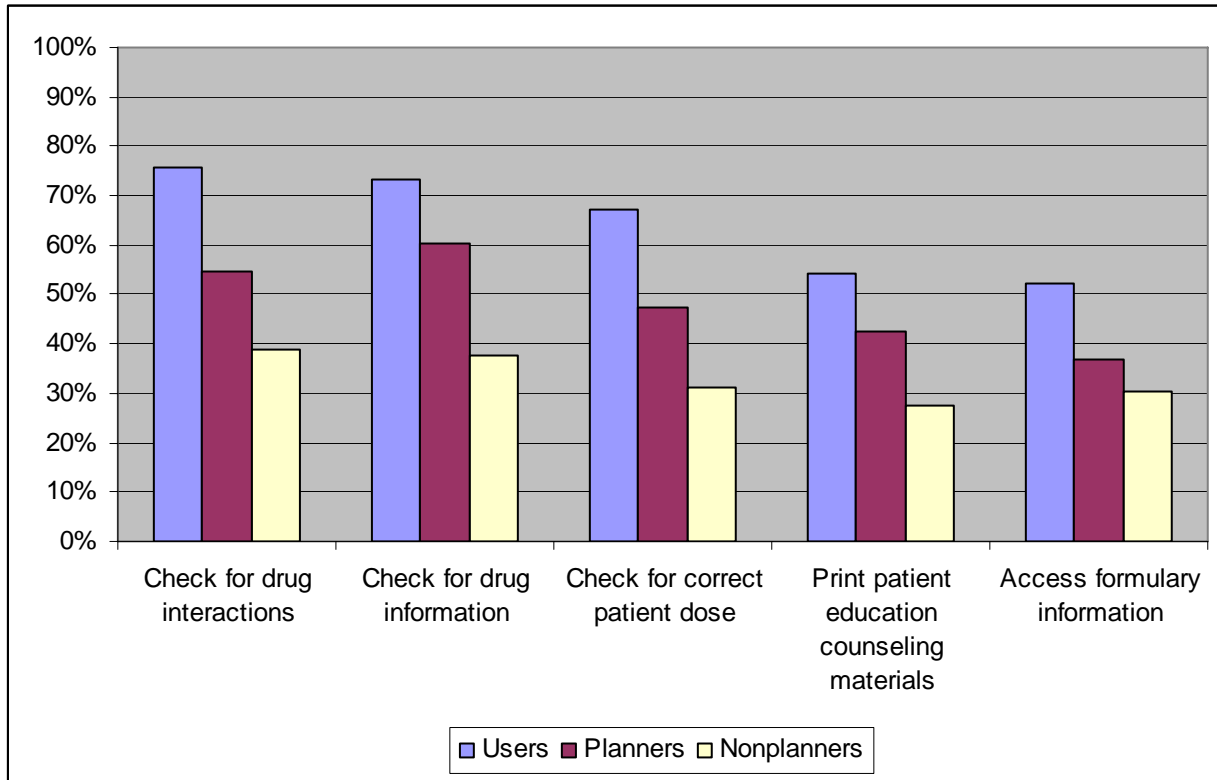


Figure 6 shows the basic applications used to find information and assist with clinical decisions in the prescribing process. Similar to the trends shown in table 3, EHR users utilize these functions more than planners and nonplanners.

**Figure 7. Prescription Generation**

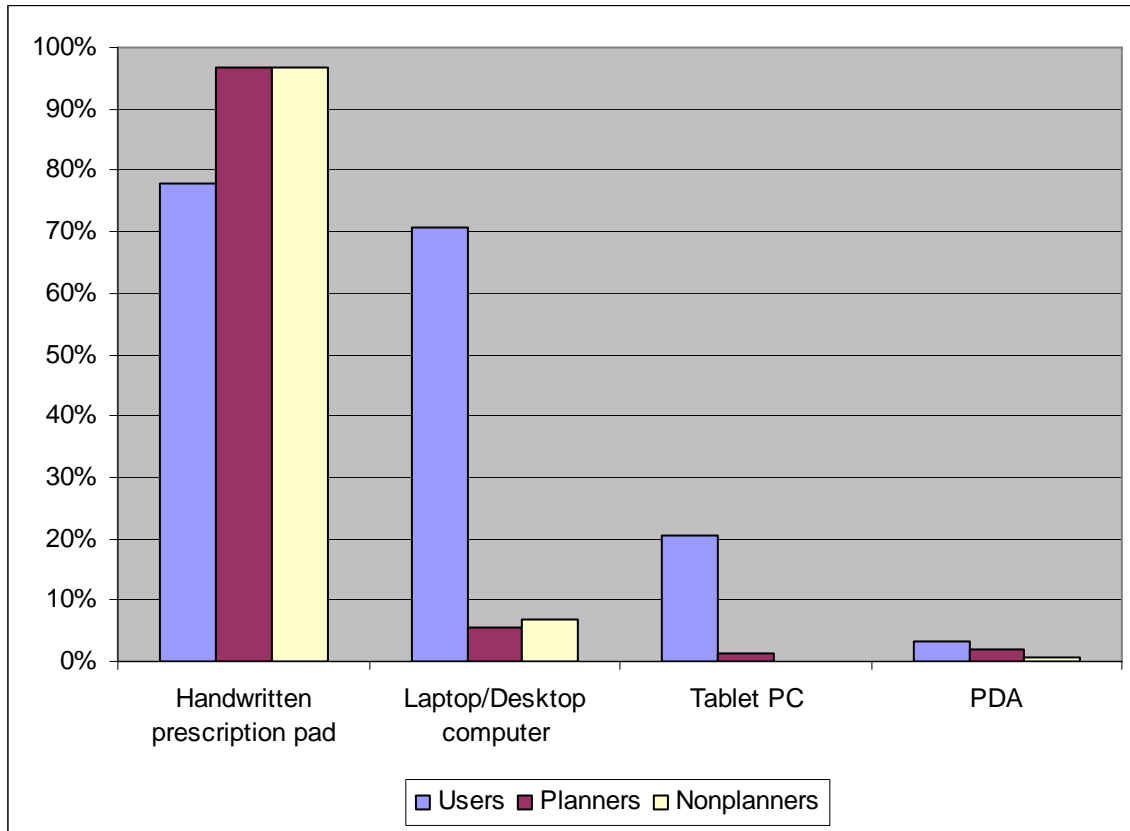


Figure 7 displays physician responses to the method of prescription generation used in their practices. Regardless of EHR implementation stage more than 75% of physicians report that they use handwritten prescription pads. Users are less likely to handwrite prescriptions as compared to planners and nonplanners. 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**

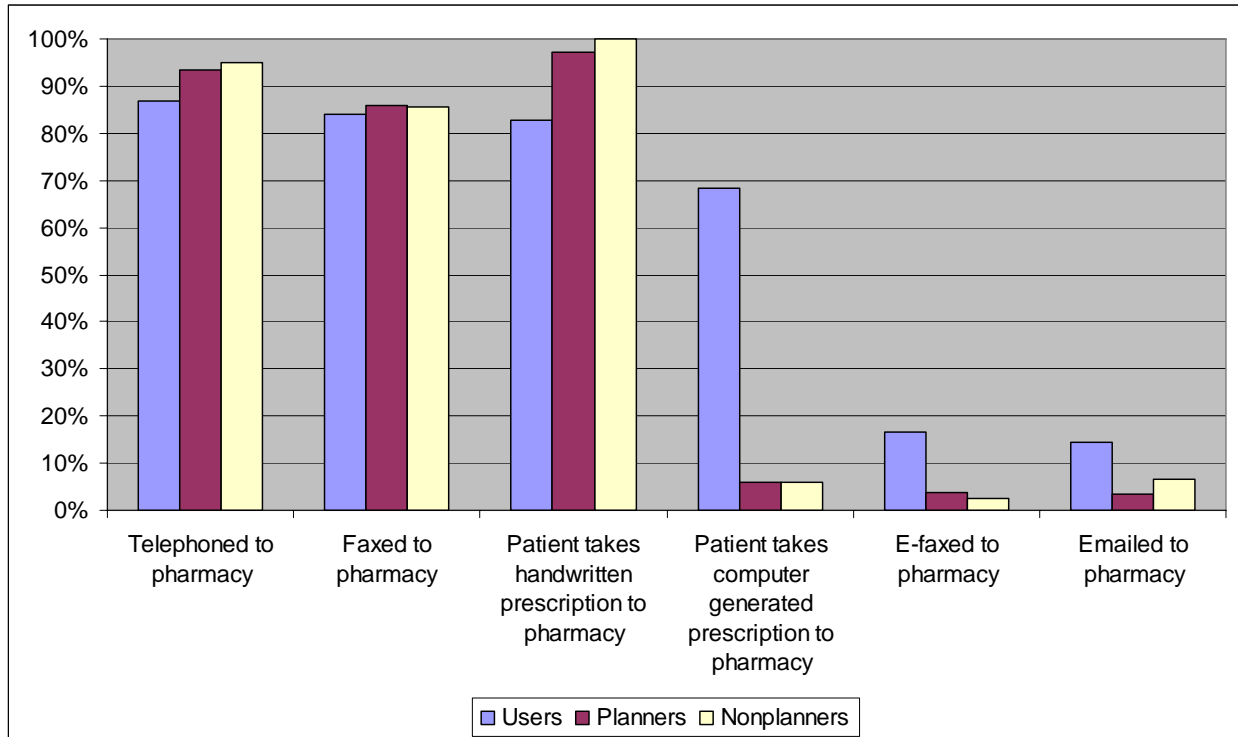


Figure 8 displays the methods that physicians use to deliver or transmit prescriptions to pharmacies. Traditional methods of prescription delivery or transmission to pharmacies predominate. Nearly 70% of EHR users have their patients take a computer-generated prescription to the pharmacy. There is potential 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 have this capability.

**EHR Users and  
EHR Planners**

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

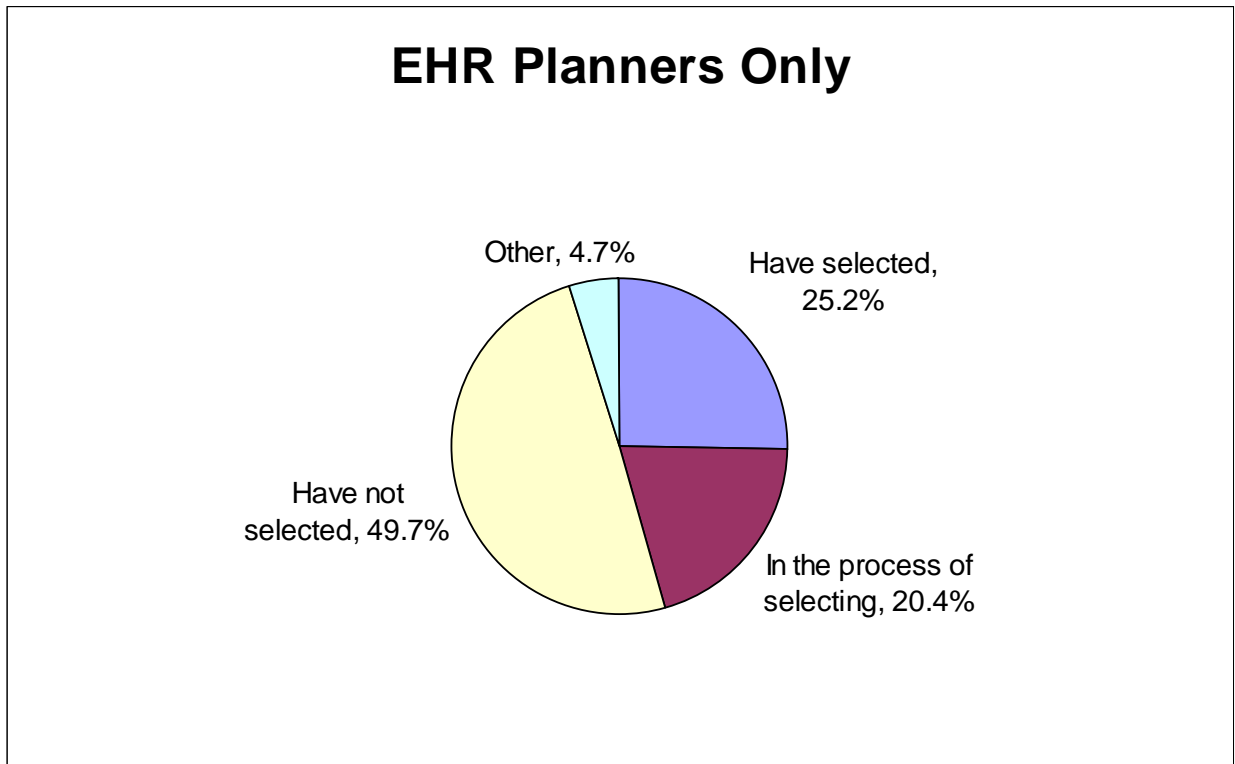


Figure 9 shows the stage of EHR system selection for planners. Almost half of physicians who reported they were planning to implement an EHR system in the future have not yet selected an EHR product.

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

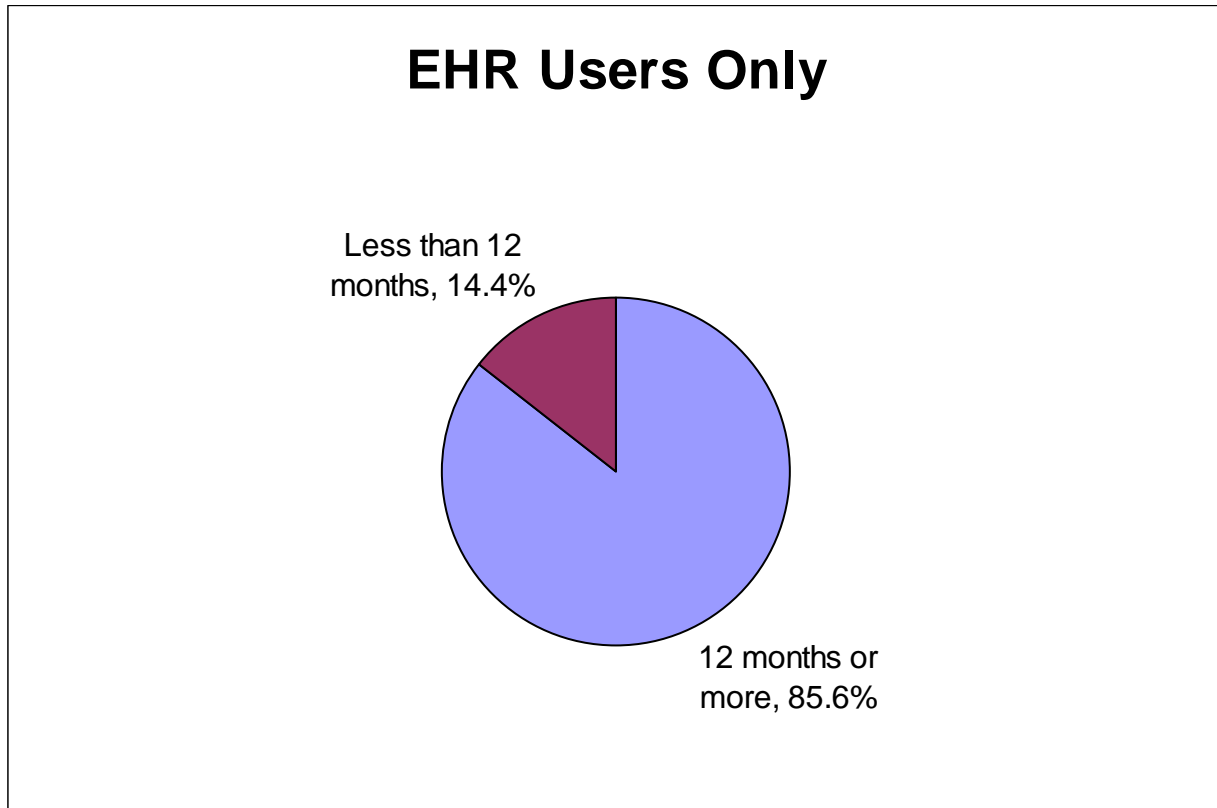


Figure 10 shows that 86% of users have had their EHR for longer than 12 months and 14% of users implemented their EHR in the last year.

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

Clinical Functions	Users <sup>1</sup> n=180 (%)	Planners <sup>2</sup> n=301 (%)
Patient demographics	91.7	92.4
Visit/encounter notes	91.7	92.0
Procedure/operative notes	86.7	89.7
Current medication history	86.1	92.7
Patient medications/prescriptions	85.0	93.0
Past medical history	83.3	93.4
Physical exam/review of systems	81.1	90.7
Presenting complaint	78.9	90.7
Problem lists	78.3	89.0
Receive laboratory results from a reference lab	68.9	92.7
Consult/report from specialists	67.8	83.4
Send orders for prescriptions	67.2	82.4
Drug interaction and contraindication warnings	65.6	81.7
Receive radiology/imaging results electronically	61.1	91.4
Print patient education materials	60.0	78.4
Integration with practice billing system	58.3	79.7
Send orders for tests	57.2	72.1
Immunization tracking	56.7	74.1
Drug reference information	51.7	73.8
Send prescriptions electronically	47.2	82.1
Referrals to specialists	40.6	67.1
Drug formularies	40.0	70.4
Exchange patient data with laboratory	32.8	73.1
Clinical guidelines and protocols	28.3	66.4
Exchange patient data with radiographic imaging facilities	27.2	71.8
Exchange patient data with hospitals	24.4	71.1
Exchange patient data with other physician practices	22.2	71.8
Exchange patient data with pharmacies	20.0	68.1
Public health reporting	10.0	51.8

<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 EHR 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**

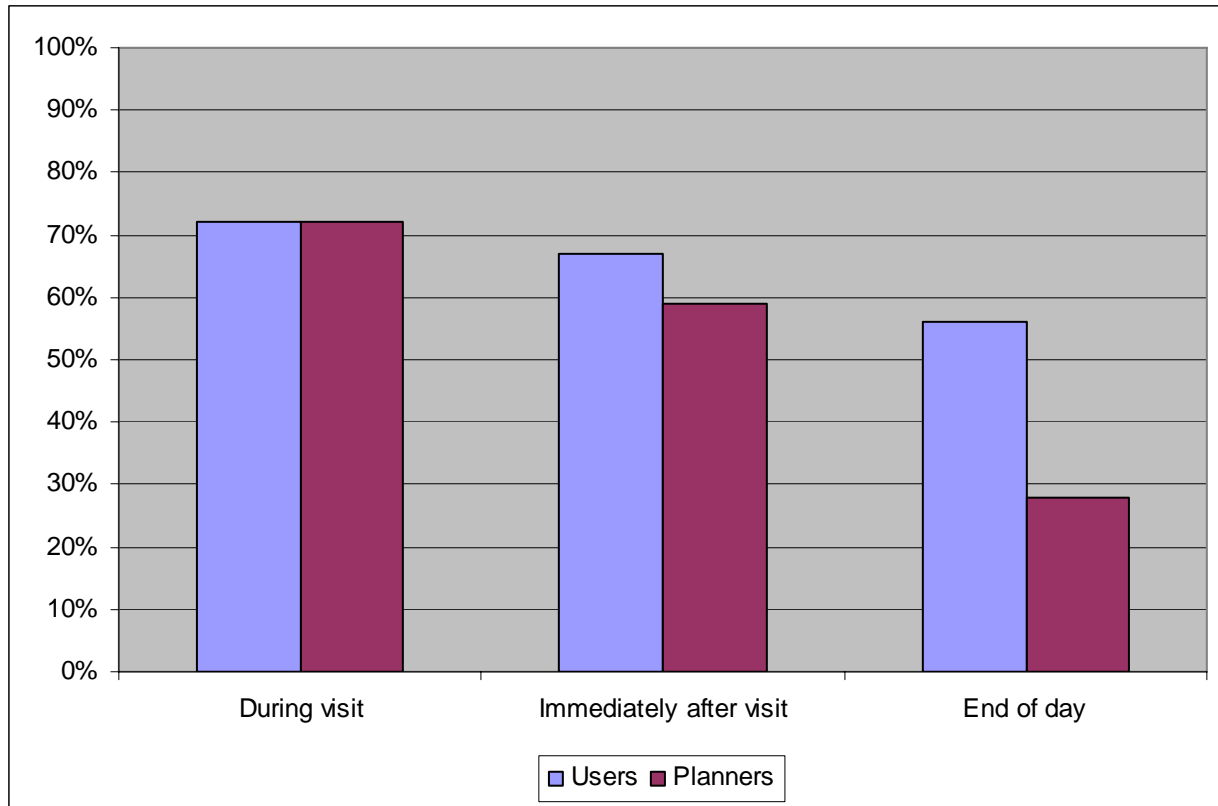


Figure 11 displays the time of day when planners preferred to enter patient data, compared to the time of day that users actually entered patient data. Most planners preferred entering data either during or immediately after a patient visit. Actual users reported entering data into an EHR throughout the day. As planners shift to becoming actual users, expectations about 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: 92.2% have access in their office; 63.3% have access in their home; 62.2% have access in the hospital; and, 4.4% have access in the nursing home.

A large portion of planners (72%) and users (59%) are unfamiliar with Regional Health Information Organizations (RHIO). Less than 10% indicated that 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>

<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-two percent used a participatory process involving everyone in the office; 37% used a vendor installed EHR product and were given a basic overview by the vendor; 31% were trained by an information technology (IT) professional who implemented the EHR product until it worked well; and 10% used an alternative process.

Overall, 86% of users have had their EHR for 12 months or more and 90% consider themselves to be fully operational. These findings were independent of both size and type of system/organization. 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**

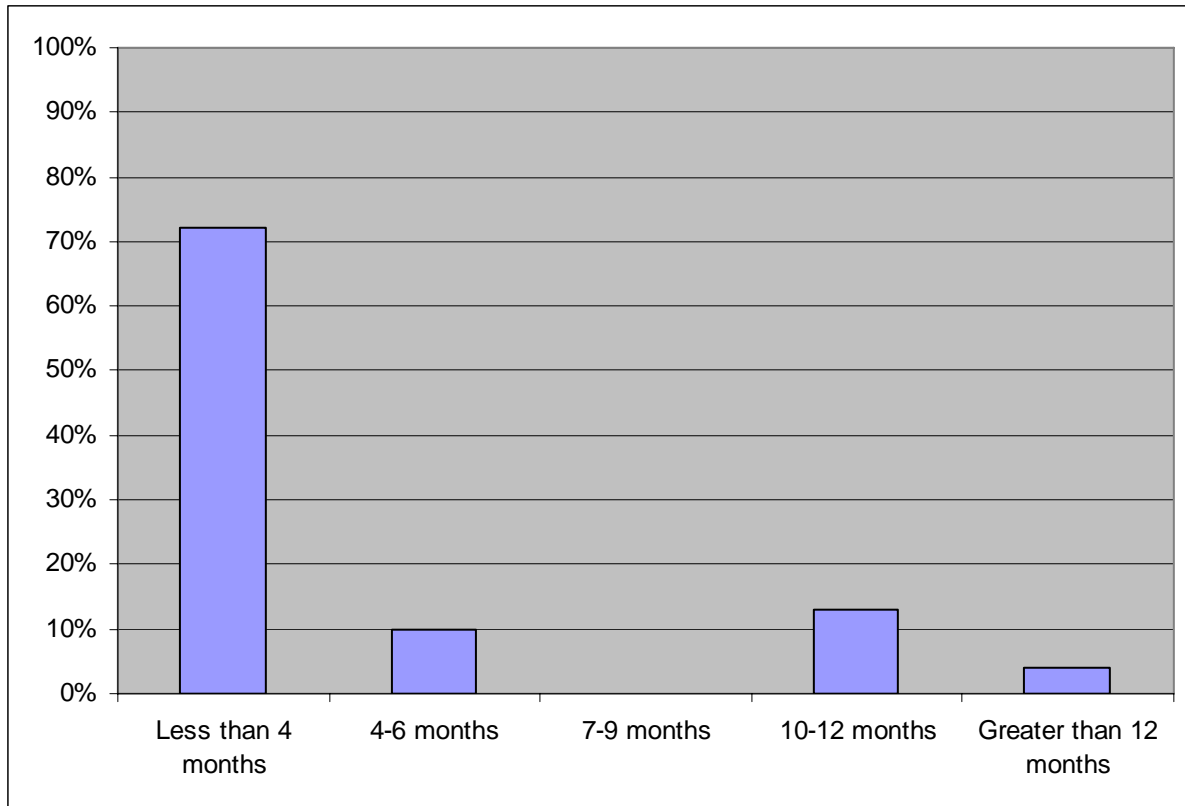


Figure 12 shows the length of time necessary for users to install and operationalize their EHR. Over 70% of users took less than four months to complete this process. It is possible that EHR implementation was staged over a long period of time (i.e. the EHR may have been installed and operationalized with additional functions to be added in the future).

Sixty-eight percent of users were using a billing and scheduling module provided by their EHR vendor. The remaining 32% 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, about half (43%) have interfaced their existing module with their EHR.

## EHR User Recommendations

Seventy-one percent of users would recommend their EHR system to their colleagues. There are currently 40-50 different EHR systems being used in Nebraska.

**Additional  
Considerations for  
EHR Adoption**

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

<b>Critical/Major Barrier</b>	<b>Planners n=301 (%)</b>	<b>Nonplanners n=119 (%)</b>
Start-up financial costs	64.7	77.6
Cannot afford to convert historic medical record data into the EHR	37.2	69.3
Poor return on investment	40.6	66.1
Ongoing financial costs	52.9	64.7
Lack of uniform standards	50.0	58.8
Technical limitations with systems	42.9	57.5
Unable to evaluate, compare and select the appropriate EHR system	38.7	50.9
Lack of technical support	42.0	46.5
Lack of time to acquire knowledge about EHRs	37.8	45.1
Loss of productivity	40.3	44.6
Personal skepticism	22.3	43.9
Colleague skepticism	29.5	39.8
Security and privacy concerns	22.5	32.5
Office staff skepticism	22.8	31.3
Lack of computer skills in the office	16.1	21.1

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

**Figure 13. Average Number of Weekly Outpatient Visits**

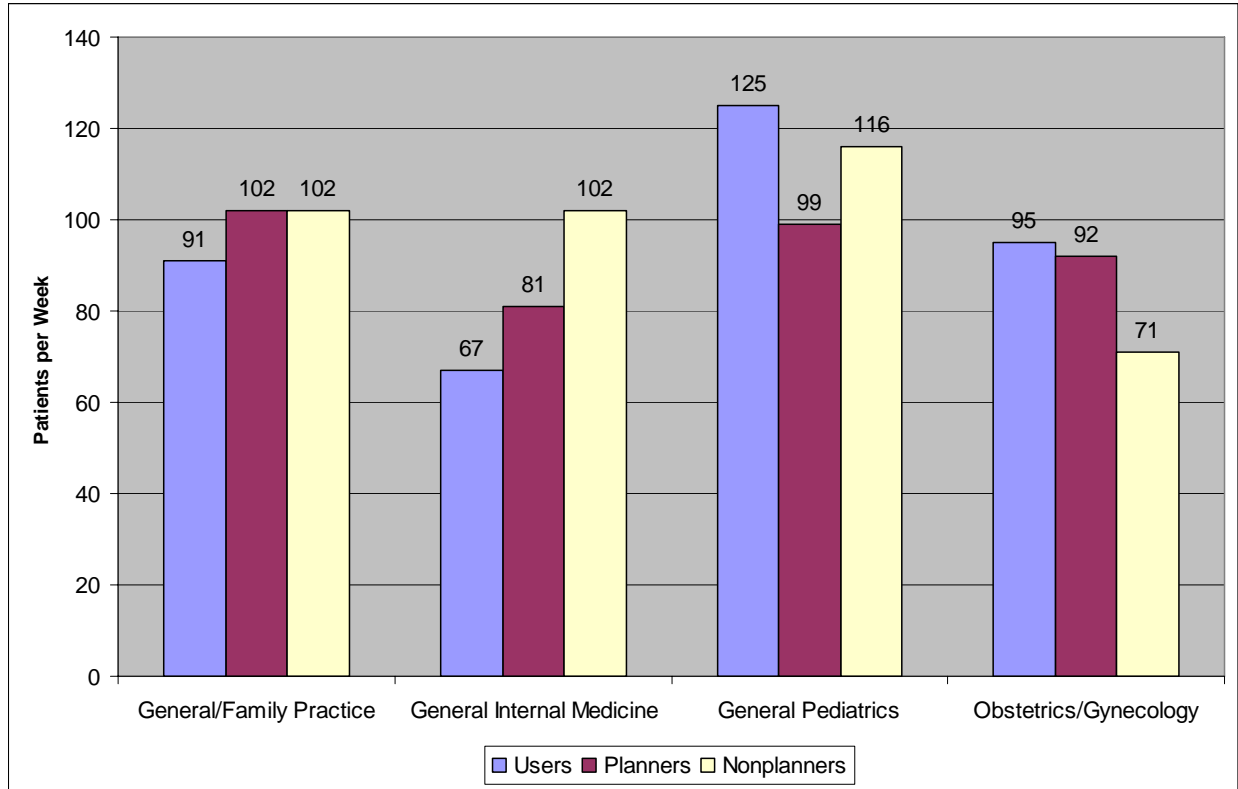
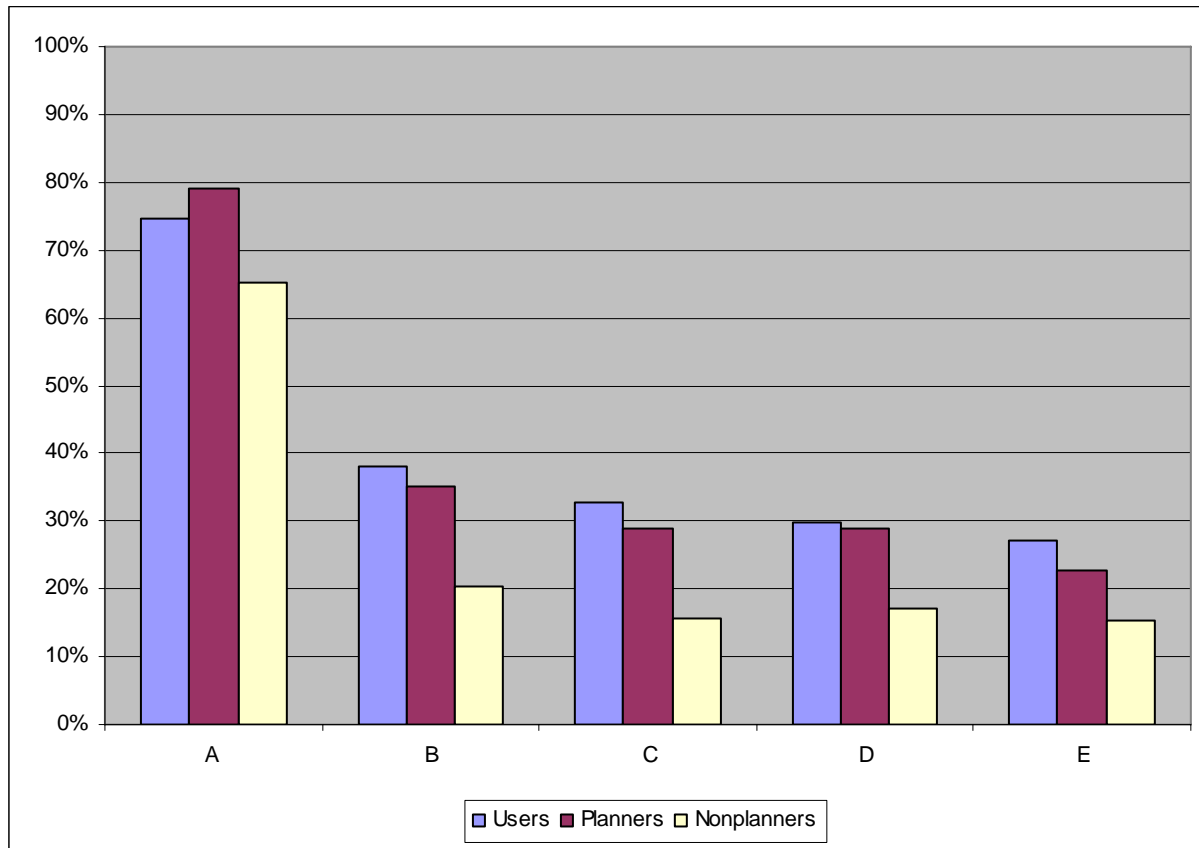


Figure 13 shows the average weekly outpatient visits by primary care physicians. Average visits per week is one indicator of physician workload and productivity. The average number of weekly outpatient visits is lower in general family practice and internal medicine practices that have implemented an EHR. This is in contrast to general pediatrics and obstetrics/gynecology practices where users of EHR reported a higher average number of outpatient visits per week. It may be that an EHR more easily meets the needs of primary care physicians who care for more homogeneous patient populations, such as pediatrics or obstetrics/gynecology. For these physicians, an EHR may facilitate more efficient evaluation and/or documentation of patient care. For more heterogeneous patient populations, such as general family practice or general internal medicine practices, the EHR does not appear to offer the same level of efficiency. More research exploring this aspect of EHR use is needed.

**Figure 14. 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 14 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. It appears that planners and users of EHRs are experiencing and observing more system-of-care related problems than nonplanners. Further exploration is needed.

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

**Figure 15. Location of Desktop Computers**

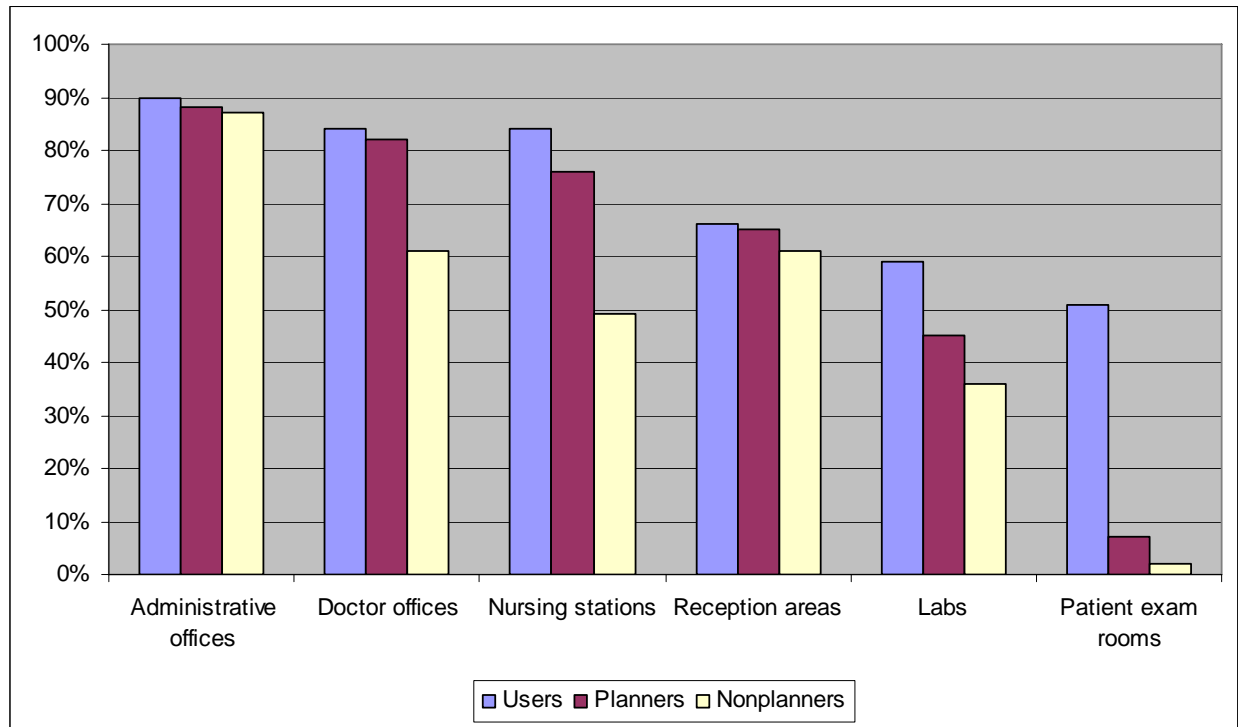


Figure 15 displays the location of desktop computers in physician practices. Most physicians report desktop computers in their administrative offices regardless of stage of EHR adoption. Fewer computers are located in patient exam rooms. However, compared to nonplanners and planners, more EHR users have desktop computers located in patient exam rooms. Adoption of EHR is associated with desktop computers being located in patient exam rooms in practices.

**Figure 16. Internet Access for Providers**

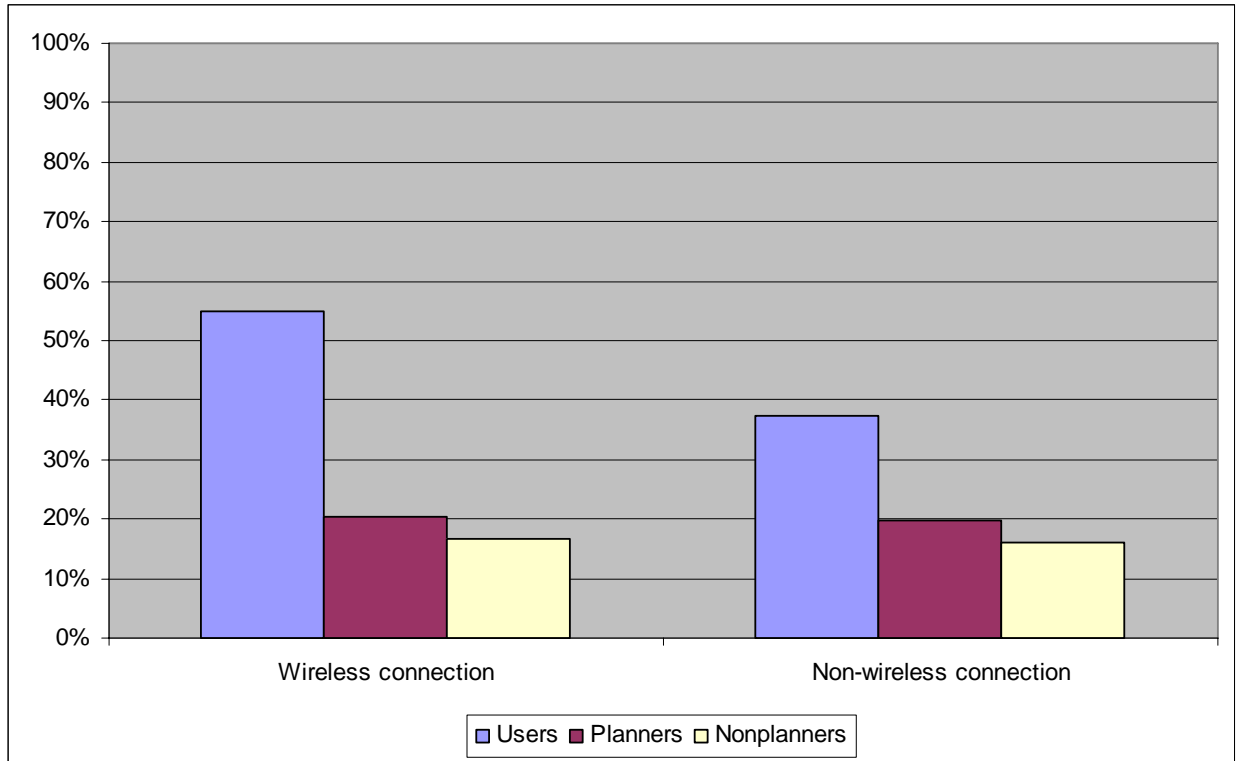


Figure 16 displays providers' access to the internet in their practices. EHR users were likely to have some type of internet access. Wireless access was dominant over non-wireless access when an EHR was being used. Both wireless and wired internet access were equally available for planners and nonplanners.

**Figure 17. EHR Training Approaches**

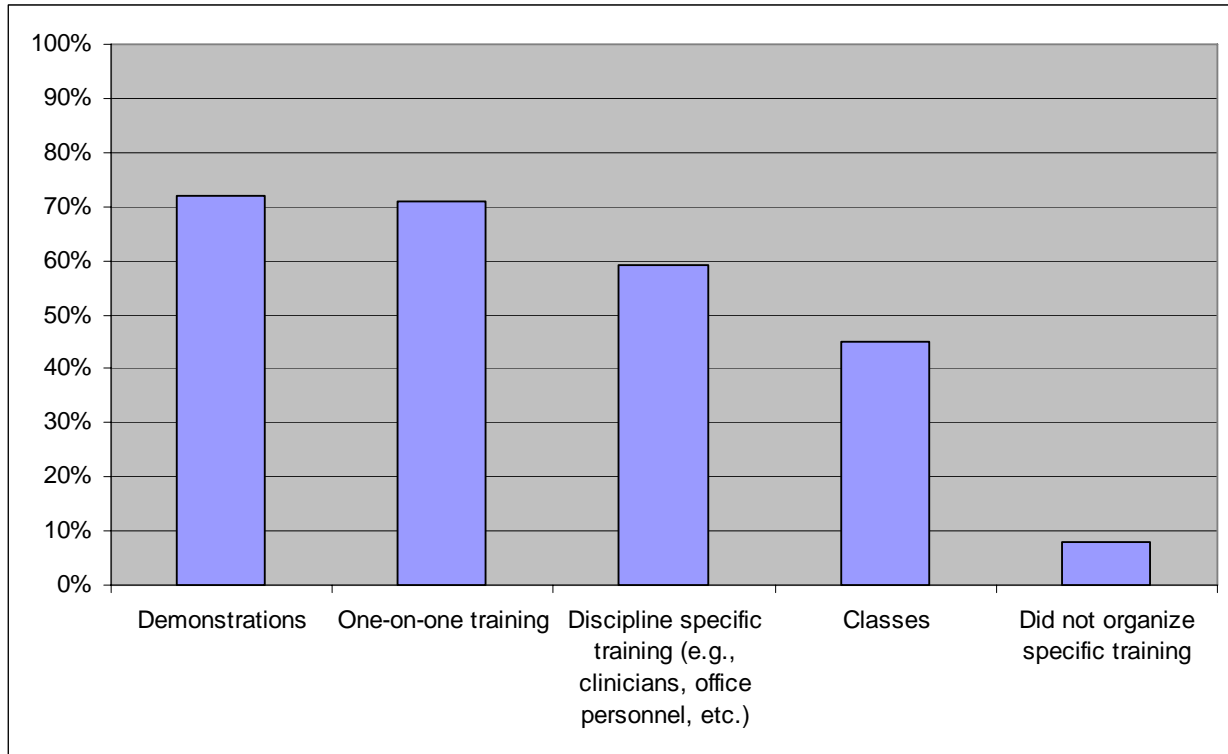


Figure 17 illustrates the various training approaches provided by EHR users to their office professionals and staff. More than 90% offered organized training.

EHR 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 (79% vs. 59%). This disparity suggests that most training is needed in the beginning of EHR implementation.

## Related Support Issues

For 57% of users, no additional staff was hired to support the EHR. Of the 43% of users who hired additional staff, 64% hired 1-3 additional people.

In addition to adequate access, support for HIT use is also important. Results show that EHR users (60.9%) were more likely to have in-house computer and IT support compared to planners (47.7%) and nonplanners (31.9%). Nonplanners (65.5%) were more likely to outsource their computer and IT support compared to planners (48.4%) and users (29.6%).

## 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 Nebraska:
  - EHR Users represent 30% of physicians in office practices
  - EHR Planners represent 50% of physicians in office practices
  - EHR Nonplanners represent 20% 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 functions that are 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 is counterintuitive to expectations that adoption of EHR will lead to improved safety and. One explanation is the existence of interoperability issues that lead to problems in information management and exchange. 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 18, 19, and 20 show counties where physicians reported either using EHR systems, planning to implement EHRs, or having no plans to implement an EHR. The county's shading indicates the number of physicians in each category. These maps are one tool for use in deciding how resources are allocated to facilitate adoption and implementation of EHR systems by Nebraska physicians. When interpreting these maps, we caution that 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 the 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. Non-planning counties often had physicians who also reported being in the other stages of EHR implementation. The larger cities often had physicians in all three categories.

**Figure 18. County Location of Responding Physicians Who Have Implemented EHRs in Their Offices**

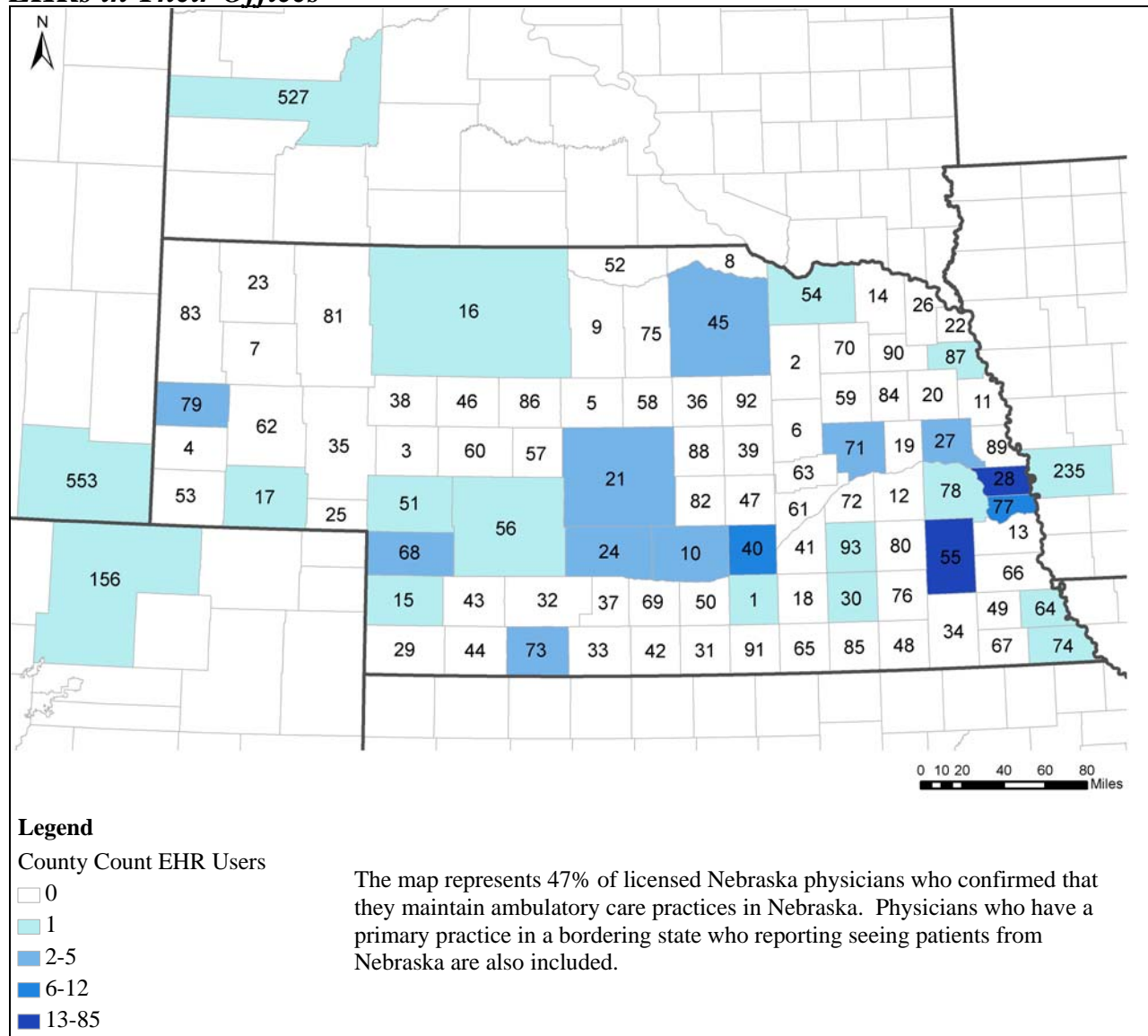


Figure 18 is a map showing the distribution of responding physicians that reported current use of EHRs. While it is noted that only responding physicians are indicated, this map in conjunction with data on the number of physicians per county (see Table 6) gives some idea of the amount of EHR use in each county. Many of these counties also had physicians reporting they were in the planning stage (see Figure 19) of EHR implementation. The counties in the surrounding states that also had Nebraska licensed physicians responding are included in this display.

Cartography: Ted Kasha, Creighton Health Services Research Program <http://chrp.creighton.edu>  
 Updated 2008-02-26

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

**Figure 19. County Location of Responding Physicians Who Plan to Implement EHRs in Their Offices**

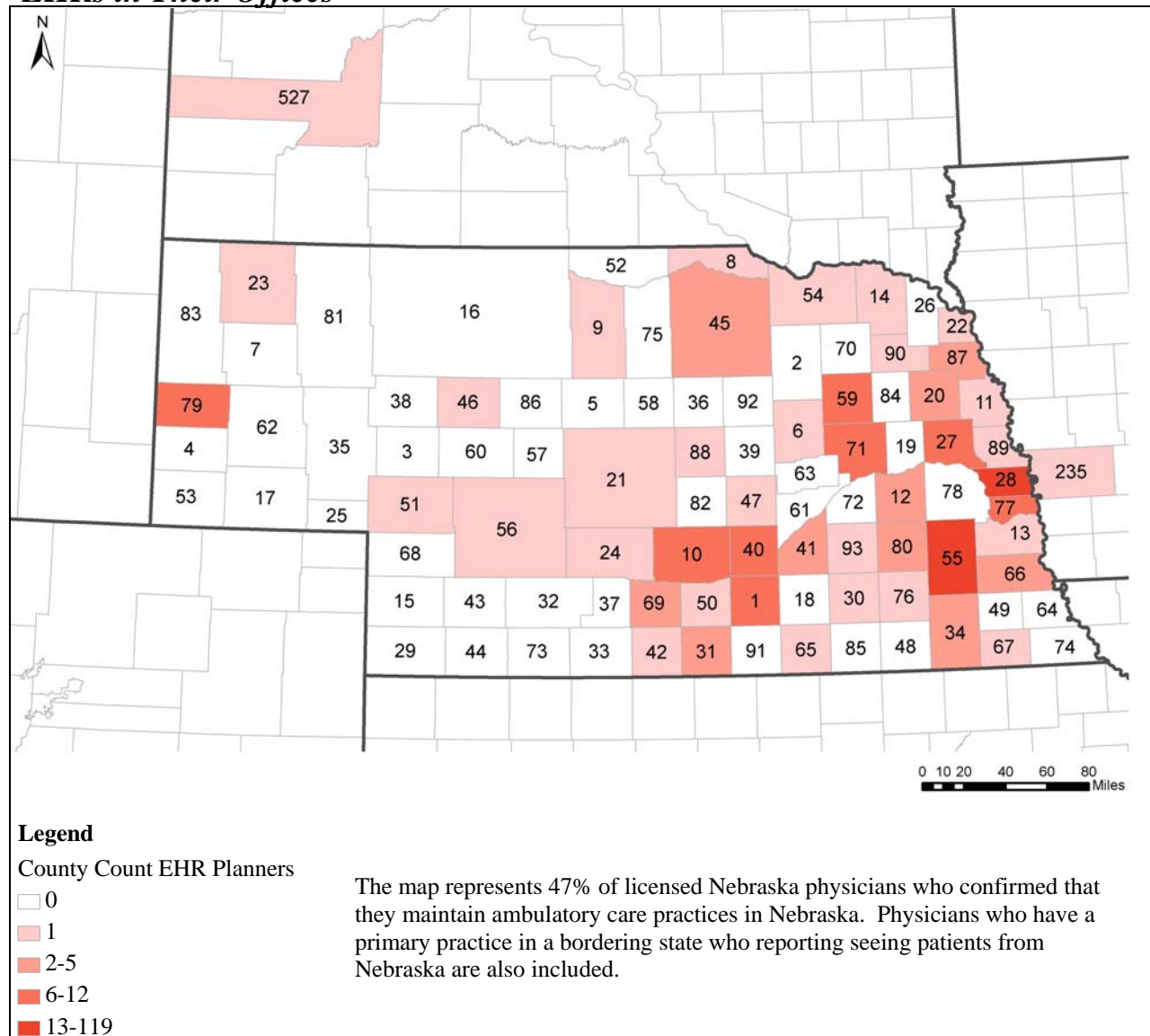


Figure 19 is a map showing the distribution of responding physicians in the planning stage of EHR implementation. Figure 19, in comparison with Figures 18 and 20, has more counties highlighted; indicating there were more reporting physicians in the planning stages. While it is noted that only responding 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 Nebraska licensed physicians responding are included in this display.

Cartography: Ted Kasha, Creighton Health Services Research Program <http://chrp.creighton.edu>  
 Updated 2008-02-26

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

**Figure 20. County Location of Responding Physicians Who Do Not Plan to Implement EHRs in Their Offices**

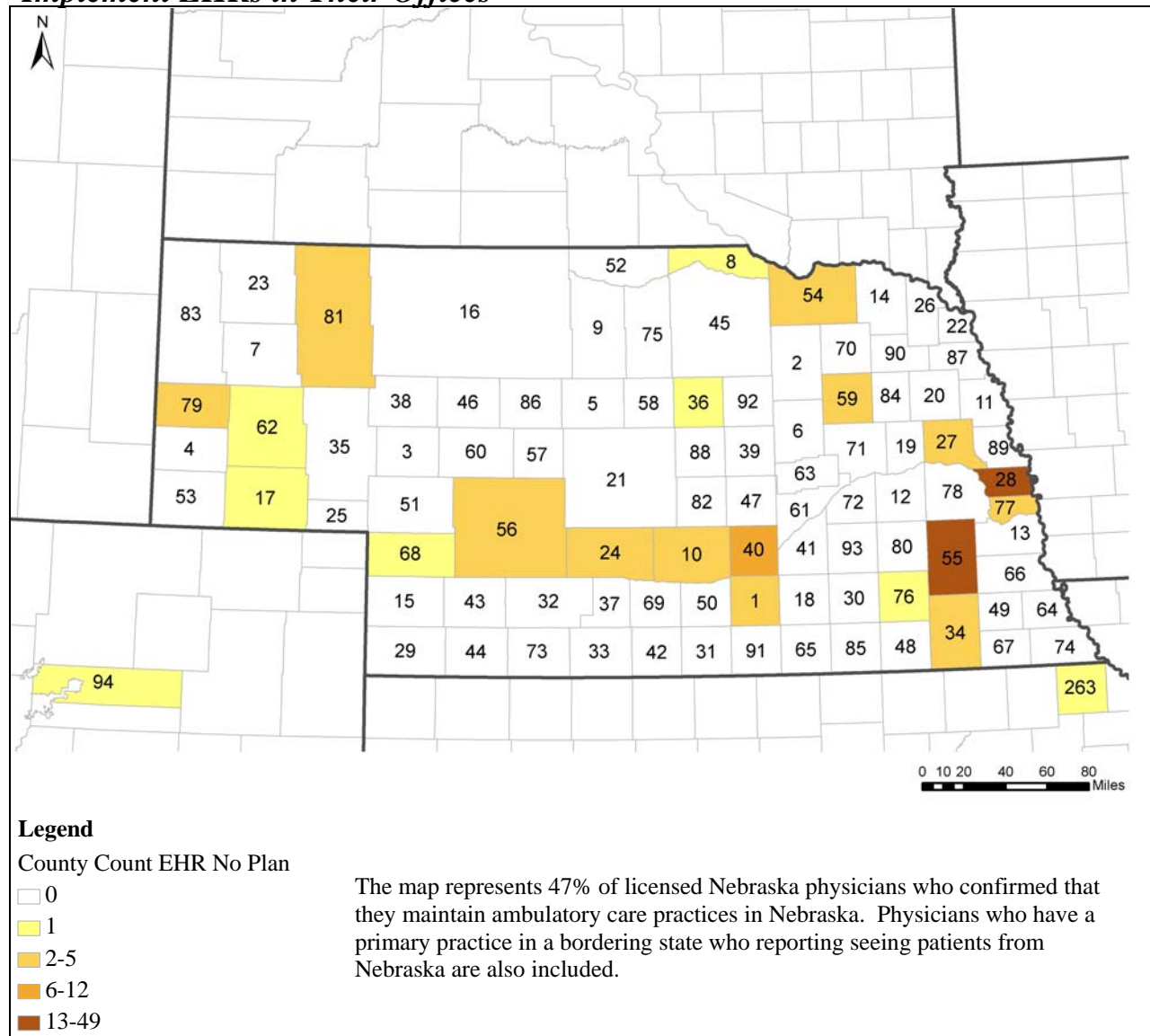


Figure 20 is a map showing the distribution of physicians that had no plans to implement EHRs. This map has the fewest counties highlighted when compared to Figures 18 and 19. Many of these counties also had physicians who reported being in the user and planning stage of EHR implementation. While it 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 Nebraska licensed physicians responding are included in this display.

Cartography: Ted Kasha, Creighton Health Services Research Program <http://chrp.creighton.edu>  
 Updated 2008-02-26

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

**Table 6: Reference Data for Maps**

County Map Reference	Name	Population 2005 <sup>5</sup>	No. of Physicians by County <sup>6</sup>	Physician Response Rate	Users <sup>7</sup>	Planners <sup>7</sup>	Nonplanners <sup>7</sup>
1	Adams	31,084	70	17%	1	6	5
2	Antelope	7,168	4	0%	0	0	0
3	Arthur	395	0	NA	NA	NA	NA
4	Banner	780	0	NA	NA	NA	NA
5	Blaine	569	0	NA	NA	NA	NA
6	Boone	6,185	8	13%	0	1	0
7	Box Butte	11,429	5	0%	0	0	0
8	Boyd	2,273	4	50%	0	1	1
9	Brown	3,356	3	33%	0	1	0
10	Buffalo	44,261	114	18%	4	12	4
11	Burt	7,569	4	25%	0	1	0
12	Butler	8,978	6	33%	0	2	0
13	Cass	25,438	15	7%	0	1	0
14	Cedar	9,295	2	50%	0	1	0
15	Chase	4,111	4	25%	1	0	0
16	Cherry	5,818	5	20%	1	0	0
17	Cheyenne	9,948	7	29%	1	0	1
18	Clay	6,873	1	0%	0	0	0
19	Colfax	10,503	2	0%	0	0	0
20	Cuming	9,984	6	33%	0	2	0
21	Custer	11,405	10	30%	2	1	0
22	Dakota	20,845	5	20%	0	1	0
23	Dawes	8,809	7	14%	0	1	0
24	Dawson	24,755	21	29%	3	1	2
25	Deuel	2,015	1	0%	0	0	0
26	Dixon	6,226	1	0%	0	0	0
27	Dodge	36,290	52	29%	3	8	4
28	Douglas	486,119	1,957	13%	85	119	49
29	Dundy	2,150	1	0%	0	0	0
30	Fillmore	6,358	7	29%	1	1	0
31	Franklin	3,380	2	150%	0	3	0
32	Frontier	2,893	1	0%	0	0	0
33	Furnas	4,989	2	0%	0	0	0
34	Gage	23,699	17	24%	0	2	2
35	Garden	2,192	2	0%	0	0	0
36	Garfield	1,775	2	50%	0	0	1

<sup>5</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>6</sup> Number of Physicians per county; Nebraska Health and Human Services System, Pharmacy Listing, Retrieved December 12, 2006; Limited to State = “NE” and License Status = “Active”, <http://www.hhs.state.ne.us/>; <https://www.nebraska.gov/hhs/lists/>.

<sup>7</sup> Data obtained from *Enhancing Clinical Practices Through the Adoption of Health Information Technology*, Creighton Health Services Research Program (CHRP) and Nebraska Medical Association (NMA).

Status of HIT in Nebraska: Focus on EHRs in Physician Offices

County Map Reference	Name	Population 2005 <sup>5</sup>	No. of Physicians by County <sup>6</sup>	Physician Response Rate	Users <sup>7</sup>	Planners <sup>7</sup>	Nonplanners <sup>7</sup>
37	Gosper	2,083	0	NA	NA	NA	NA
38	Grant	657	0	NA	NA	NA	NA
39	Greeley	2,643	0	NA	NA	NA	NA
40	Hall	54,568	100	19%	6	7	6
41	Hamilton	9,424	8	25%	0	2	0
42	Harlan	3,597	2	50%	0	1	0
43	Hayes	1,103	0	NA	NA	NA	NA
44	Hitchcock	2,957	0	NA	NA	NA	NA
45	Holt	11,078	13	31%	2	2	0
46	Hooker	729	2	50%	0	1	0
47	Howard	6,955	4	25%	0	1	0
48	Jefferson	7,879	5	0%	0	0	0
49	Johnson	4,490	4	0%	0	0	0
50	Kearney	6,796	3	33%	0	1	0
51	Keith	8,805	10	20%	1	1	0
52	Keya Paha	966	0	NA	NA	NA	NA
53	Kimball	4,036	1	0%	0	0	0
54	Knox	9,267	6	83%	1	1	3
55	Lancaster	267,300	656	19%	38	64	24
56	Lincoln	35,181	67	10%	1	1	5
57	Logan	709	0	NA	NA	NA	NA
58	Loup	724	0	NA	NA	NA	NA
59	Madison	35,631	72	17%	0	8	4
60	McPherson	524	0	NA	NA	NA	NA
61	Merrick	8,243	1	0%	0	0	0
62	Morrill	5,498	4	25%	0	0	1
63	Nance	3,775	0	NA	NA	NA	NA
64	Nemaha	7,490	6	17%	1	0	0
65	Nuckolls	4,730	5	20%	0	1	0
66	Otoe	15,833	11	36%	0	4	0
67	Pawnee	2,924	2	50%	0	1	0
68	Perkins	3,071	3	100%	2	0	1
69	Phelps	9,505	10	30%	0	3	0
70	Pierce	7,764	6	0%	0	0	0
71	Platte	31,510	30	37%	2	9	0
72	Polk	5,532	2	0%	0	0	0
73	Red Willow	11,322	13	15%	2	0	0
74	Richardson	9,171	2	50%	1	0	0
75	Rock	1,547	1	0%	0	0	0
76	Saline	14,098	14	14%	0	1	1
77	Sarpy	140,299	178	11%	9	9	2
78	Saunders	20,639	6	17%	1	0	0
79	Scotts Bluff	36,785	86	13%	2	7	2
80	Seward	16,850	12	17%	0	2	0

## Status of HIT in Nebraska: Focus on EHRs in Physician Offices

County Map Reference	Name	Population 2005 <sup>5</sup>	No. of Physicians by County <sup>6</sup>	Physician Response Rate	Users <sup>7</sup>	Planners <sup>7</sup>	Nonplanners <sup>7</sup>
81	Sheridan	5,868	4	50%	0	0	2
82	Sherman	3,100	1	0%	0	0	0
83	Sioux	1,429	0	NA	NA	NA	NA
84	Stanton	6,453	1	0%	0	0	0
85	Thayer	5,811	4	0%	0	0	0
86	Thomas	646	0	NA	NA	NA	NA
87	Thurston	7,390	5	80%	1	3	0
88	Valley	4,587	5	20%	0	1	0
89	Washington	19,656	13	8%	0	1	0
90	Wayne	9,671	6	17%	0	1	0
91	Webster	3,937	2	0%	0	0	0
92	Wheeler	786	0	NA	NA	NA	NA
93	York	14,316	12	17%	1	1	0
94	Adams (Colorado)	410,059	4	25%	0	0	1
156	Weld (Colorado)	231,430	16	6%	1	0	0
235	Pottawattamie (Iowa)	90,396	48	4%	1	1	0
263	Brown (Kansas)	10,450	4	25%	0	0	1
527	Pennington (South Dakota)	92,757	56	4%	1	1	0
553	Laramie (Wyoming)	86,295	24	4%	1	0	0