PHYSICIANS' USE, EXCHANGE, AND EVALUATION OF ELECTRONIC MEDICAL RECORDS

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The Center for Health Information & Research (CHiR) is a multidisciplinary unit under the College of Health Solutions at Arizona State University. CHiR provides comprehensive health care information for Arizona and serves as a community resource and tool for academia and public health. CHiR is directed by George Runger, PhD, who is also Chair of the Department of Biomedical Informatics and Professor in the School of Computing, Informatics, and Decision Systems Engineering. For more information about CHiR's current initiatives as well as downloadable publications, please visit http://chir.asu.edu or email us at chir@asu.edu.

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Table of Contents

Executive Summary

- The percentage of Arizona physicians using electronic medical records (EMRs) increased from approximately 45% in 2007-2009 to approximately 86% in 2013-2015. The current trend suggests that nearly all Arizona physicians will be using EMRs by 2018. The incentives and support provided by Medicare and Medicaid, combined with other influences, have succeeded in increasing EMR adoption, but important obstacles remain.
- Reliance on paper records continues to decrease, but utilization of EMRs as the only medical record has not increased proportionately. Instead, there has been a marked increase in the use of EMRs combined with scanned records. The reliance on scanned records appears to reflect barriers to electronic record transfers among health care organizations.
- The expected benefits of EMRs, such as the avoidance of duplicative tests, require the exchange of information among health care providers. However, among physicians with EMRs, less than 20% (reminders for intervention) to 46% (e-prescribing) of the physicians share the information with others, depending on the type of information being shared.
- The single most important obstacle to the inter-organizational transfer of electronic health information is the shortage of Health Information Exchanges (HIEs). The Health Information Network of Arizona (HINAz) is one such HIE. Although HINAz currently serves only forty-nine participants, it continues to expand.
- This report is the third and the last in the CHiR series to include physician rankings of EMRs by brand. EMRs were ranked on a 1-5 scale where 1=awful and 5=outstanding. Thirty-seven different EMR packages were ranked on each of five criteria.
- Many discussions among HIE professionals suggest that physicians are very dissatisfied with their EMRs. Our results indicate that physicians are at least somewhat positive about their EMRs, ranking them slightly above the midpoint in the 1-5 scale. The more accurate conclusion may be that physicians seek to improve individual elements of their EMRs, but recognize that EMRs offer advantages not available from scanned records or paper medical records.

- We implemented a revised survey instrument in April 2015. The additions include an increased focus on the use of health information exchanges to transfer information among different practices and health care organizations.
- The implementation of the new survey instrument meant that we needed to use the results from 2013-2015 to provide for a full renewal cycle. The results in this report are different from previous reports because the time period overlaps with the 2012-2014 cycle described in the previous report.

Introduction

This is one of a continuing series of reports designed to help the Arizona Health Care Cost Containment System (AHCCCS) and other stakeholders to create strategies to expand the use of Electronic Medical Records (EMRs) and develop regional Health Information Exchanges (HIEs). This report describes patterns of EMR utilization, the extent to which EMR data are exchanged among health care providers, and the values placed on EMRs by users and non-users. This report also distinguishes between physicians who influence decisions to implement EMRs and physicians who are not decision makers. Physicians' evaluations of their EMRs are included for the first time in this series.

It is widely believed that increased use of EMRs will improve the quality of health care and reduce costs (Chaudhry, et al. 2006; Sequist, et al. 2007). That belief led to the creation of the Arizona Health-e Connection and is one of the major objectives of the U.S. Department of Health and Human Services (HHS) Office of the National Coordinator for Health Information Technology's State HIE Cooperative Agreement Grant Program which was awarded in 2010 to the Arizona Governor's Office of Economic Recovery. Funds from this award were sub-awarded and competitively bid to accelerate health information technology adoption and to accelerate clinical information sharing among health care providers.

Background

Studies of EMR utilization have increased since 2005 but most use neither comparable definitions of an EMR nor comparable samples. We summarize several of the better known studies in Appendix A of this report. Additional, but not strictly comparable, information is available from a meta-analysis of national surveys of physician adoption of EMRs between 1994 and 2005. It estimated that, in 2005, approximately 24% of physicians used EMRs, but only 9% of the EMRs in use included functions such as e-prescribing (Jha, Ferris, et al. 2006).

A consistent set of estimates is produced by the National Center for Health Statistics (NCHS) surveys of ambulatory care physicians in office settings. It is important to recognize that the estimates apply to only one segment of the physicians in this study. The exclusions include physicians in federal facilities and a number of specialty practices.

The recent NCHS data show that the percentage of office-based physicians using some form of an EMR increased from 18% in 2001 to 78% in 2013 (Hsiao and Hing 2014). A smaller

percentage (48% in 2013) used EMRs that included functions such as patient summaries, e-prescribing and lab results (Hsiao and Hing 2014).

The predictions that EMRs would improve the quality of care, increase physician productivity and reduce costs have not, however, been fully realized (Kellermann and Jones 2013). This report examines both the trends in the use of EMRs and some of the obstacles to the realization of the full benefits of the EMRs.

The CHiR Survey of Physicians

This report and its predecessors are made possible by an ongoing partnership between the physician licensing boards in Arizona and Arizona State University's Center for Health Information & Research (CHiR). Beginning in 1992, the licensing boards permitted CHiR to add survey questions to license applications from physicians. With few exceptions, the data have been collected continuously since 1992. Previous reports and articles from the survey are listed in Appendix B.

The voluntary survey responses are merged with the licensing data collected by the boards for each physician. The licensing data for non-respondents to the survey permits a rigorous analysis of non-response bias.

The survey questions change over time and among different project sponsors. AHCCCS, an agency of the State of Arizona, has provided financial support for the project since 2009.

Short paper survey forms were used from 1992 through July 2009, greatly restricting the number and complexity of survey questions. The 2007 paper survey consisted, for example, of six questions. The licensing boards converted to electronic applications in 2009, but a large number of physicians continued to use paper surveys and funding was not available to create an electronic survey. (See Appendix C for a copy of the 2007-2011 survey instrument.) Results for the period July 2007 to July 2009 are described in a previous CHiR report (Johnson, Qiu, et al. 2010).

A new electronic survey was implemented in early 2012 with funding from AHCCCS and the Arizona Strategic Enterprise Technology Agency. The electronic survey included a greatly expanded set of questions and a large number of decision trees, including different questions for physicians with Arizona licenses who practice outside the state. Many of the questions on the survey duplicate questions used in national surveys, such as the NCHS and the National

Health and Nutrition Examination Survey (NHANES) surveys, to permit direct comparisons to the national data. A copy of this survey is included in Appendix C. A revised and expanded version of the survey instrument was implemented in April 2015. A copy of this survey is included in Appendix D.

The periods of data collection discussed in this report are:

- 2007-2009 – represents July 17, 2007 to July 17, 2009
- 2009-2011 – represents November 1, 2009 to November 1, 2011
- 2012-2014 – represents March 20, 2012 to March 20, 2014
- 2013-2015 – represents April 1, 2013 to April 1, 2015

The period between November 1, 2011 and March 20, 2012 was used to deploy a new electronic survey. The most recent data in this report are for April 2013 to April 2015. The data, which is unusual for this series of reports, includes a partial overlap with the results presented in the October 2014 report. This was required to obtain a full two year cycle of results. Comparisons with the previous cycle (2012-2014) should be interpreted with this in mind.

Some studies of EMR adoption identify the *number of practices* with EMRs, while this report counts the *number of physicians* with EMRs, as does the NCHS. Estimates of the number of physicians using EMRs is the most direct measure of potential impact on patients, but the number of practices is a more useful measure of the impact on organizations. A 2007 Massachusetts study is a good example of the effects of larger practices on physician counts (Simon, et al. 2007). The study reported that almost half of Massachusetts' physicians used EMRs, but less than one-quarter of practices in Massachusetts had adopted EMRs.

Definitions

Active license: The licensing boards define active physicians as those whose license has not expired or been suspended. Some physicians renew their licenses after retirement or while on leave. The distinction between physicians with an active license and those who are actively practicing medicine is only obtainable from responses to the survey. The true status of physicians who do not respond to the survey is, therefore, unknown. Survey respondents who indicate that they are retired or semi-retired/on leave physicians with active licenses are excluded from our results.

Electronic Medical Record: Physicians were given the opportunity to select any or all of the possible methods of storing their medical records. The specific survey question is:

How does the organization in which you practice store its medical records? (Check all that apply);

a) Paper ☐ Yes ☐ No
b) Scanned images of paper records ☐ Yes ☐ No
c) Electronic files (an electronic version of a patient's medical history, including progress notes, problems, medications and other information used in treatment.) ☐ Yes ☐ No
   i. *{if yes then ask}* What is the name of your EMR/EHR system

Note: Check boxes are provided for more than 21 types of EMRs with an open ended response for others.

This question is much more specific than the question on previous surveys which was thought to be too general, allowing some respondents to mistakenly include billing software as an EMR. The previous question was:

Are patients' medical records in your practice/organization stored as:

a.paper ◯ Yes ◯ No
Scanned images of paper files ◯ Yes ◯ No
Electronic files ◯ Yes (continue) ◯ No (If no, go to question #5)
◯ The records are stored on a PC/server located in my organization
◯ The records are stored on a server to which I connect via the internet
◯ I don't know where they are stored

Therefore, comparisons between the current results and data based on the short survey question may not be strictly comparable.

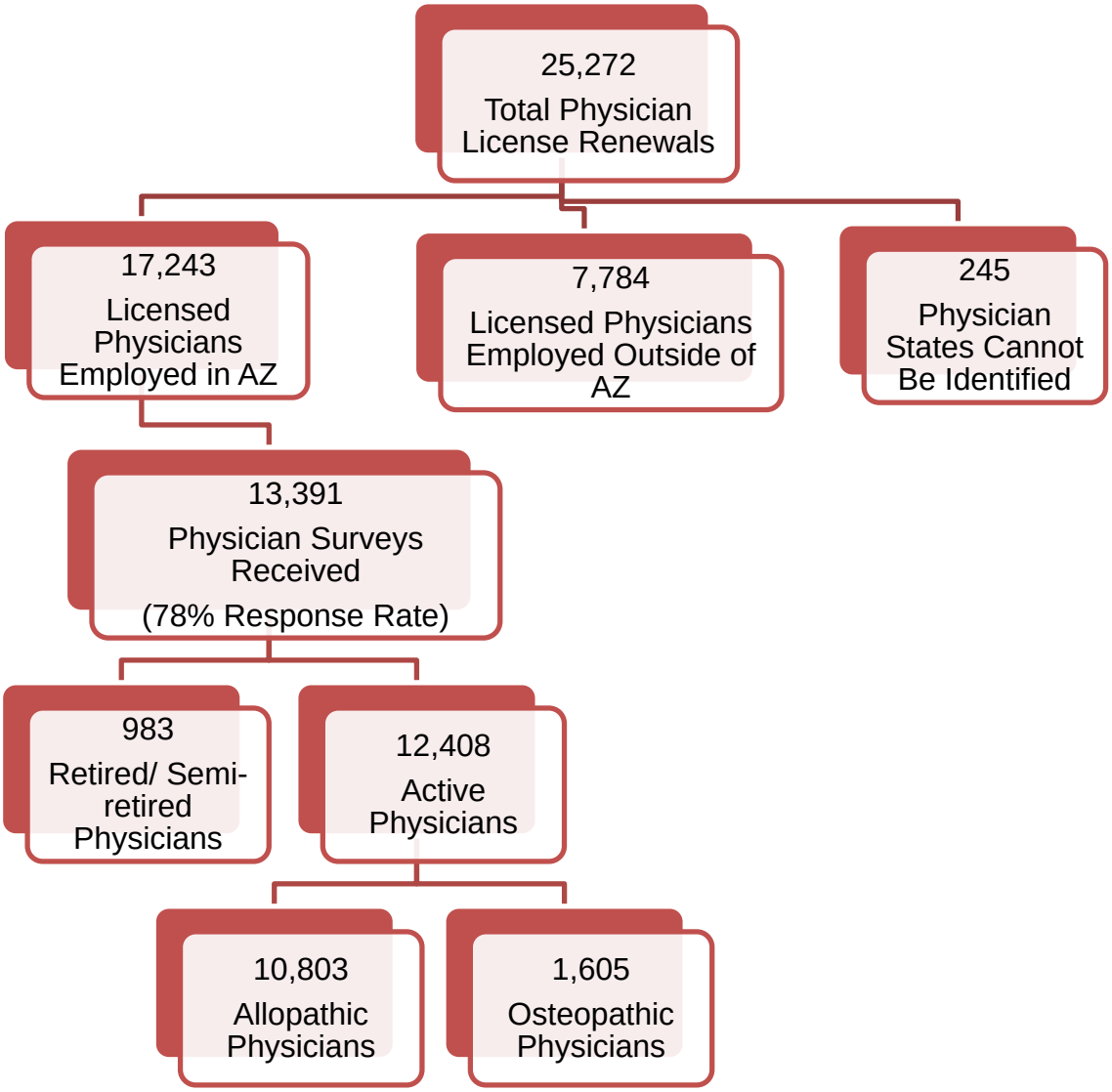
Specialty: Physicians can report more than one specialty to the licensing boards, and they need not be board certified in the reported specialty. We adopt the first specialty reported and do not classify physicians by multiple specialties. *Pediatric Specialties* are defined as pediatricians or physicians practicing a pediatric subspecialty. *Surgical Specialties* are defined to include surgeons or any surgical subspecialty. *Hospital Based Specialties* include critical care medicine, diagnostic imaging and radiology, emergency medicine, hospitalist medicine, infectious disease, neonatology, respiratory care, transport medicine, anesthesiology, intensive care medicine, pathology, nuclear medicine, rehab and occupational medicine, or radiation oncology. *Primary Care is* defined to include family care, general practice, geriatrics, or internal medicine when no other sub-specialty is listed. All other specialties are defined as *Medical Specialties,* including obstetrics and gynecology, following the conventions used by AHCCCS.

Type of Practice: The categories used from 1990-2012 were expanded and revised for the new electronic survey to be more internally consistent. Categories defined in terms of physician activity (e.g. semi-retired; locum tenens) were removed and replaced by categories representing the type of practice/organization in which a physician works. Thus, the type of practice data prior to 2012 is not strictly comparable to the data collected after March 2012.

Survey Sample

The number of physician renewals and survey respondents is described in Figure 1. A total of 25,272 physicians renewed their licenses between April 1, 2013 and April 1, 2015. Allopathic physicians renew their licenses every two years on their birthdays, and osteopathic physicians renew their licenses every other year, so the results represent approximately seventy-eight percent of the physicians in the 2013-2015 renewal cycle. The unusually high response rate from the population of all physicians, rather than a sample, provides a very robust, representative set of results. The renewals included 17,243 physicians who live in Arizona and an additional 7,784 physicians with Arizona licenses who live outside Arizona. There were 245 physicians whose state of residence could not be identified. Survey responses were received from 13,391 physicians living in Arizona. Of those, 12,408 physicians were in active practice. These respondents include 10,803 allopathic physicians and 1,605 osteopathic physicians.

Figure 1. Physician License Renewals, 2013-2015



Source: Arizona Medical Board (AMB), Arizona Board of Osteopathic Examiners (ABOE) Survey and Administrative Data, 2013-2015.

Because all physicians renewing Arizona licenses have the opportunity to complete a survey, the number of respondents is substantially larger than the number obtained from a fractional sample that typically draws respondents from a relatively small percentage of the renewals. If, for example, a five percent sample of the 17,243 renewals had a response rate of 78% then the survey results would include 672 physicians rather than the 13,391 physician respondents represented in our results. Response rates of 60% or more are considered adequate for surveys. The 78% response rate is unusually high. The NCHS survey, for example, used

approximately 3,180 physicians to represent all office practice based physicians in the United States (Jamoom, et al. 2012).

Our very large sample minimizes the need to rely on small numbers of responses to some questions on the survey, and it reduces the variance surrounding estimates. In other words, the results are more certain.

Non-Response Bias

The sample is quite large and the response rate is very high, but the best test of the extent to which a survey represents a population is a comparison of the respondents to the non-respondents. Since we have licensing data on all physicians, we can make that comparison. The "non-respondents" in our comparisons include retired or semi-retired physicians with active licenses. The identification of these physicians is only possible using answers to the survey questions. The inclusion of retired physicians is a much stricter test of response bias than the usual comparisons.

There are a number of statistically significant differences between respondents and all Arizona physicians but, with a few exceptions, the absolute differences are quite small. The proportions for gender distributions remained consistent with the overall for all physicians. Physicians aged 25-34 are significantly underrepresented among the respondents (6.6%) in comparison to non-respondents (12.5%). Similarly, physicians 65+ formed only 13.9% of respondents compared to 21% of the non-respondents. The middle age group; 35-54, however, was over-represented among the respondents, and comprised over 54% of the respondents. Surgical specialists are over-represented. Physicians in rural areas are slightly overrepresented.

Because most of the differences are small, the results are representative of the Physician population, thereby eliminating concerns about non-response bias. The comparisons between respondents and non-respondents for previous years are summarized in Appendix E.

Table 1. Comparison of Respondents to Non-Respondents, 2013-2015

Characteristic	*Respondents (N =13,391)*		*Non-Respondents (N = 3,852)*		*P-Value*
Sex					
Female	3,878	28.9%	1,081	28.0%	NS
Male	9,091	67.8%	2,687	69.6%	NS
Total	12,969	96.8%	3,768	97.7%	
Age Group					
25 - 34	887	6.6%	484	12.5%	<0.01
35 - 44	3,692	27.5%	813	21.0%	<0.01
45 - 54	3,566	26.6%	803	20.8%	<0.01
55 - 64	3,042	22.7%	852	22.0%	NS
65+	1,870	13.9%	813	21.0%	<0.01
Total	13,075	97.5%	3,765	97.6%	
Specialty					
Primary Care	4,730	35.3%	1,405	36.4%	NS
Medical	3,060	22.8%	929	24.0%	NS
Hospital-Based	3,169	23.6%	731	18.9%	<0.01
Pediatric	1,150	8.5%	306	7.9%	NS
Surgical	1,251	9.3%	466	12.0%	<0.01
Total	13,360	99.7%	3,837	99.5%	
Location					
Maricopa County	8,023	59.9%	2,270	58.8%	NS
Pima County	2,325	17.3%	735	19.0%	<0.01
All Other Counties	2,073	92.7%	3,532	91.5%	<0.05
Total	12,041	97.0%	3,532	91.5%	

Source: AMB, ABOE Administrative/Survey Data, 2013-2015. Data include retired and semi-retired physicians.

Note: A p-value of .05 or less implies only a 5% probability of declaring the relationship significant when in fact it is not. NS = no significant difference. Gender was unknown for 422 (3.1%) respondents and 88 (2.2%) non-respondents. Age was unknown for 334 (2.4%) respondents and 90 (2.3%) non-respondents. Specialty was unknown for 31 (0.2%) respondents and 19 (0.4%) non-respondents. Location was unknown for 970 (7.2%) respondents and 324 (8.4%) non-respondents.

One potential source of non-response bias is the fact that physicians in the Veterans Administration (VA) health care system or the Indian Health Service (IHS) are not required to have an Arizona license unless they also practice outside the federal systems.

We tested this possibility in a previous study by comparing the number of physicians working in any government health care system against Health Resources and Services Administration data on VA physicians in Arizona. The results indicated that nearly all the physicians also had Arizona licenses (W. G. Johnson, et al. 2014).

Note: From this point forward, retired and semi-retired/on leave physicians are excluded from all subsequent results in this report.

Physician Characteristics

The licensing board data are available for each of the 17,243 physicians who were employed in Arizona and who renewed their licenses between April 2013 and April 2015. There were 13,391 physicians who responded to the survey. We exclude the retired/semi-retired physicians and focus on the remaining 12,408 physicians. Each survey respondent represents approximately 1.3 physicians in active practice who renewed their licenses in 2013-2015. Except where noted, the results are un-weighted counts and percentages because our primary interest is in the averages, which do not change if weighted, rather than the absolute number of responses.

We measure EMR users as a percentage of all physician respondents actively practicing in Arizona, including some physicians who may not need EMRs because they don't treat patients. The inclusion of physicians who do not need EMRs understates the utilization rates by a small amount given the very low number of physicians not providing direct care. As indicated in Table 2, approximately 92.0% of the physicians provided patient care.

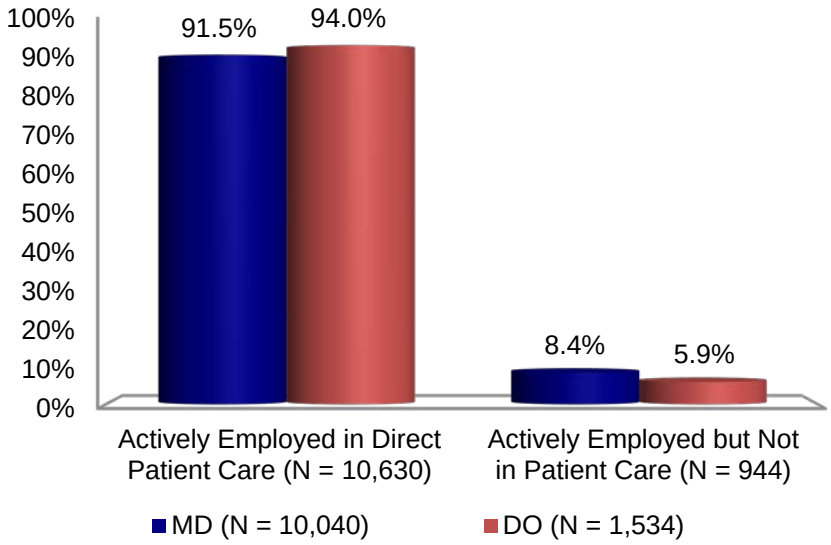
Table 2. Physicians by Employment Status, 2013-2015 (N = 11,574)

Employment Status	*MD*		*DO*		*Total*	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Actively Employed in Direct Patient Care	9,187	91.5%	1,443	94.0%	10,630	91.8%
Actively Employed but Not in Patient Care	853	8.4%	91	5.9%	944	8.1%
Total	10,040	100%	1,534	100%	11,574	100.0%

Source: AMB, ABOE Survey data, 2013-2015.

Note: Employment status was unknown for 834 of physicians.

Figure 2. Physicians Providing Patient Care, 2013-2015



Source: AMB, ABOE Survey data, 2013-2015.

Note: Employment status was unknown for 834 of physicians.

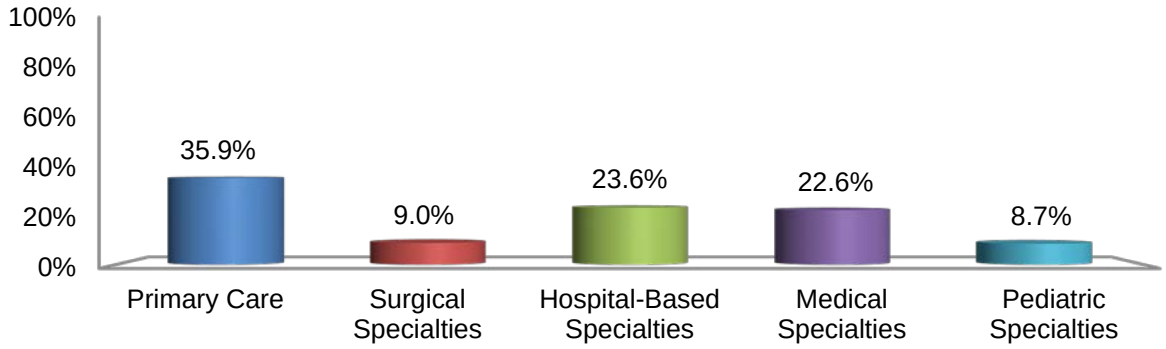
Table 3. Distribution of Practicing Physicians by Specialty, 2013-2015 (N = 12,379)

Specialty Groups	*Total Physicians*	
	N	*%*
Primary Care	4,451	35.9%
Surgical Specialties	1,122	9.0%
Hospital-Based Specialties	2,929	23.6%
Medical Specialties	2,798	22.6%
Pediatric Specialties	1,079	8.7%
Total	12,379	100.0%

Source: AMB, ABOE Survey data, 2013-2015.

Note: Primary specialty reported by physician at the time of licensure. 29 physicians did not report specialty to the medical board.

Figure 3. Distribution of Practicing Physicians by Specialty, 2013-2015 (N = 12,379)



Source: AMB, ABOE Survey data, 2013-2015.

Note: Primary specialty reported by physician at the time of licensure. 29 physicians did not report specialty to the medical board.

Practice Settings

Table 4. Type of Practice by MD and DO, 2013-2015

Type of Practice	*MD*	*DO*	*Total*
Physician Owned Solo Practice	1,510 (16.0%)	233 (15.9%)	1,743 (16.0%)
Physician Owned Group Practice	3,034 (32.2%)	473 (32.3%)	3,507 (32.2%)
Hospital/Medical School Group Practice	1,605 (17.0%)	261 (17.8%)	1,866 (17.1%)
Community or Rural Health Center	483 (5.1%)	91 (6.2%)	574 (5.2%)
Federal Government Hospital or Clinic	445 (4.7%)	58 (3.9%)	503 (4.6%)
Private Hospital System	849 (9.0%)	126 (8.6%)	975 (8.9%)
Non-Hospital Private Outpatient Facility	379 (4.0%)	79 (5.3%)	458 (4.2%)
Medical School/University Research Center	442 (4.6%)	53 (3.6%)	495 (4.5%)
Health Insurer/Health Related Organization that does not provide care	166 (1.7%)	22 (1.5%)	188 (1.7%)
City, State or County Clinic or Hospital System	122 (1.2%)	18 (1.2%)	140 (1.2%)
Other	376 (3.9%)	50 (3.4%)	426 (3.9%)
Hospice or SNF	12 (0.1%)	4 (0.2%)	16 (0.1%)
Independent Contractor	21(0.2%)	3 (0.2%)	24 (0.2%)
Medical Consultant	14 (0.1%)	1 (0.0%)	15 (0.1%)
Mental/Behavioral Health	2 (0.0%)	1 (0.0%)	3 (0.0%)
Total	9,411 (86.5%)	1,464 (13.4%)	10,875 (100.0%)

Source: AMB, ABOE Survey Data, 2013-2015.

Note: 1,533 physicians did not report type of practice (missing). Percentages are based on responses. The five practice types listed under the "Other" section are a subset of the total types included in the Other category.

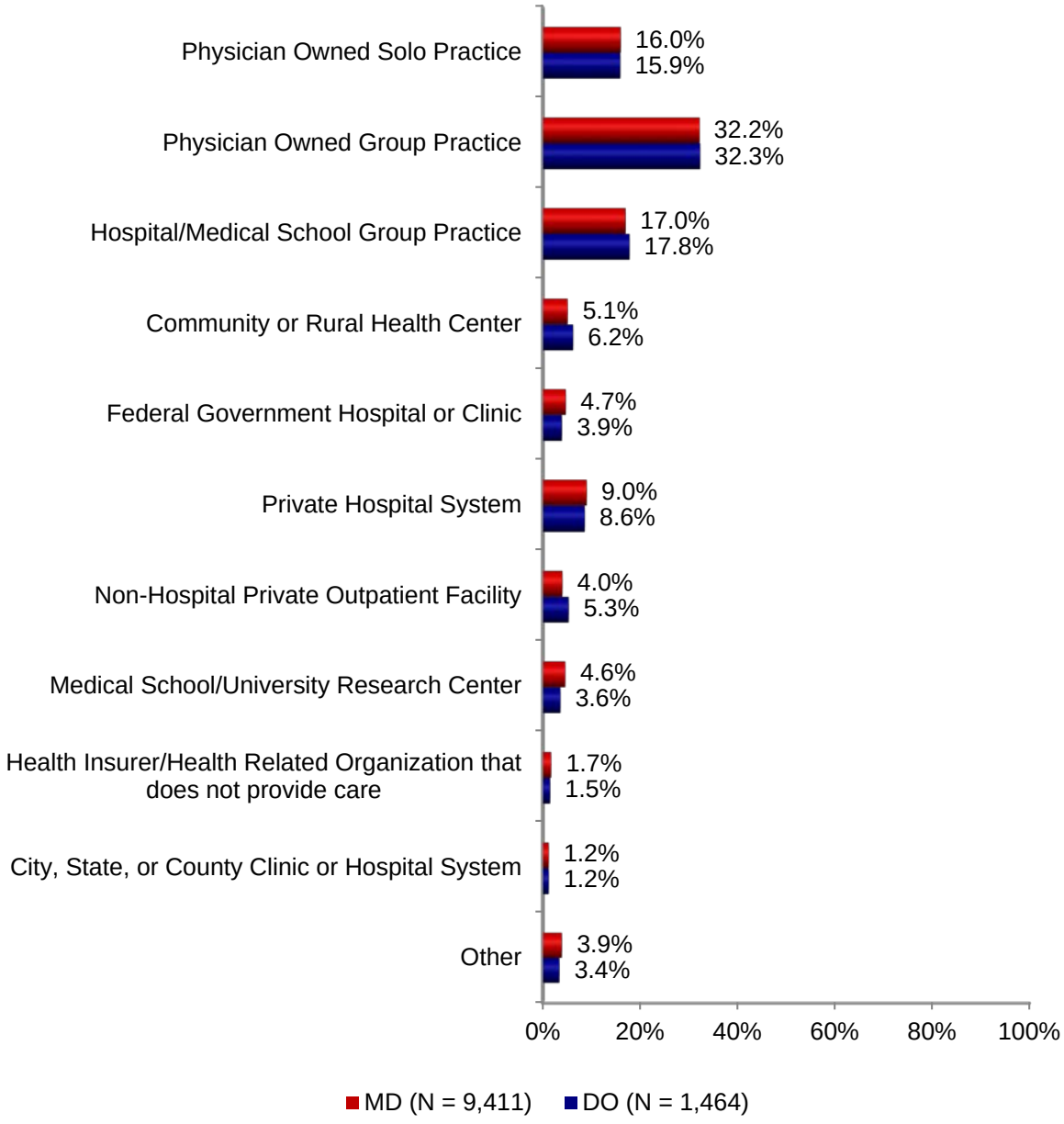
Table 4 shows the distribution of physicians by type of practice. More than 32% of physicians work in physician owned group practices, followed by 17% of physicians in hospital or medical school owned group practices. Physicians in solo practices accounted for an additional 16% of the physicians. In total, approximately two-thirds of Arizona physicians work in solo or group practices. Physicians were rather thinly distributed among the other practice types.

The prevalence of solo practice is declining in Arizona, in part due to acquisitions of practices by hospital systems. The percentage of physicians in solo practice dropped from 24% in 2007-

2009 to 16% in 2013-2015. Solo practice physicians are, all else equal, much less likely to adopt EMRs than are physicians in other practice settings. All else equal, utilization rates of EMRs will continue to increase as the percentage of physicians in solo practice declines.

There are few differences in the distribution of MDs and DOs by type of practice. Medical schools and federal government hospitals are the exception where MDs are somewhat more likely than DOs to be employed; however, the difference has narrowed over time. Should the expansion of osteopathic medical schools in Arizona continue, then it is likely that the differences between MDs and DOs in that category will further narrow.

Figure 4. Type of Practice by MD and DO, 2013-2015



Source: AMB, ABOE Survey data, 2013-2015.

Note: 1,533 Physicians did not report type of practice (missing). Percentages are based on responses.

Table 5. Type of Practice by Number of MDs, 2013-2015 (N = 4,792)

Type of Practice	*Number of Physicians*				*Total*
	2-5	*6-50*	*51-94*	*95+*	
Physician Owned Group Practice	1,028 82.3%	1,219 61.7%	137 44.9%	322 25.4%	2,706 56.4%
Hospital/Medical School Group Practice	65 5.2%	413 20.9%	85 27.8%	843 66.7%	1,406 29.3%
Community or Rural Health Center	69 5.5%	239 12.1%	62 20.3%	46 3.6%	416 8.6%
Non-Hospital Private Outpatient Facility	87 6.9%	104 5.2%	21 6.8%	52 4.1%	264 5.5%
Total	1,249 26.0%	1,975 41.2%	305 6.3%	1,263 26.3%	4,792 100.0%

Source: AMB, ABOE Survey data, 2013-2015.

Note: 1,392 MD's did not report practice type, and 2,311 MD's did not report the number of physicians in their practice for the above practice types.

Table 6. Type of Practice by Number of DOs, 2013-2015 (N = 793)

Type of Practice	*Number of Physicians*				*Total*
	2-5	*6-50*	*51-94*	*95+*	
Physician Owned Group Practice	162 73.9%	179 46.7%	29 43.2%	40 32.2%	410 51.7%
Hospital/Medical School Group Practice	15 6.8%	124 32.3%	26 38.8%	72 58.0%	237 29.8%
Community or Rural Health Center	19 8.6%	54 14.0%	9 13.4%	5 4.0%	87 10.9%
Non-Hospital Private Outpatient Facility	23 10.5%	26 6.7%	3 4.4%	7 5.6%	59 7.4%
Total	219 27.6%	383 48.2%	67 8.4%	124 15.6%	793 100.0%

Source: AMB, ABOE Survey data, 2013-2015.

Note: 141 DO's did not report practice type, and 283 DO's did not report the number of physicians in their practice for the above practice types.

Communication in Practice Environments

The survey asks physicians about the methods of communication and billing in their practices. The results are shown in the next two tables.

Table 7. Methods of Communication by Renewal Period, 2007-2015

Method	*2013-2015 N = 10,156*		*2012-2014 N = 10,587*		*2009-2011 N = 11,100*		*2007-2009 N = 6,699*	
	Number	*%*	*Number*	*%*	*Number*	*%*	*Number*	*%*
Email	9,452	93.0%	9,741	92.0%	9,634	86.7%	5,530	82.5%
Internet	9,628	94.8%	9,933	93.8%	9,947	89.6%	5,702	85.1%
Fax	9,949	97.9%	10,360	97.8%	10,365	93.4%	6,273	93.6%
Medifax	NA	NA	NA	NA	869	7.8%	536	8.0%

Source: AMB, ABOE Survey Data, 2007-2009, 2009-2011, 2012-2014, 2013-2015.

Note: Categories are not mutually exclusive. 78 physicians did not respond to this question 2007-2009; 1,081 physicians did not respond 2009-2011; 2,370 physicians did not respond 2012-2014; 2,252 physicians did not respond 2013-2015. Medifax was removed as a method of communication prior to the 2012 results.

A surprisingly large number of physicians lacked access to the internet or email in the early years of the survey. As recently as 2007-2009, nearly 15% of the physicians practicing in Arizona did not have internet access. The rapid increases in internet access shown in Table 7 remove an important obstacle to the exchange of EMR information. Given the very high levels of access, we will discontinue publication of these results in the future.

Characteristics of EMR Users

The 2012-2015 survey expanded the set of questions on the types of practices in which physicians are employed (Table 8). The results, with the exception of solo practice, are not strictly comparable to the estimates from previous years.

The fact that solo practitioners have the lowest rates of EMR utilization relative to other practice types occurs in our previous surveys and in national studies. In absolute terms, however, EMR use by solo practitioners is rapidly increasing in Arizona. The utilization rate among solo practitioners increased from approximately 26% in 2007-2009 to approximately 63% in 2013-2015. The most recent rate is substantially higher than the NCHS estimate of 29% of all office based physicians in solo practice (Jamoom, et al. 2012). The national average is for a slightly

earlier period (2011) and national averages are not representative of any particular state, but the difference is quite large and deserves additional investigation.

The highest utilization rate is now in hospital/medical school group practices, followed closely by community health centers and federal health systems. Physicians in community health centers have essentially as high a utilization rate as those in medical school practices, presumably reflecting the effects of a number of federal and state incentive programs directed to community health centers and to rural areas.

Table 8. EMR Utilization by Type of Practice, 2013-2015 (N = 8,933)

Type of Practice	*Utilization Rates*
Physician Owned Solo Practice	62.9%
Physician Owned Group Practice	86.5%
Hospital/Medical School Group Practice	96.8%
Community or Rural Health Center	96.6%
Federal Government Hospital or Clinic	96.5%
Private Hospital System	92.7%
Non-Hospital Private Outpatient Facility	83.2%
Medical School/University Research Center	92.8%
Health Insurer/Health Related Organization that does not provide care	48.0%
City, State or County Clinic or Hospital System	82.3%
Other	78.2%
Hospice or SNF	81.2%
Independent Contractor	68.1%
Medical Consultant	70.0%
Mental/Behavioral Health	100.0%

Source: AMB, ABOE Survey Data, 2013-2015.

Note: Rates = % of physicians within each practice type. 1,533 respondents were missing type of practice. 1,978 respondents were missing either variable.

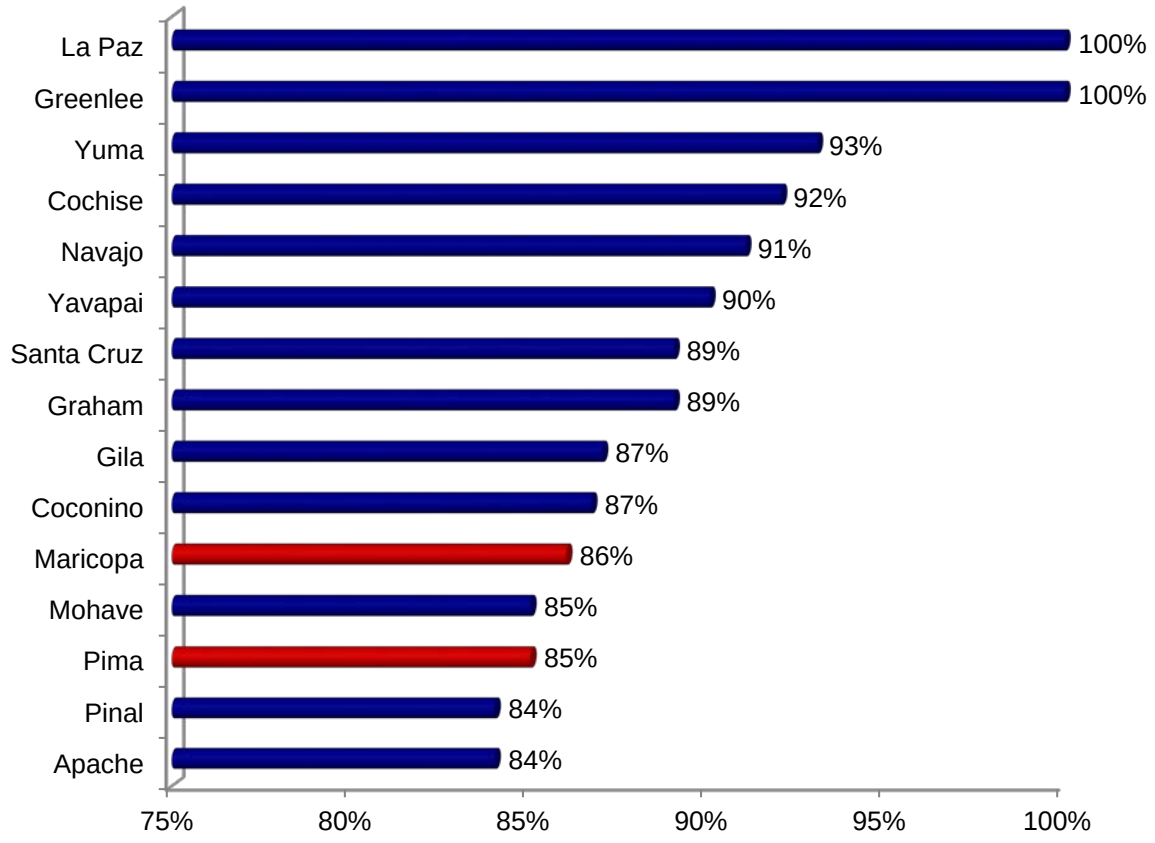
The distribution of EMR users by County is described in Figure 5. We characterize Maricopa and Pima counties as urban areas because they include the largest metropolitan areas in

Arizona. However, both counties are quite large and both include areas where population density is quite low.

The percentage of physicians who use EMRs ranges from 84% in Apache and Pinal counties to 100% in Greenlee and La Paz counties. The number of practicing physicians ranges from 1 (Greenlee) to 5,686 (Maricopa).

The utilization rate in Maricopa County is the fifth lowest in the state. The relatively high adoption rates in many of the rural counties is likely the result of aggressive campaigns, including financial incentives, that have been directed to rural health care providers by the Centers for Medicare and Medicaid Services (CMS) and the State of Arizona.

Figure 5. EMR Utilization by County 2013-2015 (N = 9,877)



Source: AMB, ABOE Survey Data, 2013-2015.

Note: Approximately 1,954 respondents did not identify a method of storing medical records and 577 did not identify their county.

Pima and Maricopa Counties (red) represent the urban areas. All other counties in blue represent the rural areas.

The Utilization of Electronic Medical Records

Trends in the utilization of EMRs are described in Table 9. A serious problem with the new reporting software for the survey in 2009-2011 required the application of utilization rates from the paper surveys to the electronic survey data. The paper surveys represented a substantial portion of the total responses in that time period, but the potential agreement between the paper and electronic results could not be validated. The overall results for that period can be interpreted with a reasonable level of confidence, but the results for some individual characteristics are subject to uncertainty. The most directly comparable results are between 2007-2009 and 2013-2015.

Table 9. Methods of Storing Medical Records by Renewal Period

Method	*2013-2015 N = 10,369*		*2012-2014 N = 10,780*		*2009-2011 N = 2,137; W = 8,996*		*2007-2009 N = 6,387*	
	Number Yes	*% of total*	*Number Yes*	*% of total*	*Weighted Yes*	*% of total*	*Number Yes*	*% of total*
Paper Files Only	807	7.7%	1,229	11.4%	3,140	37.3%	2,911	45.6%
EMR Only	1,602	15.4%	1,510	14.0%	1,565	17.4%	859	13.4%
Scanned Images Only	164	1.5%	194	1.7%	204	2.3%	205	3.2%
Paper + Scanned Images Only	444	4.2%	592	5.4%	404	4.5 %	393	6.2%
EMR + Paper Only	276	2.6%	335	3.1%	559	6.2%	484	7.6%
EMR + Scanned Images Only	3,709	35.7%	3,525	32.6%	1,411	15.7%	742	11.6%
Paper + Scanned Images + EMR	3,367	32.4%	3,395	31.4%	1,126	12.5%	793	12.4%
EMR alone or in combination*	8,954	86.3%	8,765	81.3%	4,700	52.3%	2,878	45.1%

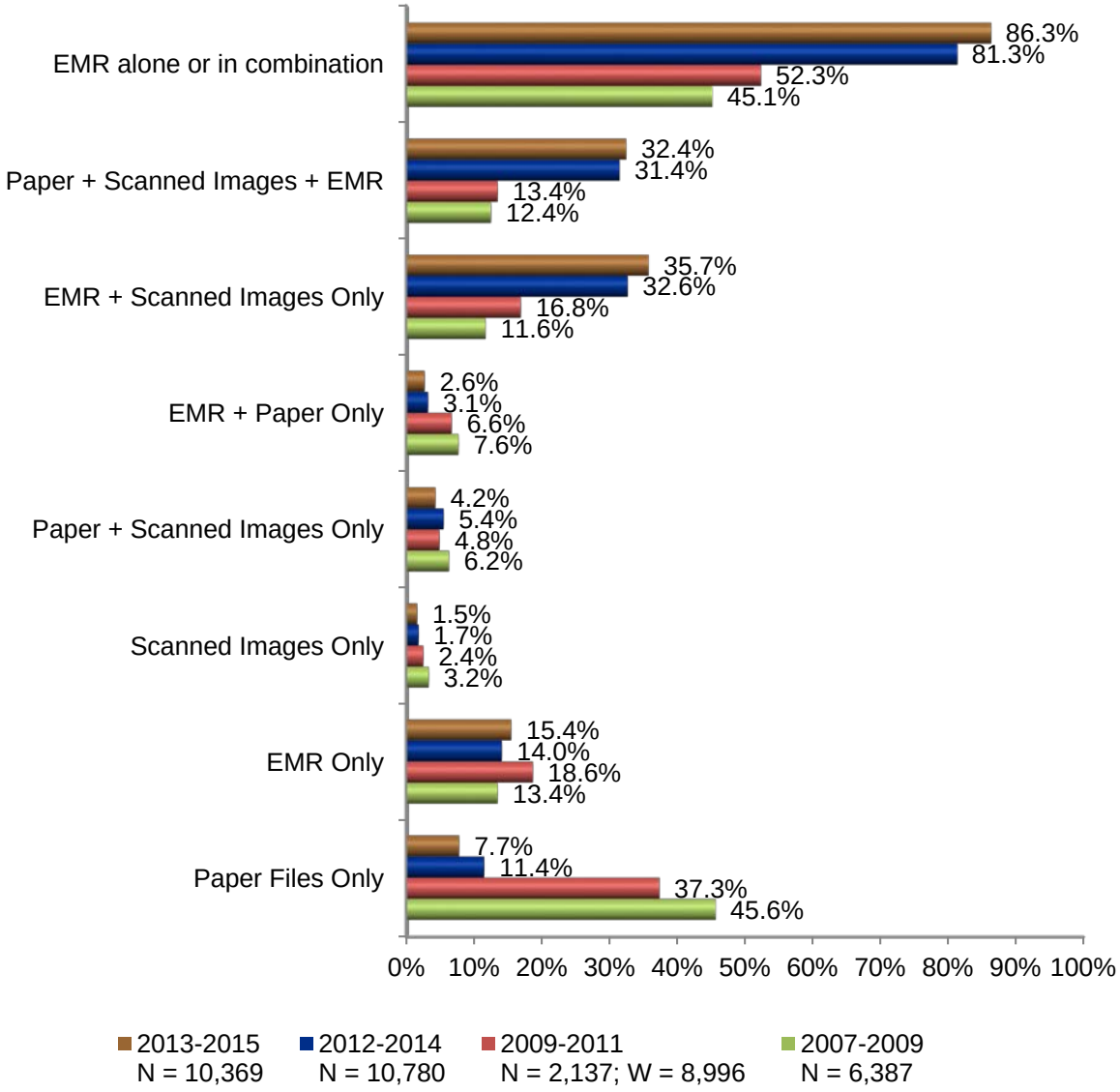
Source: AMB, ABOE Survey Data, 2007-2009; 2009-2011; 2012-2014; 2013-2015.

Note: The 2011 weight = 4.21. The 2011 estimates are subject to substantially more uncertainty than the other renewal period data.

Respondents who did not identify a method of storing medical records (missing): 390 for 2007-2009; 2,177 for 2012-2014; and 2,039 for 2013-2015.

*Data on "EMR alone or in combination" is not mutually exclusive from other categories.

Figure 6. Methods of Storing Medical Records by Renewal Period



Source: AMB, ABOE Survey Data, 2007-2009; 2009-2011; 2012-2014; 2013-2015.

Note: The 2011 weight = 4.21. The 2011 estimates are subject to substantially more uncertainty than the other renewal period data.

Respondents who did not identify a method of storing medical records (missing): 390 for 2007-2009 and 2,177 for 2012-2014 and 2,039 for 2013-2015.

*Data on "EMR alone or in combination" is not mutually exclusive from other categories.

The uncertainty in the 2009-2011 estimates, notwithstanding, the trend to increasing reliance on EMRs, often in combination with paper or scanned medical records, is quite clear. The percentage of physicians using EMRs increased from approximately 45% in 2007-2009 to approximately 86% in 2013-2015. The strength of the trend is evident in the fact that the trend

is quite marked between the 2012-2014 and 2013-2015 surveys, even though the two cohorts have one year of overlapping data. Were the results restricted to simply a one year change, the rates of change would be even larger.

The trend in Arizona is consistent with trends in the use of EMRs in the United States. The percentage of office-based physicians using some form of an EMR increased from 18% in 2001 to 78% in 2013 (Hsiao and Hing 2014). A smaller percentage (48% in 2013) used EMRs that included functions such as patient summaries, e-prescribing and lab results (Hsiao and Hing 2014).

The data from the National Ambulatory Medical Care Survey (NAMCS) are not strictly comparable to our results since they represent only a portion of the types of physicians included in our survey. The NAMCS exclusions include physicians in federal facilities where the utilization rates of EMRs are 96% and a number of specialty practices (Hsiao and Hing 2012). The results from the NAMCS estimate, however, that more than 85% of physicians in office-based practices in Arizona used some form of EMR in 2014 (Jamoom, Yang and Hing 2015).

The use of paper records alone in Arizona declined from nearly 46% to less than 8% between 2007-2009 and 2013-2015. The use of EMRs in combination with scanned files increased threefold from 12% to 36%. The use of EMRs in combination with paper and scanned files increased by nearly threefold, suggesting that many of the new adopters of EMRs had previously begun a transition from paper records to scanned records. The process is one of gradual transition from paper records and scanned records to EMRs rather than the complete translation of existing records to EMRs. Our data do not address the transition from paper to EMRs, but one can imagine strategies that create EMRs for new patients or previous patients if they continue to seek care, while leaving the records of patients who may not return for care in their original format.

Another possible influence is the absence of electronic networks for the exchange of clinical information. In a summary of several surveys reported in *Information Week*, 80% of organizations with EMRs also use paper records (Terry 2012). The *Information Week* article, citing various sources, reports that many practices with EMRs receive faxes and paper documents from other practices because electronic interfaces are not available. Many of the documents are scanned or entered into the EMRs. The reliance on scanning in conjunction with EMRs suggests another reason for the proliferation of scanned documents in firms with EMRs.

A Multivariate Model of the Determinants of EMR Adoption & Information Exchange

We use multivariate logistic regression models to: (1) estimate the influence of various characteristics on the use of EMRs; and (2) measure the extent to which the characteristics of EMR users affect the extent to which they exchange information with others. The odds ratios are a measure of the influence of a particular characteristic, such as age, on use of an EMR, "all else equal". An "all else equal" effect is the marginal influence of a measured characteristic, such as age, holding the effects of all other characteristics (e.g., type of practice, gender, location, specialty etc.) constant. The variables added to the 2013-2015 results affect all the estimated coefficients by changing the content of the variables that provide the "all else equal" interpretations of the results.

The first set of results estimate the probability of being an EMR user, comparing EMR users to all physicians. The second and third columns of results compare the number of physicians with EMRs who exchange information to all physicians who use EMRs.

To use an example from Table 10 below, physicians age 25 to 34 are, all else equal, 4.46 times *more* likely to utilize EMRs in their practice than physicians age 65 and older. An odds ratio less than 1.0 indicates that physicians in a particular group are *less* likely than those in the comparison group to utilize EMRs. Physicians age 25 to 34 who use EMRs are less likely than older physicians to be partially connected (0.85).

There are no statistically significant differences, all else equal, between Osteopathic and Allopathic physicians; between female and male physicians or between urban and rural practices.

The odds ratios for types of practice can be ranked in terms of the odds that physicians use EMRs in each work setting relative to federal health care systems. Hospital/medical school group practices and community or rural health centers have now surpassed federal facilities in the utilization of EMRs. The statistically significant estimated odds ratios range from 0.10 for solo practice to 1.61 for hospital/medical school group practices.

The effects of age are measured relative to physicians in the 65+ age group. The odds of EMR use is at a maximum in the 25-34 year age group (4.46) and slightly lower among physicians age 35-44 (3.38). The odds drop sharply for the 45-54 year age to 2.13 and drop to 1.65 among

physicians 55-64 years of age. An inverse relationship between physician age and EMR use has been observed in every period from 2007-2015.

One can speculate that differences in age represent differences in the culture of the medical profession, established work habits, facility with computerized applications, and training. An additional correlate of age, which is especially important for solo practitioners and small physician owned practices, is that the relatively short durations before retirement make the Return on Investment (ROI) to implement EMRs too low. The cost of purchasing a system is the most important single barrier cited by physicians in the NHCS Physician Workflow Survey (Jamoom, et al. 2012).

Table 10. Predictors of Being an EMR User/Partially or Fully Connected EMR User, 2013-2015

Variable	*2013-2015*		
	Odds Ratio (EMR User) N=9,742	*Odds Ratio (Partially Connected EMR User) N=8,319*	*Odds Ratio (Fully Connected EMR User) N=8,319*
DO (vs. MD)	0.84	1.18*	1.22
Type of Practice (vs. Federal Government)			
Physician Owned Solo Practice	0.10*	3.68*	1.23
Physician Owned Group Practice	0.35*	3.84*	1.63
Hospital/Med School Group Practice	1.61*	1.96*	1.44
Community or Rural Health Center	1.29	2.85*	2.11*
Private Hospital System	0.61*	2.00*	1.33
Non-Hospital Private Outpatient Facility	0.28*	2.04*	1.28
Medical School, University Research Center	0.64	1.94*	1.31
City, State or County Clinic or Hospital System	0.23*	1.47	0.83
Other	0.20*	1.75*	0.76
Age (vs. 65 and older)			
25 to 34	4.46*	0.85	0.98
35 to 44	3.38*	0.88	1.04
45 to 54	2.13*	1.03	1.12
55 to 64	1.65*	1.03	1.04
Gender (Female vs. Male)	0.91	0.97	0.86
Location (vs. all other AZ counties)			
Maricopa County	0.87	0.90	1.18
Pima County	0.74*	1.15	1.24
Specialty (vs. Hospital Based Specialists)			
Primary Care	1.85*	4.25*	5.37*
Medical Care	1.35*	3.24*	2.49*
Pediatric Care	1.28*	4.07*	2.29*
Surgical Care	1.21	2.75*	2.88*

Source: AMB, ABOE Survey & Licensing Data, 2013–2015.

Note: 2,666 observations were deleted due to missing values for EMR Users and 635 observations were deleted for Partially Connected EMR Users and Fully Connected EMR Users. *Statistically significant at p less than or equal to 0 .05.

The odds ratios for the influence of each specialty are measured relative to physicians in hospital based specialties. All else equal, primary care physicians and physicians in the medical specialty group are more likely to use EMRs than hospital based specialists. There are no significant differences between Pediatricians and Surgeons relative to hospital based specialists.

We next compare the extent to which physicians who use EMRs are partially or fully connected with others. The "Partially Connected" physicians are defined as users of at least one of their EMR's functions to exchange information with others. The "Fully Connected" physicians are those who use all six functions to exchange information to others.

Approximately 3,639 or 43.8% of physicians with EMRs are "Partially Connected" and only 309 or 3.7% of physicians with EMRs are "Fully connected". The small sample of fully connected users is not, in our opinion, sufficient for stable estimates. We present results for the fully connected group, but defer discussion until a larger sample is available.

The significant influences on being partially connected are the type of practice, being in the youngest (25-34) age group, practicing in an urban location and physician specialty.

The practice types that are most likely to exchange information are the physician owned group practice, with solo practice a close second relative to federal government practices. Physicians in solo practice are the most likely to be partially connected. Thus, while solo practitioners are the least likely to have EMRs, the solo practice physicians with EMRs are the most likely to share at least some information with other health care organizations. Physicians in physician owned group practices are second to the solo practitioners, but the differences are very small. Community health centers are the next most likely to exchange information with others.

All the specialty groups have large significant effects on connectivity, with primary care the most influential. One can speculate that the results for primary care reflect the effects of the Medicaid and Medicare incentive programs, but that suggestion requires additional study.

The results suggest that the characteristics of individual physicians that are significant influences on the use of EMRs do not influence the exchange of information once an EMR is adopted. Older physicians are, for example, least likely to adopt EMRs, but once an EMR is adopted, the only significant age related difference in the extent to which physicians exchange

EMR data with others is that the youngest group are less likely than the oldest group of physicians with EMRs to be connected.

It appears that the exchange of information depends primarily on the environment in which physicians work. As we indicated in the previous section, a major obstacle to the exchange of information is the absence of electronic networks (health information exchanges) that are necessary for exchanges to occur. The extent to which connectivity is determined by intra-organizational factors versus the availability of health information networks will require additional study.

Our results include exchanges within a practice or a single hospital system and exchanges between organizations. Exchanges among different organizations such as between hospital systems or among physician owned solo or group practices are much less frequent.

Trends 2007-2011

An advantage of the ongoing CHiR survey is the ability to track trends in the use of EMRs and an array of associated characteristics over time. Improvements in the electronic version of the survey were achieved at the costs of some loss of between-year comparability for some questions. The survey questions for previous years included, for example, only two specialty groups rather than the five classifications in current use. The categories for types of practice were also expanded and the content was changed to eliminate some internal inconsistencies. Other questions, such as the types of medical records (EMR, paper, scanned and combinations) are the same and comparisons of EMR utilization rates over time are appropriate.

The definitions of partially and fully connected changed with the availability of more detailed survey questions. The changes limit longitudinal comparisons of the multivariate results. Inferences at a very general level are possible, including longitudinal differences among the effects of physicians' ages, differences between allopathic and osteopathic physicians, and urban versus rural physicians.

Table 11. Multivariate Predictors of Being an EMR User/Connected EMR User, 2007-2011

Variable	*2009-2011*		*2007-2009*	
	Odds Ratio (EMR User)	*Odds Ratio (Fully Connected)*	*Odds Ratio (EMR User)*	*Odds Ratio (Fully Connected)*
Type of Practice (vs. Government)				
Group Practice	0.38*	0.43*	0.28	0.13
Community Health Center	0.66	0.45*	0.23	0.08
Hospitalist	0.52	0.80	0.54	0.46
Solo Practice	0.11*	0.09*	0.08	0.02
Academic Teaching/Research	1.10	1.19	0.76	0.72
DO (vs. MD)	1.02	1.14	1.60*	1.04
Age (vs. 65 and older)				
25 to 34	2.63*	1.99	3.16*	2.12*
35 to 44	3.19*	1.85*	2.49*	1.69*
45 to 54	2.36*	1.75*	2.12*	1.90*
55 to 64	1.35	1.24	2.07*	1.92*
Gender (Female vs. Male)	0.75*	0.84	0.92	0.94
Location (vs. all AZ counties)				
Maricopa County	0.98	0.93	1.12	1.28
Pima County	0.92	0.92	1.18	0.89
Primary Care (vs. Specialty Care)	1.20	1.85*	1.20*	0.89

Source: AMB, ABOE Survey Data, 2007- 2009; 2009-2011.

Note: 1,284 observations were deleted due to missing values.

*Statistically significant at p less than or equal to 0 .05.

The inverse relationship between physician ages and the use of EMRs occurs in all the years. There is a shift, however, between the most recent results and the 2007-2009 results that may reflect aging of the workforce. In 2007-2009, the 25-34 year old physicians were most likely to use EMRs, with the odds steadily declining for each of the older age groups. In 2013-2015, the highest ratios apply to the 35-44 year old group, with the 25-34 age physicians ranking second. The other change was that physicians in the 55-64 age group in 2007-2009 were twice as likely

as physicians age 65+ to use EMRs. There is no significant difference between these two age groups in 2013-2015. Age is not the only influence on the use of EMRs, but the gap in utilization rates between older and younger physicians will gradually disappear as the younger physicians replace retiring older physicians.

Osteopathic physicians were more likely than allopathic physicians to have EMRs in 2007-2009, but there are no significant differences between DOs and MDs in 2009-2011 or in 2013-2015.

There are no significant differences in EMR use between Maricopa and Pima County physicians or between them and physicians practicing in more rural counties (the omitted group) in the past.

Utilization of EMR Functions

The functions included in EMR software packages vary among vendors. In addition, the selection of functions included varies among physicians. The results describe the extent to which key functions are included in physicians' EMRs; the extent to which physicians use those functions; and the extent to which information is exchanged with others by physicians who use the functions. Specifically we examine inclusion, use and exchange for each of the following:

- Patient Care Summary
- Prescription Function
- Lab Results Function
- Reminders Intervention Function
- Public Health Reports Function
- Quality Metrics Function

There is variation in the extent to which the functions are included in EMR software. Although there are some variations among categories, there are approximately 6,600 physicians who used one or more of the functions.

Table 12. Utilization of Available EMR Functions*

EMR Functions	*Included in EMR*	*Used by the Respondent Number/Percent*		*Exchanged with Other Providers Number/Percent*	
Patient Care Summary	6,609	6,062	91.7%	2,087	31.6%
Prescription "e-prescribing"	6,323	5,618	88.9%	2,911	46.0%
Lab Results	6,568	6,174	94.0%	2,274	34.6%
Reminders for Interventions	4,377	3,653	83.5%	831	19.0%
Public Health Reports	3,230	2,506	77.6%	1,029	31.9%
Quality Metrics (HEDIS, AQA, etc.)	2,980	2,401	80.6%	1,115	37.4%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: *The data in this table effectively treat *"Don't Know"* answers as *"No"* since the questions ask for the respondent's experience, not for the practices of other physicians in the same organization.

The data in this table only include those physicians that answered *"Yes"* to the Include question for each EMR function. Furthermore, the data only includes those that answered both the Used and Exchanged questions for each EMR functions; if either question was left blank the physician was excluded from the table for that function.

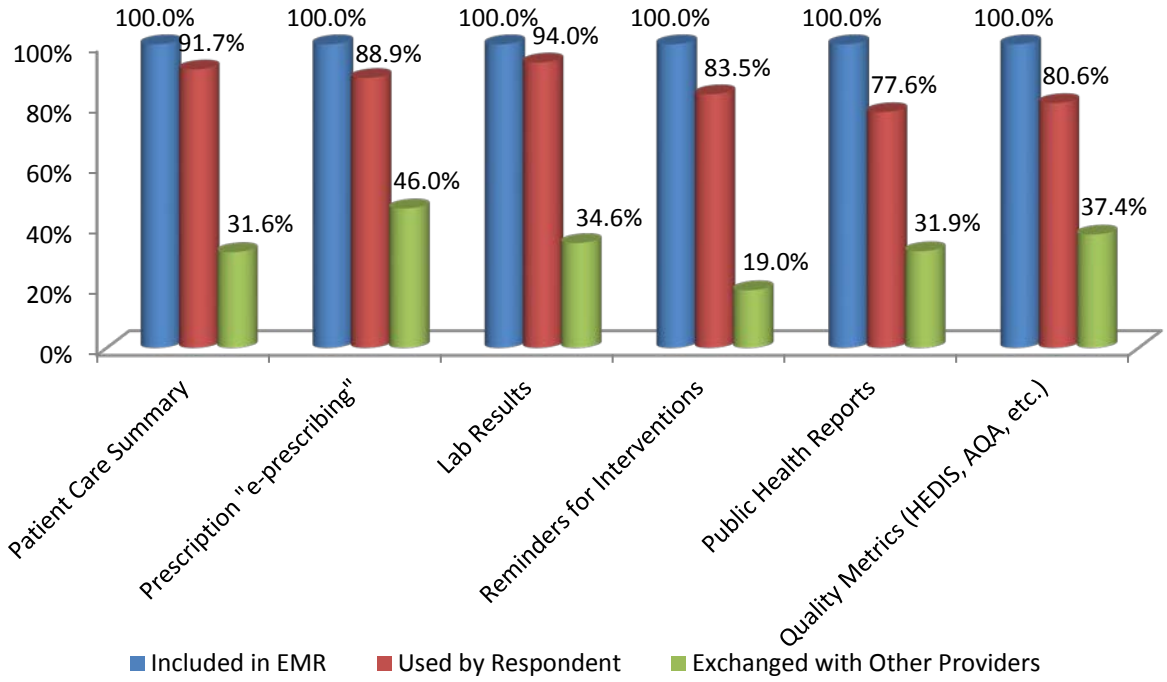
The most frequently used functions are the *Lab Results*, *Patient Care Summary and e-prescribing* functions. There has been a concerted effort in Arizona to incent providers to use e-prescribing and it appears to be succeeding. The prevalence of use of lab functions probably reflects the long standing practice of electronic reporting by Sonora Quest Laboratories. The pre-existing reporting systems simplified the inclusion of laboratory results in EMR software.

The *Quality Metrics f*unction is least often included in EMRs among the six functions and, when included, is used by approximately 81% of physicians.

The use of EMRs is the necessary condition for the realization of the benefits of EMRs, but it is not sufficient to reach that goal without adequate methods of exchanging information. The very low percentages of physicians who exchange their EMR data with others are a significant obstacle to achieving the benefits of EMRs.

Exchanges using *e-prescribing* were more prevalent than any other function, but less than one-half of the physicians made exchanges. Less than 20% of the physicians exchanged information involving the *Reminders* for *Guideline Based Interventions.* Exchanges of information from the other functions cluster between approximately 31% and 37%. Potential benefits that depend upon the exchange of information on a patient among different providers are, therefore, not being realized.

Figure 7. Summary Utilization of Available EMR Functions



Source: AMB, ABOE Survey Data, 2013–2015.

Note: The data in this table only include those physicians that answered *"Yes"* to the Include question for each EMR function. Furthermore, the data only includes those that answered both the Used and Exchanged questions for each EMR functions; if either question was left blank the physician was excluded from the table for that function.

Quality metrics and required reports such as reportable diseases are reported by other methods, including email, faxes and separate electronic networks. Although the information is not lost, EMRs would be a more efficient and timelier means of delivery. The marked disparity between the use of EMRs and the sharing of information is a consistent feature of all the previous CHiR surveys, although the previous results are less detailed.

The results overstate exchanges of information that occur between physicians in different practices or different hospital systems because the results include exchanges within a practice or a single hospital system as well as exchanges between organizations. Exchanges among different organizations such as between hospital systems or among physician owned solo or group practices are much less frequent.

The single most important obstacle to the inter-organization transfer of electronic health information is the shortage of Health Information Exchanges (HIEs). The history of HIEs linking different organizations is one of frequent failure, largely traceable to the absence of viable

business models (E Health Initiative 2012). The lack of HIEs also forces practices with EMRs to exchange information via fax, requiring the recipients to continue to use paper or scanned documents in addition to their EMRs (Terry 2012).

The Health Information Network of Arizona (HINAz), Arizona's statewide health information organization, is striving to solve the problems that have hampered the expansion of HIEs, but it does not yet provide service to the majority of Arizona physicians. The Network currently has 49 active participants, defined as a health care organization or provider with an executed participation agreement enabling active contributions and/or consumption of network data. The Network participants are:

- 13 hospitals/health systems
- 12 health plans
- 7 community health centers
- 2 reference laboratories
- 5 community providers
- 2 corrections departments
- 1 community behavioral health HIE

(Arizona Health-e Connection 2015).

One promising feature of HINAz is the involvement of the 12 health plans. The economic benefits of exchanging patient information directly accrue to payers. The unnecessary costs of duplicate testing, treatments required because of prescription errors, and other information related problems are borne by the organizations that assume economic risk, including insurers and health care organizations that provide capitated care. Thus, they are also the primary economic beneficiaries of exchanges of information that reduce avoidable negative outcomes of care.

Utilization of EMRs by Vendor

The 2013-2015 survey includes, for the first time, questions enabling physicians to evaluate their EMRs on usability, functionality and a number of other important characteristics.

The distribution of EMR brands by number of users is described in Figures 8 and 9. One peculiar feature of the results is the large number of EMR users who do not know the brand of software they are using (Table 13). Large surveys always include responses that seem to be illogical or erroneous. These responses result from misunderstandings of the question because of a respondent's inattention or from poorly designed questions.

Table 13. EMR Users Unaware of EMR Vendor Name by Type of Practice, 2013-2015 (N = 691)

Type of Practice	*Number of Physicians*	*Percent*
Physician Owned Solo Practice	74	10.7%
Physician Owned Group Practice	263	38.0%
Hospital/Medical School Group Practice	76	10.9%
Community or Rural Health Center	44	6.3%
Private Hospital System	58	8.3%
Non-Hospital Private Outpatient Facility	60	8.6%
Medical School/University Research Center	22	3.1%
Health Insurer/Health Related Organization that does not provide care	12	1.7%
City, State or County Clinic or Hospital System	9	1.3%
Other	73	10.5%
Hospice or SNF	5	0.7%
Independent Contractor	3	0.4%
Medical Consultant	4	0.5%
Mental/Behavioral Health	1	0.1%
Total	691	100.0%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: N represents the number of physicians who answered "Don't Know" for this survey question. Governmental hospitals or clinics are excluded. There was one physician that didn't respond to practice type.

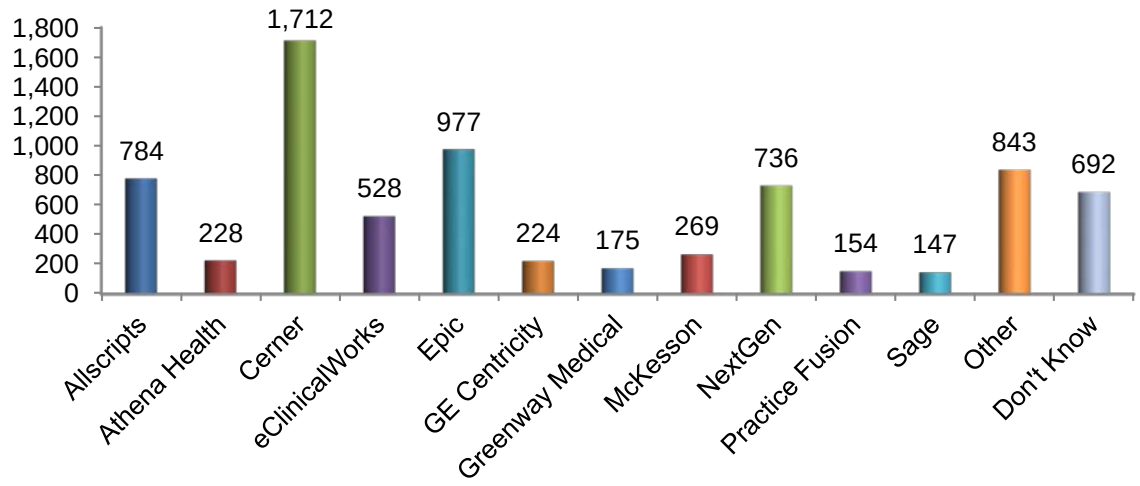
The question that asked for the vendor or brand name of the EMR used by a respondent included 37 brand names and a category for "Other" with an associated blank for the name to be written in by the respondent. Slightly less than 850 physicians answered "Other" and an

additional 692 physicians who used EMRs did not know the brand name of their EMR. Previous years' results show that only approximately one-third of physicians using EMRs were either the decision maker or participated in a shared decision making process. The "Don't Know" answers may reflect the fact that, especially in large health care organizations, relatively few physicians make choices concerning the purchase of EMR systems.

We expected that the "Don't Know" responses should disproportionately be found in large organizations such as hospital systems but more than 69% of the "don't know" respondents worked outside of hospital settings. It was most surprising that 10.7% of solo practitioners could not identify their EMRs.

One implication of the results is that many physicians using EMRs are not likely to communicate to their EMR vendor about the advantages or problems that they face in using the EMR. In large hospital systems, the feedback may be provided by physicians in management or information technology (IT) roles, but in smaller organizations, it appears that valuable information concerning the performance of EMRs is being lost.

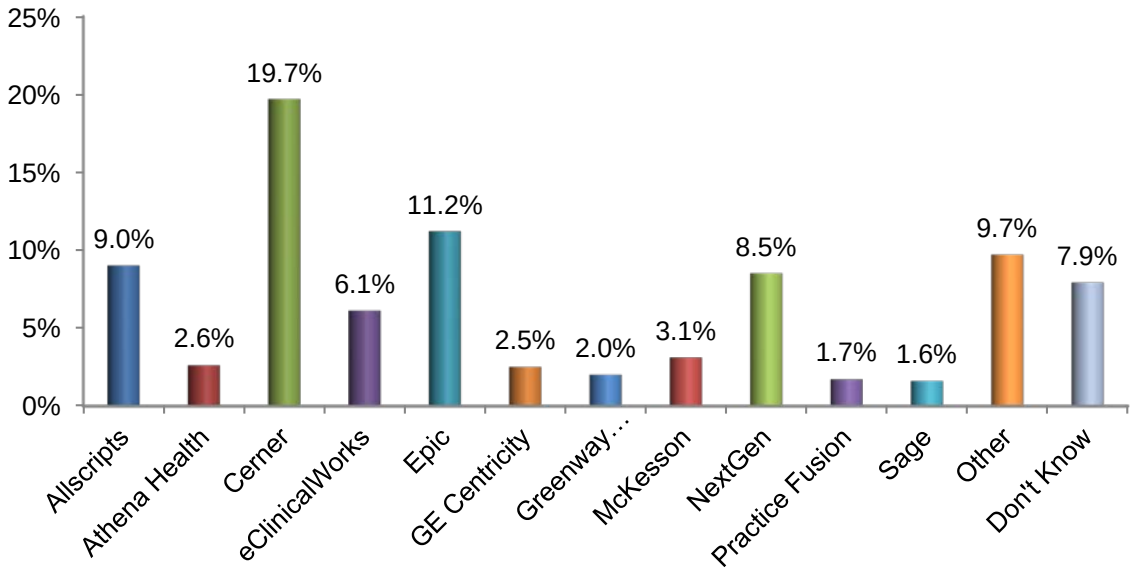
Figure 8. Number of EMR Users by Vendor ≥ 130 Users



Source: AMB, ABOE Survey Data, 2013–2015.

Note: The "Other" vendor excludes vendors contracted with government hospitals/clinics.

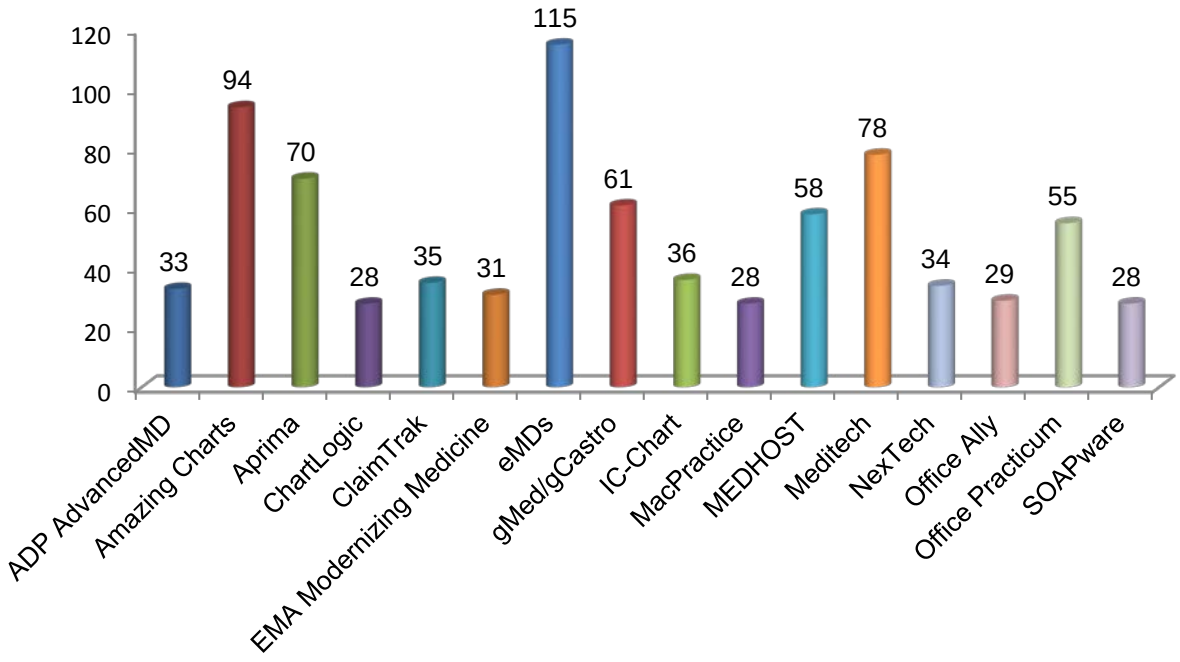
Figure 9. Percent of EMR Users by Vendor ≥ 130 Users



Source: AMB, ABOE Survey Data, 2013–2015.

Note: The "Other" vendor includes all vendors contracted with government hospitals/clinics.

Figure 10. Number of EMR Users by Vendor < 130 Users



Source: AMB, ABOE Survey Data, 2013–2015.

Note: Vendors with less than 25 users were excluded.

Physicians' Evaluation of EMR Software

The results in this section describe how Arizona physicians rank their EMR software on five criteria, namely:

- Ease of use
- Effect on physician productivity
- Effect on staff productivity
- Reliability
- Performance vs. promise

Each physician rates the EMR that she or he uses on a scale from 1 to 5, where 1 represents "Awful" and 5 represents "Outstanding". The intermediate values are not defined but the mid-point in the range can be thought of as approximating "acceptable" or a neutral evaluation. Rankings greater than 3 can be interpreted as positive. A ranking greater than "3" for physician or staff productivity indicates, for example, that an EMR has increased productivity, while rankings less than "3" suggest that an EMR has reduced productivity.

This section begins with a description of the rankings assigned to each of the five criteria described above. It then summarizes the results for each vendor in Table 25. Our discussion focuses on the summary results with a few comments on the more detailed information.

The rankings across all EMRs are a representation of a general evaluation of EMRs of several different types by different types of practices and physicians. Thus, without further clarification, individual EMR packages should not be interpreted as substitutes for one another. Many EMRs, such as *eClinicalWorks* are general purpose products while the *Gmed* EMR is specifically designed for gastroenterology specialists. Appendix G summarizes EMRs by vendor and intended use.

The fact that an EMR designed for primary care physicians might be ranked lower than an EMR designed for only one specialty does not imply that the primary care physicians could or should adopt the specialty EMR. Similarly, the finding that EMR brand A has a higher rating than EMR

brand B should not imply that brand A is a better buy than brand B without reference to the cost (and thereby the cost effectiveness) of the two brands.

The survey does not ask if the physician respondent is using an EMR that replaced an EMR package that was not acceptable. In such cases, the rankings of the current EMR could reflect a choice that solved the problems with the previous EMR and would, presumably be more positive than a first time EMR that was acceptable, but perhaps not as well suited to the physician's specific needs. Such situations are extremely costly but the information on the prevalence of these problems in Arizona is not known.

The results presented next are restricted to the ten EMR packages that have the largest number of users because of the difficulty of presenting results for the very large number of vendors that serve physicians in Arizona. A more complete summary is presented in Table 25.

A great deal of attention has been given to the shortcomings of EMRs, but the rankings described in the following tables have means equal to or slightly above the midpoint in the 1-5 scale. The results on physician satisfaction with EMRs are generally consistent with results from the NCHS Survey of physicians in office-based practices. The NCHS results for 2011 show that 38% of the physicians were very satisfied with their EMRs and 46% were somewhat satisfied (Jamoom, et al. 2012).

Table 14. Ranking of All EMRs by Ease of Use (N = 7,879) (Weighted Mean Rank = 3.3)

Ranking	*Number of Physicians*	*Percent*
1 (Awful)	564	7.1%
2	1,058	13.4%
3	2,787	35.3%
4	2,392	30.3%
5 (Outstanding)	1,078	13.6%

Source: AMB, ABOE Survey Data, 2013–2015.

As indicated in Table 14, the weighted mean rank for the ease of using an EMR is 3.3. Only 20.5% of physicians give their EMR a rank less than 3 while 43.9% rate their EMR as greater than 3. The distribution suggests that physicians are mildly positive about the ease with which the EMR can be used. With minor variations, this distribution is characteristic of the rankings for the other criteria used to evaluate EMRs.

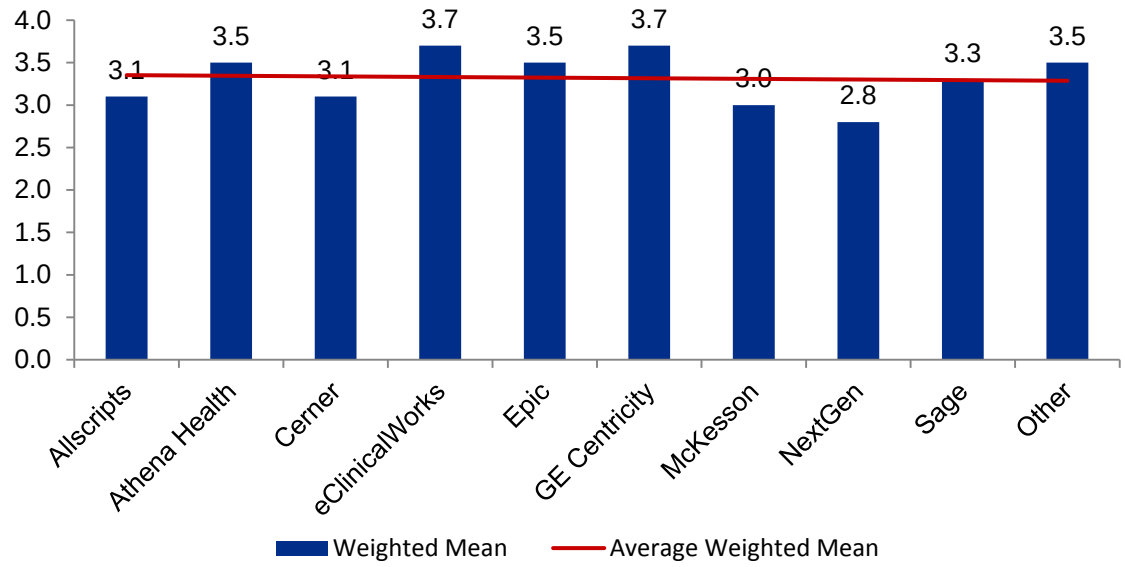
Table 15. Ease of Use by Top 10 Vendors

Vendor	*1 Awful*	*2*	*3*	*4*	*5 Outstanding*	*Total*	*Weighted Mean*
Allscripts	56 7.8%	110 15.4%	312 43.7%	177 24.8%	58 8.1%	713 12.1%	3.1
Athena Health	12 5.5%	25 11.6%	64 29.7%	76 35.3%	38 17.6%	215 3.6%	3.5
Cerner	139 8.8%	295 18.6%	609 38.5%	403 25.5%	132 8.3%	1,578 26.8%	3.1
eClinicalWorks	11 2.1%	39 7.6%	142 27.8%	202 39.6%	116 22.7%	510 8.6%	3.7
Epic	36 4.4%	88 10.8%	275 33.9%	287 35.4%	123 15.2%	809 13.7%	3.5
GE Centricity	3 1.4%	17 8.1%	63 30.2%	91 43.7%	34 16.3%	208 3.5%	3.7
McKesson	37 14.9%	42 16.9%	83 33.4%	68 27.4%	18 7.2%	248 4.2%	3.0
NextGen	127 18.0%	137 19.4%	255 36.1%	146 20.7%	40 5.6%	705 12.0%	2.8
Sage	2 1.4%	21 14.8%	61 43.2%	46 32.6%	11 7.8%	141 2.4%	3.3
Other	37 4.9%	79 10.5%	226 30.2%	260 34.7%	146 19.5%	748 12.7%	3.5
Top 10 Total	460 7.8%	853 14.5%	2,090 35.5%	1,756 29.8%	716 12.1%	5,875 100.0%	3.2

Source: AMB, ABOE Survey Data, 2013–2015.

Note: There were 489 physicians who did not identify a brand name but answered this question. The weighted mean for those physicians is 3.11.

Figure 11. Weighted Mean Rank of Ease of Use by Top 10 Vendors



Source: AMB, ABOE Survey Data, 2013–2015.

Figure 11 shows that *eClinicalWorks* and *GE Centricity* are the most highly ranked EMRs in terms of ease of use, followed by *Athena Health* and *Epic,* followed closely by a cluster of EMRs with rankings either at the group weighted mean (*Sage*) or slightly below or above the mean. The exception is *NextGen* with a ranking of 2.8 followed by McKesson with a ranking of 3.0. Tables 16-24 detail the ranks that physicians assigned to EMRs from the 10 most widely used EMRs. Our discussion begins following Table 24 where the summary ranking of all EMR criteria are also presented.

The introduction of an EMR into a practice typically requires investments in physician and staff time to learn new procedures and make the transition from paper or scanned records to the EMR. In some instances, an EMR package does not fit well into a practice and must be replaced. Both situations imply a loss of physician and staff productivity and both are often cited in critiques of EMRs. Increases in productivity attributable to the use of EMRs are much less discussed. The physician rankings of the effect of EMRs on physician and staff productivity, however, reveal an almost exact balance between increases and reductions in productivity creating an average rank approximately equal to the mid-point in the scale.

We do not know from the current results whether the rankings would be substantially different if we separated physicians dealing with recently introduced EMRs from those with EMRs in use

for longer periods of time. We suspect that productivity, on average, would increase with the duration for which an EMR had been used. That is a topic worthy of additional analysis.

Table 16. Rank All EMRs by Physician Productivity (N = 7,866) (Weighted Mean = 3.0)

Ranking	*Number of Physicians*	*Percent*
1 (Awful)	1,076	13.6%
2	1,508	19.1%
3	2,589	32.9%
4	1,809	22.9%
5 (Outstanding)	884	11.2%

Source: AMB, ABOE Survey Data, 2013–2015.

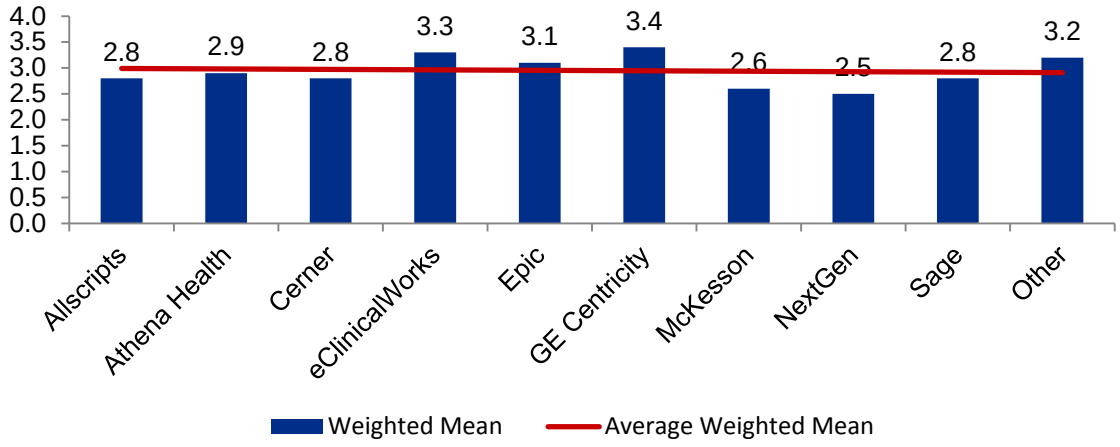
Table 17. Physician Productivity by Top 10 Vendors

Vendor	*1 Awful*	*2*	*3*	*4*	*5 Outstanding*	*Total*	*Weighted Mean**
Allscripts	112 15.7%	162 22.7%	259 36.3%	132 18.5%	48 6.7%	713 12.1%	2.8
Athena Health	35 16.2%	40 18.5%	69 31.9%	49 22.6%	23 10.6%	216 3.6%	2.9
Cerner	263 16.6%	361 22.8%	517 32.7%	315 19.9%	123 7.7%	1,579 26.8%	2.8
eClinicalWorks	44 8.6%	71 13.9%	152 29.8%	157 30.7%	86 16.8%	510 8.6%	3.3
Epic	82 10.1%	150 18.5%	273 33.8%	194 24.0%	108 13.3%	807 13.7%	3.1
GE Centricity	13 6.2%	24 11.5%	61 29.3%	77 37.0%	33 15.8%	208 3.5%	3.4
McKesson	55 22.1%	57 22.9%	87 35.0%	35 14.1%	14 5.6%	248 4.2%	2.6
NextGen	177 25.1%	167 23.7%	201 28.5%	122 17.3%	37 5.2%	704 11.9%	2.5
Sage	21 14.8%	31 21.9%	49 34.7%	30 21.2%	10 7.0%	141 2.4%	2.8
Other	84 11.2%	105 14.0%	226 30.3%	203 27.2%	127 17.0%	745 12.6%	3.2
Top 10 Total	886 15.0%	1,168 19.8%	1,894 32.2%	1,314 22.3%	609 10.3%	5,871 100.0%	2.9

Source: AMB, ABOE Survey Data, 2013–2015.

Note: There were 485 physicians who did not identify a brand name but answered the Physician Productivity question. The weighted mean for those physicians is 2.95.

Figure 12. Weighted Mean Rank of Physician Productivity by Top 10 Vendors



Source: AMB, ABOE Survey Data, 2013–2015.

Among the ten vendors with the most users, *eClinicalWorks* and *GE Centricity* EMR received the most positive rankings in terms of physician productivity. *NextGen* received the lowest ranking and *McKesson* was only very slightly higher.

Table 18. Ranking of All EMRs by Staff Productivity (N = 7,815) (Weighted Mean Rank = 3.0)

Ranking	*Number of Physicians*	*Percent*
1 (Awful)	898	11.4%
2	1,453	18.5%
3	2,715	34.7%
4	1,871	23.9%
5 (Outstanding)	878	11.2%

Source: AMB, ABOE Survey Data, 2013–2015.

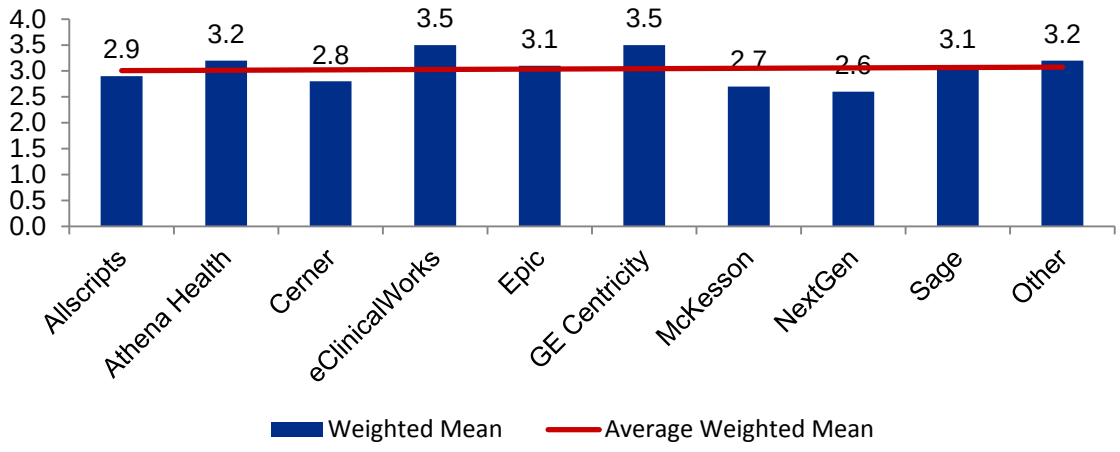
The *eClinicalWorks* and *GE Centricity* EMRs are the most highly ranked in terms of staff productivity, just as they were the most highly ranked for physician productivity. *Cerner, McKesson* and *NextGen* EMRs all had the lowest rankings. The ranking for *Allscripts* is only very slightly higher.

Table 19. Staff Productivity by Top 10 Vendors

Vendor	*1 Awful*	*2*	*3*	*4*	*5 Outstanding*	*Total*	*Weighted Mean*
Allscripts	90 12.6%	146 20.5%	282 39.7%	144 20.3%	47 6.6%	709 12.1%	2.9
Athena Health	21 9.7%	30 13.9%	71 33.0%	66 30.6%	27 12.5%	215 3.6%	3.2
Cerner	248 15.8%	379 24.1%	549 34.9%	284 18.1%	109 6.9%	1,569 26.8%	2.8
eClinicalWorks	29 5.6%	56 11.0%	151 29.6%	170 33.3%	103 20.2%	509 8.7%	3.5
Epic	69 8.6%	155 19.3%	284 35.4%	198 24.6%	96 11.9%	802 13.7%	3.1
GE Centricity	6 2.9%	22 10.7%	68 33.1%	76 37.0%	33 16.0%	205 3.5%	3.5
McKesson	49 19.9%	57 23.1%	83 33.7%	41 16.6%	16 6.5%	246 4.2%	2.7
NextGen	147 20.9%	177 25.1%	216 30.7%	122 17.3%	41 5.8%	703 12.0%	2.6
Sage	10 7.0%	23 16.3%	57 40.4%	42 29.7%	9 6.3%	141 2.4%	3.1
Other	76 10.2%	99 13.3%	243 32.8%	208 28.1%	113 15.2%	739 12.6%	3.2
Top 10 Total	745 12.7%	1,144 19.5%	2,004 34.3%	1,351 23.1%	594 10.1%	5,838 100.0%	3.0

Source: AMB, ABOE Survey Data, 2013–2015. Note: There were 479 physicians did not identify a brand name but answered the Staff Productivity question. The weighted mean for those physicians is 2.96.

Figure 13. Weighted Mean Rank of Staff Productivity by Top 10 Vendors



Source: AMB, ABOE Survey Data, 2013–2015.

Table 20. Ranking of All EMRs by Reliability, (N = 7,827) (Weighted Mean Rank = 3.5)

Ranking	*Number of Physicians*	*Percent*
1 (Awful)	378	4.8%
2	766	9.7%
3	2,460	31.4%
4	2,908	37.1%
5 (Outstanding)	1,315	16.8%

Source: AMB, ABOE Survey Data, 2013–2015.

Table 21. Reliability by Top 10 Vendors

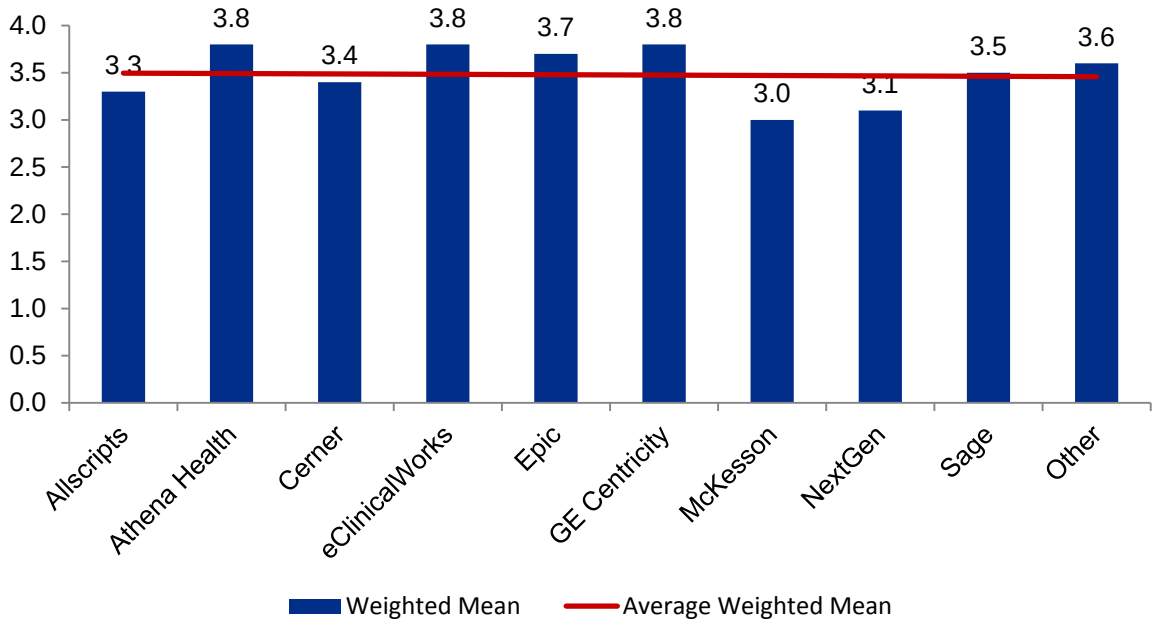
Vendor	*1 Awful*	*2*	*3*	*4*	*5 Outstanding*	*Total*	*Weighted Mean*
Allscripts	36 5.0%	85 11.9%	258 36.3%	258 36.3%	72 10.1%	709 12.1%	3.3
Athena Health	5 2.3%	22 10.1%	44 20.3%	93 43.0%	52 24.0%	216 3.6%	3.8
Cerner	69 4.3%	159 10.0%	550 34.9%	603 38.2%	194 12.3%	1,575 26.9%	3.4
eClinicalWorks	10 1.9%	28 5.5%	125 24.8%	216 42.8%	125 24.8%	504 8.6%	3.8
Epic	17 2.1%	54 6.7%	227 28.3%	326 40.6%	178 22.1%	802 13.7%	3.7
GE Centricity	4 1.9%	10 4.8%	55 26.6%	92 44.6%	45 21.8%	206 3.5%	3.8
McKesson	34 13.8%	39 15.8%	76 30.8%	75 30.4%	22 8.9%	246 4.2%	3.0
NextGen	85 12.0%	103 14.6%	230 32.7%	219 31.1%	66 9.3%	703 12.0%	3.1
Sage	3 2.1%	13 9.2%	53 37.5%	56 39.7%	16 11.3%	141 2.4%	3.5
Other	31 4.1%	63 8.5%	217 29.2%	275 37.1%	155 20.9%	741 12.6%	3.6
Top 10 Total	294 5.0%	576 9.8%	1,835 31.4%	2,213 37.8%	925 15.8%	5,843 100.0%	3.5

Source: AMB, ABOE Survey Data, 2013–2015.

Note: There were 478 physicians who did not identify a brand name but answered the Reliability question. The weighted mean for those physicians is 3.31.

In this case, *Athena Health, eClinicalWorks* and *GE Centricity* are the highest ranking EMRs in terms of reliability, followed closely by *Epic*. The rankings for reliability are, however, higher in absolute terms for most of the EMRs relative to the rankings for productivity. The lowest ranking is for *McKesson* with *NextGen* only slightly higher.

Figure 14. Weighted Mean Rank of Reliability by Top 10 Vendors



Source: AMB, ABOE Survey Data, 2013–2015.

Table 22. Ranking of All EMRs by Performance vs. Promise (N = 7,702) (Weighted Mean Rank = 3.1)

Ranking	*Number of Physicians*	*Percent*
1 (Awful)	777	10.0%
2	1,155	14.9%
3	2,951	38.3%
4	1,988	25.8%
5 (Outstanding)	831	10.7%

Source: AMB, ABOE Survey Data, 2013–2015.

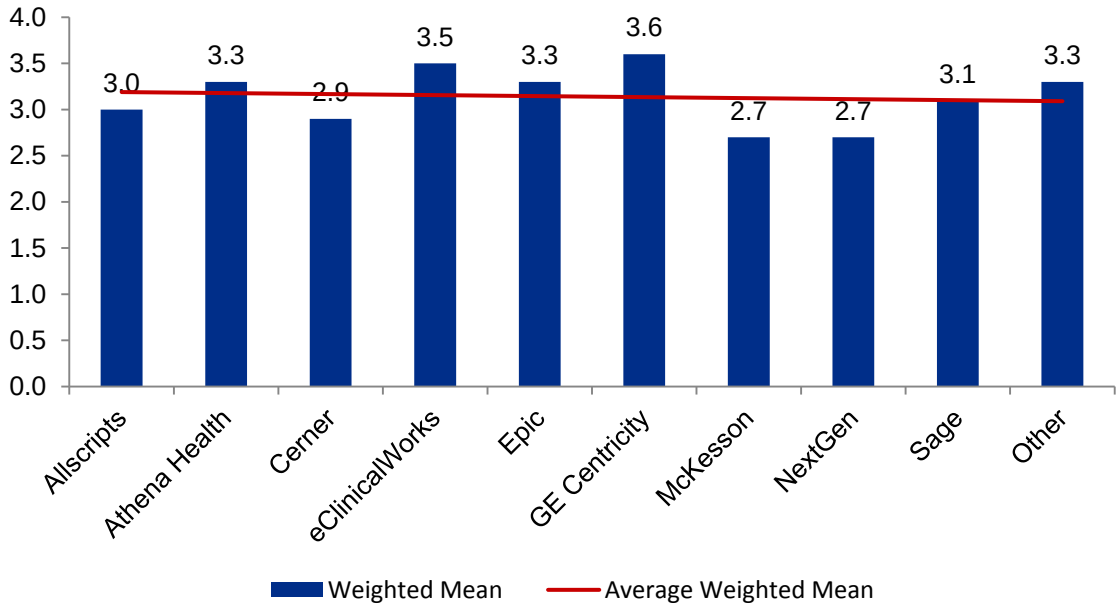
Table 23. Performance vs. Promise by Top 10 Vendors

Vendor	*1 Awful*	*2*	*3*	*4*	*5 Outstanding*	*Total*	*Weighted Mean*
Allscripts	70 10.0%	117 16.7%	324 46.2%	151 21.5%	38 5.4%	700 12.1%	3.0
Athena Health	24 11.2%	23 10.7%	70 32.7%	69 32.2%	28 13.0%	214 3.7%	3.3
Cerner	181 11.7%	314 20.3%	620 40.1%	341 22.0%	89 5.7%	1,545 26.8%	2.9
eClinicalWorks	24 4.7%	35 6.9%	177 35.1%	191 37.8%	77 15.2%	504 8.7%	3.5
Epic	55 6.9%	101 12.7%	306 38.7%	219 27.7%	109 13.7%	790 13.7%	3.3
GE Centricity	6 2.9%	15 7.4%	74 36.6%	74 36.6%	33 16.3%	202 3.5%	3.6
McKesson	52 21.3%	36 14.8%	91 37.4%	52 21.3%	12 4.9%	243 4.2%	2.7
NextGen	137 19.9%	144 20.9%	248 36.0%	126 18.3%	32 4.6%	687 11.9%	2.7
Sage	6 4.4%	28 20.5%	61 44.8%	29 21.3%	12 8.8%	136 2.3%	3.1
Other	71 9.7%	78 10.7%	252 34.7%	213 29.3%	111 15.3%	725 12.6%	3.3
Top 10 Total	626 10.8%	891 15.5%	2,223 38.6%	1,465 25.4%	541 9.4%	5,746 100.0%	3.1

Source: AMB, ABOE Survey Data, 2013–2015.

Note: There were 465 physicians who did not identify a brand name but answered the Reliability question. The weighted mean for those physicians is 2.98.

Figure 15. Weighted Mean Rank of Performance vs. Promise by Top 10 Vendors



Source: AMB, ABOE Survey Data, 2013–2015.

Table 24. Summary of All EMR Ranking Criteria

Criterion	*Weighted Mean*	*Number of Physicians*
Ease of Use	3.3	7,879
Effect on Physician Productivity	3.0	7,866
Effect on Staff Productivity	3.0	7,815
Reliability	3.5	7,827
Performance vs. Promise	3.1	7,702
Mean of the Weighted Means	3.2	--

Source: AMB, ABOE Survey Data, 2013–2015.

Ease of use and reliability are more highly ranked than effects of EMRs on productivity or perceptions of performance versus vendor promises. The differences are small and one must recognize that physicians who were not involved in the decision to implement a system may not be aware of vendors' promises. A summary of weighted means for each EMR ranking criteria by the more commonly listed vendors is listed in Appendix F.

The next section considers the extent to which physicians were aware of incentives to adopt EMRs and the extent to which applications for incentives were made. Many physicians in large

organizations do not make these decisions and a large number of respondents did not answer the incentive questions.

EMR Adoption Incentives

The costs of implementing an EMR system are one of the most significant obstacles to EMR adoption and the problem is especially difficult for relatively small health care organizations. Economic incentives have been effective in increasing the rate of adoption nationally. A 2010 study of e-prescribing shows, for example, that nearly 40 percent of e-prescribers had adopted e-prescribing in response to a federal incentive program (Joseph, et al. 2013).

There are a number of conditions defining eligibility for Medicare or Medicaid incentives (Centers for Medicare & Medicaid Services 2012). The basic eligibility criteria for hospitals under the Medicare incentive program are:

- Subsection (d) hospitals that are paid under the inpatient prospective payment system (PPS)
- Critical Access Hospitals (CAH)
- Medicare Advantage (MA-Affiliated) Hospitals

The Medicaid Eligible Hospitals include:

- Acute care hospitals with at least 10% Medicaid patient volume
- Children's hospitals

Eligible Professionals for Medicaid incentives include:

- Physicians (primarily MD and DO)
- Nurse Practitioners
- Certified nurse-midwives
- Dentists
- Physician assistants who furnish services in a federally qualified community health center or rural health clinic led by a physician assistant.

Eligible Professionals for Medicare incentives include:

- MDs and DOs
- Doctor of dental surgery or dental medicine
- Doctor of podiatry
- Doctor of optometry
- Chiropractor

The available survey data do not adequately distinguish between eligible and non-eligible physicians. The results include, therefore, physicians in environments to which the incentives do not apply. We hope to improve this analysis in future reports.

The incentive payments made by Medicare and Medicaid (AHCCCS) in Arizona are summarized in Tables 25 and 26. As noted, we do not have the data needed to link adoptions to incentives, but it is true that the recent increases in the rate of adoption of EMRs are correlated with the incentive payments made to health care providers.

Table 25. Total Arizona Medicare and Medicaid EHR Incentive Payments by Provider Type (January 2011 – July 2015)

Provider Type	*Number of Payments*	*Amount of Incentive Payments*
Medicare Eligible Professionals	11,548	$137,978,967
Medicaid Eligible Professionals	3,860	$70,547,182
Total Eligible Professionals	15,408	$208,526,149
Medicare Eligible Hospital	2	$1,976,688
Medicaid Eligible Hospitals	5	$8,959,532
Medicare/Medicaid Eligible Hospitals (Medicare)	165	$198,349,840
Medicare/Medicaid Hospitals (Medicaid)	158	$147,122,196
Total Eligible Hospitals	330	$356,408,256
Total EPs and EHs	15,738	$564,934,405

Source: Centers for Medicare and Medicaid Services, July Payments by States by Program and Provider, https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/July2015_PaymentsbyStatebyProgramandProvider.pdf.

Table 26. Summary of AHCCCS Payments to Eligible Professionals as of July, 31 2013

Eligible Professionals	*Number of Providers*
Physicians (non-Pediatric)	1,384
Physicians (Pediatricians)	577
Physician Assistants (Federally Qualified Health Center)	5
Nurse Practitioners	293
Certified Nurse Midwives	71
Dentists	109
Total Eligible Professional Payments*	2,439

Source: (Johnson, Harootunian and Mayer 2013).

Note: *There were 3,200 payments attested, but 2,439 (76%) were paid.

The success in incentivizing physicians to adopt EMRs will continue, and there are physicians as yet unaware of the opportunities. Physicians in large organizations are often unaware of decisions regarding incentives. Others may practice in settings that are ineligible for incentives. We will more fully analyze these relationships when the current renewal cycle is completed.

Table 27. Medicare/Medicaid Incentive Payments (N = 9,565)

Aware of Incentive Payments	Number of Physicians	Percent
No	1,618	16.9%
Yes	7,947	83.0%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 2,340 physicians did not respond to this question.

The data in Table 27 support our speculation concerning the relationship between physicians' awareness of incentives and the organization in which they practice. The largest percentages of physicians not knowledgeable about incentives are employed in Public or Private Insurer/Health Related Organization that does not provide care (generally not eligible for incentives), followed by City, State or County hospital systems. Solo practice physicians are the group most aware of the incentive programs with only approximately 9% of them who are not aware. The number of physicians in practices that have applied for Medicare incentive payments is described in Tables 29 through 32.

Table 28. Awareness of Incentive Payments by Type of Practice and Decision Maker (N = 9,226)

Type of Practice	*Aware of Incentive Payments*					
	Sole decision maker		*Decided by others*		*Shared decision*	
	Yes	*No*	*Yes*	*No*	*Yes*	*No*
	Number of Physicians (Percent)	*Number of Physicians (Percent)*	*Number of Physicians (Percent)*	*Number of Physicians (Percent)*	*Number of Physicians (Percent)*	*Number of Physicians (Percent)*
Physician Owned Solo Practice	1,496 (90.1%)	153 (9.2%)	7 (0.4%)	1 (0.0%)	2 (0.1%)	0 (0.0%)
Physician Owned Group Practice	1,898 (59.7%)	147 (4.6%)	785 (24.6%)	213 (6.7%)	130 (4.0%)	6 (0.1%)
Hospital/Medical School Group Practice	59 (3.5%)	29 (1.7%)	1,198 (71.6%)	336 (20.1%)	44 (2.6%)	5 (0.2%)
Community or Rural Health Center	4 (0.7%)	2 (0.3%)	372 (73.6%)	92 (18.2%)	34 (6.7%)	1 (0.1%)
Private Hospital System	33 (3.7%)	8 (0.9%)	575 (65.7%)	223 (25.4%)	32 (3.6%)	4 (0.4%)
Non-Hospital Private Outpatient Facility	29 (7.1%)	9 (2.2%)	258 (63.7%)	80 (19.7%)	27 (6.6%)	2 (0.4%)
Medical School, University Research Center	5 (1.2%)	0 (0.0%)	282 (68.1%)	109 (26.3%)	16 (3.8%)	2 (0.4%)
Health Insurer/Health Related Organization that does not provide care	4 (8.8%)	0 (0.0%)	18 (40.0%)	19 (42.2%)	3 (6.6%)	1 (2.2%)
City, State or County Clinic or Hospital System	0 (0.0%)	0 (0.0%)	72 (59.0%)	46 (37.7%)	3 (2.4%)	1 (0.8%)
Other	30 (8.5%)	10 (2.8%)	211 (60.1%)	85 (24.2%)	14 (3.9%)	1 (0.2%)
Hospice or SNF	1 (7.1%)	0 (0.0%)	12 (85.7%)	1 (7.1%)	0 (0.0%)	0 (0.0%)
Independent Contractor	3 (14.2%)	0 (0.0%)	9 (42.8%)	7 (33.3%)	2 (9.5%)	0 (0.0%)
Medical Consultant	4 (40.0%)	1 (10.0%)	1 (10.0%)	3 (30.0%)	0 (0.0%)	1 (10.0%)
Mental/Behavioral Health	0 (0.0%)	0 (0.0%)	2 (66.6%)	1 (33.3%)	0 (0.0%)	0 (0.0%)
Total	3,558 (38.5%)	358 (3.8%)	3,778 (40.9%)	1,204 (13.0%)	305 (3.3%)	23 (0.2%)

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 2,679 physicians were excluded from this table due to missing data, including 2,340 missing Awareness of Incentive Payments; 1,533 missing the Type of Practice; and 2,305 missing the Decision Maker.

Table 29. Applications for Medicare Incentives (N = 7,894)

Applied for Medicare Incentives	*Number of Physicians*	*Percent*
No	2,909	36.8%
Yes	4,985	63.1%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 4,011 did not respond to this question.

Table 30. Applications for Medicare Incentives by Type of Practice (N = 7,878)

Type of Practice	*Applied for Medicare Incentives*			
	Yes		*No*	
	Number of Physicians	*Percent*	*Number of Physicians*	*Percent*
Physician Owned Solo Practice	779	51.1%	743	48.8%
Physician Owned Group Practice	2,074	71.8%	814	28.1%
Hospital/Medical School Group Practice	921	68.4%	425	31.5%
Community or Rural Health Center	302	68.3%	140	31.6%
Private Hospital System	389	58.8%	272	41.1%
Non-Hospital Private Outpatient Facility	171	54.2%	144	45.7%
Medical School, University Research Center	190	59.1%	131	40.8%
Health Insurer/Health Related Organization that does not provide care	5	16.1%	26	83.8%
City, State or County Clinic or Hospital System	33	41.2%	47	58.7%
Other	108	39.7%	164	60.2%
Hospice or SNF	2	15.3%	11	84.6%
Independent Contractor	2	13.3%	13	86.6%
Medical Consultant	1	14.2%	6	85.7%
Mental/Behavioral Health	0	0	2	100.0%
Total	4,972	63.1%	2,906	36.8%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 4,027 physicians were excluded from this table due to missing data, including 4,011 physicians missing applied for Medicare incentives and 1,533 missing type of practice related questions.

Table 31. Applications for Medicaid Incentives (N = 7,762)

Applied for Medicaid Incentives	*Number of Physicians*	*Percent*
No	3,781	48.7%
Yes	3,981	51.2%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 4,143 physicians did not respond to this question.

Table 32. Applications for Medicaid Incentives by Type of Practice (N = 7,746)

Type of Practice	*Applied for Medicaid Incentives*			
	Yes		*No*	
	Number of Physicians	*Percent*	*Number of Physicians*	*Percent*
Physician Owned Solo Practice	483	32.0%	1,024	67.9%
Physician Owned Group Practice	1,465	51.6%	1,372	48.3%
Hospital/Medical School Group Practice	862	65.5%	453	34.4%
Community or Rural Health Center	320	74.0%	112	25.9%
Private Hospital System	364	55.9%	287	44.0%
Non-Hospital Private Outpatient Facility	175	55.9%	138	44.0%
Medical School/University Research Center	174	55.0%	142	44.9%
Health Insurer/Health Related Organization that does not provide care	3	9.6%	28	90.3%
City, State or County Clinic or Hospital System	33	41.7%	46	58.2%
Other	93	35.0%	172	64.9%
Hospice or SNF	1	8.3%	11	91.6%
Independent Contractor	3	20.0%	12	80.0%
Medical Consultant	1	14.2%	6	85.7%
Mental/Behavioral Health	0	0	2	100.0%
Total	3,972	51.2%	3,774	48.7%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 4,159 physicians were excluded from this table due to missing data, including 4,143 physicians missing applied for Medicaid incentives and 1,533 missing type of practice related questions.

Meaningful Use

Table 33. EMR Vendor Helping Meet Meaningful Use (N = 5,076)

Is EMR Vendor Helping Meet Meaningful Use	*Number of Physicians*	*Percent*
No	817	16.0%
Yes	4,259	83.9%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 6,829 physicians did not respond to the meaningful use question.

Table 34. EMR Vendor Helping Meet Meaningful Use by Type of Practice (N = 5,062)

Type of Practice	*Yes*		*No*	
	Number of Physicians	*Percent*	*Number of Physicians*	*Percent*
Physician Owned Solo Practice	681	79.5%	175	20.4%
Physician Owned Group Practice	1,782	84.6%	324	15.3%
Hospital/Medical School Group Practice	768	85.6%	129	14.3%
Community or Rural Health Center	277	87.3%	40	12.6%
Private Hospital System	315	84.4%	58	15.5%
Non-Hospital Private Outpatient Facility	151	81.6%	34	18.3%
Medical School, University Research Center	154	84.6%	28	15.3%
Health Insurer/Health Related Organization that does not provide care	4	80.0%	1	20.0%
City, State or County Clinic or Hospital System	28	87.5%	4	12.5%
Other	88	80.7%	21	19.2%
Hospice or SNF	1	100.0%	0	0.0%
Independent Contractor	2	66.6%	1	33.3%
Medical Consultant	0	0.0%	1	100.0%
Private Hospital - Not for Profit	9	100.0%	0	0.0%
Mental/Behavioral Health	0	0.0%	0	0.0%
Total	4,248	83.9%	814	16.0%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 6,843 physicians were excluded from this table due to missing data, including 1,533 missing type of practice.

Table 35. Support from Regional Health Extension Center by Decision Maker (N = 8,935)

Aware of Support Offered by AZ Regional Extension Center	*Decision Maker*					
	Decided by others		*Shared decision*		*Sole decision maker*	
	Number of Physicians	*Percent*	*Number of Physicians*	*Percent*	*Number of Physicians*	*Percent*
No	4,192	87.8%	237	71.6%	2,397	62.5%
Yes, but not working with them at present	578	12.1%	92	27.7%	1,092	28.5%
Yes, working with them	4	0.0%	2	0.6%	341	8.9%
Total	4,774	100.0%	331	100.0%	3,830	100.0%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 2,970 physicians were excluded from this table due to missing data, including 2,701 missing Awareness of Support Offered; and 2,305 missing the Decision Maker.

The overall survey results suggest that more than three-quarters of the respondents were not aware of the support offered by the Arizona Regional Extension Center (REC). The result is, however, misleading because many physicians do not participate in decisions to adopt EMRs. The results in Table 35 separate physicians according to their role in decision making. The most relevant group is physicians who are the sole decision makers. These physicians are often the owners of group practices and, of course, physicians in solo practice. Approximately 63% of the sole decision makers are not aware of the REC support. An additional 28.5% are aware of the support, but are not working with REC.

Further analysis of the results will be completed to classify the physicians by their eligibility for REC support. The results are also limited by the number of physicians who either did not respond to the decision maker question and/or the question on the awareness of support. The survey includes a question that offers physicians the opportunity to submit a request for information to the REC. Lists of the requesters are periodically delivered to the REC for further action.

Plans to Install EMRs

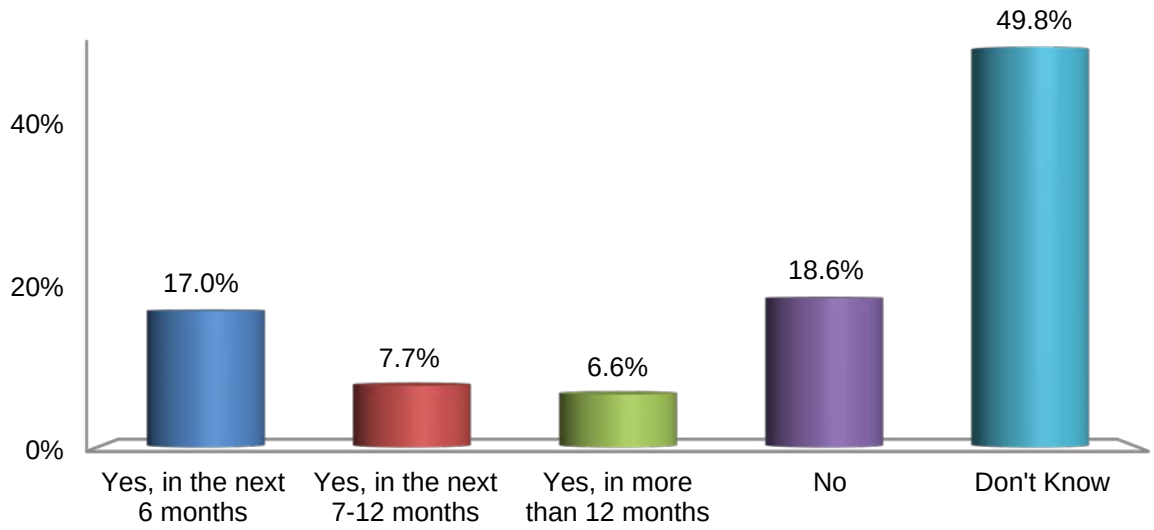
Table 36. Non-EMR Users Plans for Adoption of EMRs (N = 439)

Future Plans to Adopt EMRs	*Number of Physicians*	*Percent*
Don't Know	219	49.8%
No	82	18.6%
Yes, in more than 12 months	29	6.6%
Yes, in the next 7-12 months	34	7.7%
Yes, in the next 6 months	75	17.0%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results.

Figure 16. Non-EMR Users Plans for Adoption of EMRs (N = 439)



Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results.

Table 37. Plans to Install EMRs by Vendor (N = 288)

Vendor	*Number of Physicians*	*Percent*
Allscripts	20	6.9%
Amazing Charts	5	1.7%
Athena Health	1	0.3%
Cerner	23	7.9%
eClinicalWorks	4	1.3%
Epic	13	4.5%
Greenway Medical	1	0.3%
McKesson	2	0.6%
Meditech	1	0.3%
NextGen	6	2.0%
Office Practicum	1	0.3%
Sage	3	1.0%
Other	54	18.7%
Don't Know	154	53.4%
Total	288	100.0%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings are excluded from these results.

Table 38. Plans to Switch EMRs by Vendor (N = 2,087)

Vendor	*Number of Physicians*	*Percent*
Allscripts	130	6.2%
Amazing Charts	4	0.1%
Aprima	2	0.0%
Athena Health	15	0.7%
Cerner	390	18.6%
eClinicalWorks	38	1.8%
e-MDs	7	0.3%
Epic	368	17.6%
McKesson	17	0.8%
Meditech	5	0.2%
NextGen	91	4.3%
Noteworthy	1	0.0%
Office Practicum	1	0.0%
Sage	2	0.0%
SOAPware	4	0.1%
Other	242	11.5%
Don't Know	770	36.8%
Total	2,087	100.0%

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings are excluded from these results.

The Target Population

The data presented to this point are good profiles of the characteristics of the EMR users. It remains to describe the physicians who have not adopted EMRs. They are the targets of incentives that seek to increase EMR utilization. Their numbers are estimated in Table 39 by applying the population weights (W = 1.29 per respondent for 2013-2015, which is a complete two year renewal cycle. The weights for the three previous completed renewal cycles are 1.1 per respondent for 2012-2014, 1.97 per respondent in 2007-2009, and 1.30 in 2009-2011 to the numbers (N) of survey respondents.

The target population of Non-EMR users in each county is described in Table 39. There are approximately 1,450 physicians who do not currently use EMRs. The target population ranges from three physicians in Santa Cruz County to 1,226 physicians in Maricopa County.

The estimates of target populations by county are a guide to the prioritization of some types of incentives designed to expand the use of EMRs. The smaller the target population in a county is, the lower the priority for a project with a fixed budget. Some of the potentially low yield areas are also the areas where time and travel costs of some interventions will be relatively high. If, for example, an initiative includes IT support services on an ongoing basis, counties such as Apache, Gila or La Paz offer small payoffs and relatively high costs in terms of travel time for support personnel.

Table 39. The Target Population of Physicians without EMRs by County, 2013-2015 (N = 9,708)

Location	*2013-2015 Renewal Cycle*			
	All Survey Respondents (N)	*Survey Respondents EMR Users (N)*	*Survey Respondents Non-EMR Users (N)*	*The Target Population (W*N)*
Apache	16	12	4	5
Cochise	96	88	8	10
Coconino	231	204	27	35
Gila	46	40	6	8
Graham	25	22	3	4
Greenlee	1	1	0	0
La Paz	11	11	0	0
Maricopa	6,389	5,439	950	1,225
Mohave	254	217	37	48
Navajo	64	56	8	10
Pima	1,667	1,409	258	333
Pinal	138	116	22	28
Santa Cruz	17	15	2	3
Yavapai	250	224	26	34
Yuma	202	187	15	19
Missing	16	16	0	0
Unknown	285	219	66	85
Total	9,708	8,276	1,432	1,847

Source: AMB, ABOE Survey Data, 2013-2015.

Note: Table does not include fully retired physicians or physicians practicing in government settings. 355 respondents were of unknown/missing county.

The target population is calculated as the number of non-EMR users multiplied by the population weight (1.29).

The results also suggest consideration of different approaches to increase EMR utilization for different geographic areas. We know from our multivariate results, for example, that the rate of EMR use is, all else equal, at its lowest among older physicians. It seems equally likely that the required investments and the relatively short period for the return on investment will make their potential rates of adoption much lower than among younger physicians. Age and other criteria can be added to the definition of the target population to sharpen the focus of planned interventions. The data described in Table 39 provide estimates of the target population that

can be used as a baseline against which to compare the success of interventions designed to increase the use of EMRs.

Progress in the expansion of EMR use in each county can be measured by comparing the 2013-2015 targets to the estimates from previous renewal cycles. We rely on comparisons between 2007-2009 and 2012-2014 because of the variability in the county results for 2009-2011.

Table 40. Trends in the Target Population of Physicians without EMRs by County, 2013-2015 vs. 2012-2014 vs. 2007-2009

Location	*Non- Users of EMRs as a Percent of Physicians*		
	2013-2015	*2012-2014*	*2007-2009*
Apache	25.0%	31.6%	47.1%
Cochise	8.3%	17.0%	56.6%
Coconino	11.7%	16.7%	56.8%
Gila	13.0%	18.2%	67.7%
Graham	12.0%	13.3%	57.9%
Greenlee	0.0%	0.0%	57.9%
La Paz	0.0%	36.4%	66.7%
Maricopa	14.9%	20.3%	57.2%
Mohave	14.6%	16.9%	64.1%
Navajo	12.5%	29.2%	52.9%
Pima	15.5%	19.7%	56.0%
Pinal	15.9%	14.3%	52.1%
Santa Cruz	11.8%	5.3%	77.8%
Yavapai	10.4%	13.6%	62.6%
Yuma	7.4%	16.5%	73.3%
Total	14.8%	20.5%	57.6%

Source: AMB, ABOE Survey Data, 2007-2009; 2012-2014, 2013-2015.

Table 41. The Target Population of Physicians without EMRs by County, 2009-2011 vs. 2007-2009

Location	2009-2011			2007-2009		
	All Survey Respondents (W)	*Survey Respondents Non-EMR Users (W)*	*Target Population (W*N)*	*All Survey Respondents (N)*	*Survey Respondents Non-EMR Users (N)*	*Target Population (W*N)*
Apache	54	27	35	17	8	16
Cochise	110	42	55	76	43	85
Coconino	231	108	140	176	100	197
Gila	49	17	22	31	21	41
Graham	26	14	18	19	11	22
Greenlee	9	9	12	5	4	8
La Paz	9	9	12	9	6	12
Maricopa	5,229	2,859	3,717	4,371	2,500	4,925
Mohave	188	113	147	184	118	232
Navajo	105	46	60	68	36	71
Pima	1,965	857	1,114	1,376	771	1,519
Pinal	153	90	117	94	49	97
Santa Cruz	47	15	20	18	14	28
Yavapai	262	122	159	163	102	201
Yuma	149	92	120	135	99	195
Total	8,586	4,420	5,746	6,742	3,882	7,648

Source: AMB, ABOE Survey Data, 2007-2009; 2009-2011.

Note: Table does not include fully retired physicians. 342 respondents did not identify a method of storing medical records in 2007-2009.

The target population is calculated as the number of non-EMR users multiplied by the population weight (1.97 in 07-09 and 1.3 in 09-11).

The results in Table 39 document a substantial reduction in the percentage of physicians who do not use EMRs. On average, across all counties, there was more than a three-fold reduction in the percentage of physicians without access to an EMR between 2007-2009 and 2013-2015. The reduction was larger in many of the rural counties than in either Maricopa or Pima County.

Physicians and health care organizations that are not yet connected to a network that permits them to exchange information are another part of the target population. As the results on individual physician use show, EMR use continues to increase but the ability to exchange

information languishes. AHCCCS and ASET are addressing the problem with incentive payments to unconnected providers. The data in Table 42 describes the awardees from the Unconnected Providers grant program, many of which serve rural areas of the state of Arizona.

Table 42. Grant Awards to Rural Providers to Plan for HIE

Unconnected Providers Sub-Grantee Award Information	
Sub-Grantee	*Funds Requested*
A New Leaf, Inc.	$50,000
CONMED Health Management	$50,000
Copper Queen Community Hospital	$50,000
Flagstaff Medical Center, Inc.	$98,007
Jewish Family and Children's Service, Inc.	$100,000
La Paz Hospital, Inc.	$50,000
Little Colorado Medical Center	$99,955
North Country Healthcare, Inc.	$100,000
People of Color Network, Inc.	$100,000
Quality Care Network	$100,000
Sierra Vista Regional Health Center, Inc.	$50,000
Symphony of Mesa and Springdale Village	$40,385
Terros, Inc.	$100,000
Villa Maria Care Center, LLC/CopperSands, Inc.	$42,210
Total Awarded Funds	$1,030,557

Source: (Johnson, Harootunian and Mayer 2013).

Table 43 are the grants that were awarded under a second program which focused on large health care organizations who were creating, developing or maturing HIE capabilities that would accelerate connecting providers within their own networks.

Table 43. HIE Enterprise Grant Program Awardees

Awardee	*Type of Organization*	*Revised Award Amount*
Jewish Family and Children's Services/ Behavioral Health Information Network of Arizona (BHINAZ)	HIE	$200,000
Tuba City Regional Healthcare Organization	Integrated Delivery Network	$134,525
Dignity Health	Integrated Delivery Network/Enterprise Wide HIE	$185,792
People of Color Network	Behavioral Health Provider/ Primary Care/ Enterprise Wide HIE/ Integrated Delivery Network	$200,000
Total Awarded Funds		$720,317

Source: (Arizona Strategic Enterprise Technology 2013)

Summary & Conclusion

The percentage of Arizona physicians using EMRs increased from approximately 45% in 2007-2009 to approximately 85% in 2013-2015. The current trend suggests that nearly all Arizona physicians will be using EMRs by 2018. The results from 2007-2015 consistently show that utilization of EMRs is lowest among older physicians and physicians in solo practices. The findings are similar to the results of national surveys. The increased use of EMRs in Arizona reflects the gradual replacement of retiring older physicians by younger physicians and the consolidation of solo practices into larger group practices or hospital based practices. The growth is also induced by Medicare and Medicaid incentive payments.

The use of EMRs increased more rapidly in the rural counties of Arizona than in the urbanized areas. The Medicare and Medicaid incentives and the support from organizations such as the REC are often directed to organizations with the most need, including smaller practices which typify rural medicine. This appears to have had a very significant impact on the use of EMRs by rural health care providers and Community Health Centers.

The expected benefits of EMRs, such as the avoidance of duplicative tests, require the exchange of information among health care providers. The lack of communication networks is now a much more important obstacle to the realization of the benefits of EMRs than is underutilization of EMRs. Among physicians with EMRs that include functions such as *e*-prescribing, patient summaries and others, slightly less than 20% to around 46% of the physicians share information with other providers. The data, however, include exchanges among providers within organizations such as hospital systems. Exchanges between hospital systems or among solo or group practices are much less frequent.

HINAz continues to expand and its future is hopeful. It currently serves 49 participants.

This report is the second in the CHiR series to include physician rankings of EMRs by brand. EMRs were ranked on a 1-5 scale where 1=Awful and 5=Outstanding. Twenty five different EMR packages were ranked on each of five criteria.

Many articles in the press and on-line discussions among HIE professionals suggest that physicians are very dissatisfied with the EMRs that they use. The results presented here differ, indicating that physicians are at least somewhat positive about the EMR software that they use with their rankings averaging slightly more than the midpoint in the 1-5 scale. Ease of use and

reliability receive the highest rankings, although the variance among rankings of the five criteria is very small. The more accurate conclusion may be that physicians seek to improve individual elements of their EMRs, but recognize that EMRs offer advantages not available from scanned records or paper medical records.

We have revised the survey questions to include a focus on the use of and obstacles to the exchange of information among physicians who use EMRs. The new survey also includes an enhanced focus on Medicaid providers. The implementation of the survey was delayed by workload problems at the Arizona Board of Medical Examiners, so the survey did not go into the field until April 1, 2015. Those results will be presented in the next report from this study.

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Appendix A: Comparison to National Surveys

The results of a national survey of EMR use and attitudes toward the adoption of EMRs by physicians with the American Medical Association (AMA) memberships were published on July 3, 2008 (DesRoches, et al. 2008; Jha, DesRoches, et al. 2009). The results cannot be strictly compared to the results reported here because of differences in the structure of the sample and some differences in methods. The sample design does not, for example, provide estimates for Arizona and is limited to members of the AMA.

The ASU study queries all physicians who renew their Arizona licenses. The practice began in 1992 and with a few interruptions has continued. The data are not, therefore, a sample but rather a census of all physicians. Some characteristics, drawn from the information required for licensing, are obtained for all physicians while the survey questions are voluntary and obtained from those physicians who choose to respond. Fully retired physicians were not asked to respond to the survey questions.

The national survey results are restricted to non-federal, allopathic physicians directly involved in patient care who are members of the AMA. Doctors of Osteopathy were excluded. Other exclusions included physicians working in federally owned hospitals, those who requested not to be contacted; radiologists; anesthesiologists; pathologists; psychiatrists; no known address; medical school students and physicians not providing patient care.

The NCHS released the preliminary results of a mail survey of a national sample of office based physicians in December 2008. The survey, conducted from April through August 2008 shows that 38.4% of physicians used full or partial EMR systems in their office based practices. Approximately 20.4% of the physicians used systems that included orders for prescriptions, orders for tests, results of lab or imaging tests and clinical notes (Hsiao and Hing 2012). As indicated in Table A – 1 below, our results are much closer to the NCHS study than the NEJM study. The difference between the two national studies is surprisingly large give the apparent similarities in sample design.

Table A - 1. Comparison of CHiR Survey vs. National EMR Surveys (under revision 9/24/15)

Study	*Data Source*	*Sample Size*	*Characteristics of Sample, Exclusions*	*Percent of Physicians with EMR**	*Definition of basic EMR*	*Definition of connected EMR*	*Definition of fully functional EMR*
Hing et al. (2007)	2006 National Ambulatory Medical Care Survey	1,311	Sample consists of non-federal, office-based physicians who see patients in an office setting.	29.2% (B) 12.4% (F)	Use of full or partial electronic records	NA	Can electronically order prescriptions & tests, report results to lab or radiology; manage clinical notes
DesRoches et al. (2008)	Survey created by the study team and Research Triangle Institute	2,758	Sample consists of US physicians who provide direct patient care. Exclusions: D.O.s, residents, physicians in federally owned hospitals, retired physicians, radiologists, anesthesiologists, pathologists, psychiatrists, hospitalists, part-time, physicians who worked < 20 hour per week.	13% (C) 4% (F)	NA	EMR can store demographic data, problem lists, medication lists, and clinical notes; can order prescriptions; can view laboratory results and imaging results. (Study authors refer to this type of record as a "basic EMR")	All capabilities listed in previous column, plus enhanced order-entry management and clinical-decision support
AHCCCS/ CHIR (2009)	Survey created by study team and Arizona Hospital and Health Care Association; Licensing data from Arizona Medical Board and Arizona Board of Osteopathic Examiners	10,813	This sample includes Arizona-based physicians who provide direct patient care and exclude the following: DOs, residents, retired/semi-retired, physicians in government settings, radiologists, anesthesiologists, pathologists, psychiatrists, hospitalists. Specialty exclusions were for Primary Specialty. (exclusions not part of full survey..applied to compare to DesRoches.	40.8% (B) 19.9% (C) 6.1% (F)	Use of electronic files as method of storing medical records	EMR that is connected to at least one of the following: hospital, radiology, lab, pharmacy	EMR that is connected to all of the following: radiology, lab, pharmacy

*B = basic EMR, C = connected EMR, F = fully functional EMR

Table A - 2. Comparison of CHiR Survey vs. National EMR Surveys (cont.)

Study	*Data Source*	*Sample Size*	*Characteristics of Sample, Exclusions*	*Percent of Physicians with EMR**	*Definition of basic EMR*	*Definition of connected EMR*	*Definition of fully functional EMR*
Jamoom et al. (2012)	2011 Physician Workflow Survey	3,180	Sample consists of non-federal, office-based physicians who see patients in an office setting. Excludes: radiologists, anesthesiologists and Pathologists	54%	Electronic medical records or electronic health records not including billing records	NA	?
CHiR/ AHCCCS (2012)	Survey created by CHIR and AHCCCS; Licensing data from Arizona Medical Board and Arizona Board of Osteopathic Examiners		Sample consists of all Arizona physicians with active licenses who renewed their license between November 1, 2009 and November 1, 2011. Exclusions: non-Arizona physicians, fully retired physicians.	44.5% (B) 24.1% (C) 9.3% (F			
	Survey created by study team and Arizona Hospital and Health Care Association; Licensing data from Arizona Medical Board and Arizona Board of Osteopathic Examiners	10,813	Arizona-based physicians who provide direct patient care and exclude the following: DOs, residents, retired/semi-retired, physicians in government settings, radiologists, anesthesiologists, pathologists, psychiatrists, hospitalists. Specialty exclusions were for Primary Specialty.	40.8% (B) 19.9% (C) 6.1% (F)	Use of electronic files as method of storing medical records	EMR that is connected to at least one of the following: hospital, radiology, lab, pharmacy	EMR that is connected to all of the following: radiology, lab, pharmacy
			Sample consists of all Arizona physicians with active licenses who renewed their license between November 1, 2009 and November 1, 2011. Exclusions: non-Arizona physicians, fully retired physicians.	44.5% (B) 24.1% (C) 9.3% (F)			

Table A - 3. Comparison of CHiR Survey vs. National EMR Surveys (cont.)

Study	*Data Source*	*Sample Size*	*Characteristics of Sample, Exclusions*	*Percent of Physicians with EMR**	*Definition of basic EMR*	*Definition of connected EMR*	*Definition of fully functional EMR*
DesRoches et al. (2013)	American Medical Association Physician Masterfile.	1820 primary care physician and specialists in office-based practices	Primary care physicians. Board certified in adolescent medicine, family practice, general practice, general preventive medicine, internal medicine, or pediatrics.	43.5%	Computerized system that can view and manage patient demographics, patient problem lists, electronic lists of medications taken by patients, clinical notes, orders for prescriptions, laboratory results, and imaging results.	NA	NA
Geisler et al. (2010)	NHAMCS (2005-2006)	694 EDs	Non-Federal hospital EDs. No exclusions were made.	46% of EDs reported having an EMR	EMR systems that included demographic information, CPOE, lab and imaging results. 'Basic with Clinical Notes' was a separate classification.	NA	A comprehensive EMR system include characteristics from basic EMR, basic with clinical notes EMR, and also included electronic prescribing, radiographic image display, and decision support.

Table A - 4. Comparison of CHiR Survey vs. National EMR Surveys (cont.)

Study	*Data Source*	*Sample Size*	*Characteristics of Sample, Exclusions*	*Percent of Physicians with EMR**	*Definition of basic EMR*	*Definition of connected EMR*	*Definition of fully functional EMR*
Hing et al. (2010)	2007 National Ambulatory Medical Care Survey (NAMCS)	1,743	Sample of office-based physicians who reported they were direct patient care. Specialists in radiology, anesthesiology, and pathology were excluded.	34.8% of office-based physicians	Systems that included patient demographic information, patient problem lists, clinical notes, orders for prescriptions, and viewing laboratory and imaging results.	NA	Systems that included characteristics of basic system plus medical history and follow-ups, orders for tests, prescription and test orders sent electronically, warnings of drug interactions or contradictions, highlighting out-of-range test levels, electronic images returned, and reminders for guideline-based interventions.

Table A - 5. Comparison of CHiR Survey vs. National EMR Surveys (cont.)

Study	*Data Source*	*Sample Size*	*Characteristics of Sample, Exclusions*	*Percent of Physicians with EMR**	*Definition of basic EMR*	*Definition of connected EMR*	*Definition of fully functional EMR*
Hsaio et al. (2011)	2010, 2011 mail surveys of physicians of physicians in NAMCS	13,081 survey responses – 6,798 from 2010 and 6,283 from 2011	Physicians classified as providing direct patient care in office-based practices, including clinicians in community health centers. Radiologists, anesthesiologists, and pathologists are excluded.	34% of physicians reported having a basic system.	System which has the following functionalities: patient history and demographics, patient problem list, physician clinical notes, comprehensive list of patient's medications and allergies, computerized orders for prescriptions, and ability to view laboratory and imaging results electronically.	NA	NA

Table A - 6. Comparison of CHiR Survey vs. National EMR Surveys (cont.)

Study	*Data Source*	*Sample Size*	*Characteristics of Sample, Exclusions*	*Percent of Physicians with EMR**	*Definition of basic EMR*	*Definition of connected EMR*	*Definition of fully functional EMR*
Kazley et al. (2011)	2005-2008 HIMSS Analytics survey of integrated health delivery systems and 2007-2008 AHA Annual Survey of Hospitals.	3,388 hospitals from 2007 and 3.458 hospitals from 2008.	All hospitals in HIMSS Analytics survey of integrated health delivery systems and AHA Annual Survey of Hospitals.	HIMSS Data - 2005: 49% 2006: 45% 2007: 38% 2008: 39% AHA Data - 2007: 17% (Full), 44% (Partial) 2008: 18% (Full), 51% (Partial)	HIMSS definition was employed – "An application environment that is composed of the clinical data repository, clinical decision support, controlled medical vocabulary, order entry, computerized practitioner order entry, and clinical and physician documentation applications. This environment supports the patient's electronic medical record across inpatient modalities of care and may also support outpatient care services, and is used by healthcare practitioners to document, monitor, and manage health care delivery."	NA	NA

Table A - 7. Comparison of CHiR Survey vs. National EMR Surveys (cont.)

Study	*Data Source*	*Sample Size*	*Characteristics of Sample, Exclusions*	*Percent of Physicians with EMR**	*Definition of basic EMR*	*Definition of connected EMR*	*Definition of fully functional EMR*
Kokkonen et al. (2013)	2003-2010 NAMCS Data	102,965 primary care physician survey responses; 126,000 specialist survey responses	All physicians in NAMCS data.	Partial EMR: 2005: 25.2% 2009: 50.4% 2010: 52% Full EMR - 2005: 14.2% 2009: 37.8% 2010: 39%	No definition was given by the authors. Since NAMCS data was used it is assumed the definition used by Hsaio et al. (2011) was used in this study for the Basic EMR.	NA	NA

Appendix B: CHiR Health Care Workforce Reports and Articles

Butler MJ, Harootunian G, Johnson WG. (June 2013). Are low income patients receiving the benefits of electronic health records? A statewide survey. *Health Informatics Journal*. 19(2):91-100 doi: 10.1177/1460458212460846 PMID: 23715209.

Friedman AL, Basco WT, Hotaling AJ, Pletcher BA, Rimsza ME, Shipman SA, et al. (2007). Enhancing the diversity of the pediatrician workforce. *Pediatrics.* 119(4):833-7. PMID: 17403859.

Furukawa MF, Ketcham JD, Rimsza ME. (2007). Physician practice revenues and use of information technology in patient care. *Medical Care.* 45(2):168-76. PMID: 17224780.

Johnson WG, Harootunian G. (December 2012). W*hat Happened to the Shortage of Registered Nurses: The Arizona Experience 2008-2012.* (Prepared under contract for the Arizona Hospital and Healthcare Association.) Phoenix (AZ): Arizona State University, Center for Health Information & Research.

Johnson WG, Qiu Y, Harootunian G, Edge M. (2010). *The use of electronic medical records and physicians' attitudes towards a health information exchange.* Phoenix (AZ): Arizona State University, Center for Health Information & Research.

Johnson WG, Wilson BL, Edge M, Qiu Y, Oliver EL, Russell KM. (April 2009). *The Arizona health care workforce: nurses, pharmacists, & physician assistants.* (Prepared under contract with the Arizona Hospital and Healthcare Association.) Phoenix, AZ: Center for Health Information & Research.

Johnson WG, Bannister WM, Russell KM, Edge M, Gray H, Merritt R. (June 2008). *Arizona physician trends: reasons for leaving Arizona*. Phoenix (AZ): Arizona State University, Center for Health Information & Research.

Johnson WG, Rimsza ME, Garcy AM, Grossman M. (2005) *The Arizona physician workforce study - part I: the numbers of practicing physicians 1992-2004.* Tempe (AZ): Arizona State University, Center for Health Information and Research.

Johnson WG, Ptak BA, Casper K, Madsen B. (March 1996). The survey of physicians in residencies in Arizona academic year 1993-1994: a report to the Arizona Council for Graduate Medical Education. Tempe (AZ): Arizona State University.

Johnson WG, Meenan RT, Klett D, Ott J, Liddon M, Schneller ES. (1994). *The 1992 survey of physicians: a report to the Arizona Council for Graduate Medical Education*. Tempe (AZ): Arizona State University.

Johnson WG, Meenan RT, Preuss N, Schneller ES. (1993). The survey of medical residents: a report to the Arizona Council for Graduate Medical Education. Tempe (AZ): Arizona State University.

Qiu Y, Johnson WG. (August 2009). *Arizona primary care workforce report*. Phoenix (AZ): Center for Health Information & Research, Arizona State University.

Rimsza ME, Johnson WG, Speicher M, Grossman M. (2006) *The Arizona physician workforce study: part II*. Tempe (AZ): Arizona State University, Center for Health Information and Research.

Rimsza ME, Johnson WG, Speicher M, Grossman M. (2005). *The Arizona psychiatric physician workforce study*. Tempe (AZ): Arizona State University, Center for Health Information and Research.

Schneller ES, Preuss N, Johnson WG, Klett D. (1993). The survey of medical residency programs: a report to the Arizona Council for Graduate Medical Education. Tempe (AZ): Arizona State University.

Wilson BL, Johnson WG. (July/August 2009). Using innovation to assess nursing workforce in Arizona: a collaborative approach. *Nursing Economics.* 27(4):233-238.

Appendix C: Survey Instruments (2007-2015)

Survey Instrument 2007-2011

1. How would you best characterize your practice? (PLEASE DO NOT CHECK MORE THAN TWO)

◯ Fully retired (skip to end)	◯ Community health center	◯ Government (VA, IHS, etc.)
◯ Semi-retired/On Leave	◯ Group Practice	◯ Administrative Medicine
◯ Med school, intern, resident, fellow	◯ Solo Practice	◯ Academic/Teaching/Research
	◯ Hospitalist	◯ Locum Tenens

2. Which of the following are available at your practice location? (CHECK ALL THAT APPLY)
◯ Email ◯ Internet ◯ Fax ◯ Medifax ◯ None of the above

3. How do you submit your bills to payers? (CHECK ALL THAT APPLY)
◯ Email ◯ Internet ◯ Fax ◯ US Mail ◯ Don't Know ◯ N/A

4. Are patients' medical records in your practice/organization stored as:
a. Paper files ◯ Yes ◯ No
Scanned images of paper files ◯ Yes ◯ No
Electronic files ◯ Yes (continue) ◯ No (If no, go to question #5)
◯ The records are stored on a PC/server located in my organization
◯ The records are stored on a server to which I connect via the internet
◯ I don't know where they are stored

b. Is your EMR system connected to: (CHECK ALL THAT APPLY)
◯ Hospital ◯ Pharmacy ◯ Lab ◯ Radiology Center ◯ None of these
Are you the person who decided to purchase an electronic medical record system?
◯ Sole Decisionmaker ◯ Shared Decision ◯ Decided by Others
What is a reasonable amount to pay for an electronic medical record system (per individual provider within a practice setting)?
◯ $5,000-$10,000/provider ◯ $10,000-$20,000/provider ◯ >$20,000/provider

GO TO QUESTION #6

5. Are you the person who would decide to purchase an electronic medical record system?
a. ◯ Sole Decisionmaker ◯ Shared Decision ◯ Decided by Others
b. What best describes the barriers to adoption of electronic medical records in your practice/organization?
◯ Cost ◯ Insufficient Return on Investment ◯ Time/Training ◯ Lack of Interoperability ◯ Attitudes
c. Would you consider an internet-based system (patient records stored offsite) rather than one where the records are stored in your office PC or server? ◯ Yes ◯ No
d. What is a reasonable amount to pay for an electronic medical record system (per individual provider within a practice setting)? ◯ $5,000-$10,000/provider ◯ $10,000-$20,000/provider ◯ >$20,000/provider

6. Would you be willing to participate in a web-based system that permits the exchanges of medical records among health care providers? ◯ Yes ◯ No (if no, SKIP TO #7)
a. Who would you trust to manage the health information exchange system? (CHECK ALL THAT APPLY)

◯ Commercial Vendor	◯ Health Insurer/Managed Care Plan
◯ Hospital System	◯ Regional Health Information Organization (RHIO)
◯ State of Arizona (AHCCCS)	◯ Other

7. ◯ PLEASE SEND ME A COPY OF THE RESULTS

Thank you for completing this survey.

Survey Instrument (2012-2015)

Since 1991, the Arizona Physician Survey has, with the cooperation of physicians, their licensing boards and their professional associations, collected important information on the physician workforce. The current survey focuses on the use of medical records that are electronic (often called electronic medical records (EMRs) or electronic health records (EHRs)). Your participation is encouraged by the *Arizona Medical Association* and the *Arizona Osteopathic Medical Association*. Your answers are confidential and results are published only in aggregate form.

1. Which one of the following **best** describes your employment status ?(check one)
    a. Actively employed in Arizona in direct patient care ☐Yes ☐No {if yes ask:}
        i. I usually treat _____patients in a typical work week.
        ii. I usually work _____hours/day, _____days/week, and _____weeks/year.
    b. Actively employed in Arizona but not in direct patient care ☐Yes ☐No
    c. Actively employed outside of Arizona ☐Yes ☐No {*skip to separate survey questions*}
    d. Semi-retired/on leave ☐Yes ☐No *{go to end fill all intermediate questions with DNA}*
    e. Retired ☐Yes ☐No {go to end fill all intermediate questions with DNA}

2. Which one of the following **best** describes the organization in which you practice
    a. a physician owned solo practice ☐Yes ☐No *{if yes, auto fill 3a=yes; skip to 4}*
    b. A physician owned group practice ☐Yes ☐No
    {if yes then ask}
        i. Approximately how many physicians are associated with this practice?
            1. 2-5 physicians ☐Yes ☐No
            2. 6-50 physicians ☐Yes ☐No
            3. 51-94 physicians ☐Yes ☐No
            4. 95 or more physicians ☐Yes ☐No
    c. A hospital or medical school physician group practice ☐Yes ☐No
    if yes then ask}
        i. Approximately how many physicians are associated with this practice?
            1. 2-5 physicians ☐Yes ☐No
            2. 6-50 physicians ☐Yes ☐No o
            3. 51-94 physicians ☐Yes ☐No
            4. 95 or more physicians ☐Yes ☐No
    d. A community or rural health center(e.g. federally qualified CHC) ☐Yes ☐No
    {if yes then ask}
        i. Approximately how many physicians are associated with this center?
            1. 2-5 physicians ☐Yes ☐No
            2. 6-50 physicians ☐Yes ☐No
            3. 51-94 physicians ☐Yes ☐No
            4. 95 or more physicians ☐Yes ☐No
    e. Federal Government hospital or clinic (e.g. VA, IHS etc.) ☐Yes ☐No { *if yes skip to 5}*
    f. State or County hospital system ☐Yes ☐No *if yes skip to 4}*
    g. Private Hospital system ☐Yes ☐No

h. Private Outpatient Facility not part of a hospital system (e.g. Urgent Care center, insurer owned clinic, etc.) ☐Yes ☐No
{if yes then ask}
    i. Approximately how many physicians are associated with this facility?
        1. 2-5 physicians ☐Yes ☐No
        2. 6-50 physicians ☐Yes ☐No
        3. 51-94 physicians ☐Yes ☐No
        4. 95 or more physicians ☐ Yes ☐ No
i. Medical school ,university, research center ☐ Yes ☐ No
j. Public or private health Insurer, pharmaceutical company or other health related organization that does not provide care. ☐ Yes ☐ No *{if yes then skip to end; auto code intermediate questions as DNA}*
k. Other_____

3. Which of the following **best** describes your primary role in the organization in which you practice? *{(if 2d=yes or 2e=yes or 2f=yes) then set 3b=yes)}*
    a. Owner , partner, part-owner ☐ Yes ☐ No
    {if yes then ask}
        i. Approximately how many of each of the following providers are associated with this practice?
            1. ____ PAs
            2. ____RNs
            3. ____NPs
            4. ____Other Licensed Health Care Providers
    b. Employee/contractor/locum tenens ☐ Yes ☐ No
    c. Faculty ☐ Yes ☐ No
    d. Student (include residents, fellows etc.) ☐ Yes ☐ No

4. Which of the following are available at your practice location? (check all that apply)
    a. Email ☐ Yes ☐ No
    b. Internet (FTP etc.) ☐ Yes ☐ No
    c. Fax ☐ Yes ☐ No
    d. US Mail ☐ Yes ☐ No
    e. Don't know ☐ Yes ☐ No

5. How does the organization in which you practice submit bills/claims to insurers or other payers? (check all that apply)
    a. Email ☐ Yes ☐ No
    b. Internet (FTP etc.) ☐ Yes ☐ No
    c. Fax ☐ Yes ☐ No
    d. US Mail ☐ Yes ☐ No
    e. Don't know ☐ Yes ☐ No

6. How does the organization in which you practice store its medical records? (Check all that apply);
    a. Paper ☐ Yes ☐ No
    b. Scanned images of paper records ☐ Yes ☐ No
    c. Electronic files (an electronic version of a patient's medical history, including progress notes, problems, medications and other information used in treatment.) ☐ Yes ☐ No *{if yes then ask}*
        i. What is the name of your EMR/EHR system

Allscripts ☐ Yes ☐ No
Amazing Charts ☐ Yes ☐ No
Aprima ☐ Yes ☐ No
Athena Health ☐ Yes ☐ No
GE Centricity ☐ Yes ☐ No
Cerner ☐ Yes ☐ No
CHARTCARE ☐ Yes ☐ No
eClinicalWorks ☐ Yes ☐ No
Epic ☐ Yes ☐ No
eMDs ☐ Yes ☐ No
Epic ☐ Yes ☐ No
GE ☐ Yes ☐ No
Greenway Medical ☐ Yes ☐ No
HealthPort ☐ Yes ☐ No
McKesson ☐ Yes ☐ No
Meditech ☐ Yes ☐ No
NextGen ☐ Yes ☐ No
Noteworthy ☐ Yes ☐ No
Office Practic.com ☐ Yes ☐ No
Sage ☐ Yes ☐ No
SOAP ware ☐ Yes ☐ No
Other_____ ☐ Yes ☐ No
Don't know ☐ Yes ☐ No

7. On a scale of 1 (awful) to 5 (outstanding), how would you rate your EMR/EHR system in terms of:
   a. Ease of use ☐1 ☐2 ☐3 ☐4 ☐5
   b. Effect on your productivity ☐1 ☐2 ☐3 ☐4 ☐5
   c. Effect on staff productivity ☐1 ☐2 ☐3 ☐4 ☐5
   d. Reliability ☐1 ☐2 ☐3 ☐4 ☐5
   e. Performance versus vendor's promises ☐1 ☐2 ☐3 ☐4 ☐5

8. *{if 6c=yes} then ask:* Does the EMR/EHR system include the following functions? (CHECK ALL THAT APPLY) *{if 6c ne yes then auto fill DNA and skip to 8}*

Functions	**Is the Function Included in the EMR?**	**Do You Use the Function?**	**Do you exchange this information using your EMR/EHR to organizations outside your practice?"**
Patient Care Summary	☐Yes ☐No ☐Don't Know {If yes then go to next row}	☐ Yes ☐ No	☐Yes ☐No ☐Don't Know
Prescriptions (e-prescribing)	☐ Yes ☐ No ☐ Don't Know {If yes then go to next row}	☐ Yes ☐ No	☐Yes ☐No ☐Don't Know
Lab Test Results	☐Yes ☐No ☐Don't Know {If yes then go to next row}	☐ Yes ☐ No	☐Yes ☐No ☐Don't Know
Reminders for Guideline Based Interventions	☐Yes ☐No ☐Don't Know {If yes then go to next row}	☐ Yes ☐ No	☐Yes ☐No ☐Don't Know
Public Health Reports: immunizations, notifiable diseases	☐Yes ☐No ☐Don't Know {If yes then go to next row}	☐ Yes ☐ No	☐Yes ☐No ☐Don't Know
Quality Metrics (HEDIS, AQA etc.)	☐Yes ☐No ☐Don't Know {If yes then go to next row}	☐ Yes ☐ No	☐Yes ☐No ☐Don't Know

9. {if 6c=yes and (3a=yes or 3b=yes or 3c=yes or 3d=yes) then ask}: Are you aware of the incentive payments from Medicare and Medicaid to physicians who adopt EMRs/EHRs that meet **meaningful use criteria**?
    a. ☐ Yes ☐ No {if no skip to c}
    b. Have you applied OR are you planning to apply for the meaningful use incentives offered by Medicare and Medicaid? Medicare ☐Yes ☐No Medicaid ☐Yes ☐ No {if both No *skip to c}*
    c. Is your EMR/EHR vendor helping you to meet the **meaningful use criteria**?
        i. ☐ *Yes*
        ii. ☐ *No*
    d. Are you aware of the support offered by the Arizona Regional Extension Center?
        i. ☐ *Yes :workin*g with them {go to wind up question}
        ii. ☐ Yes but not working with them at present
        iii. ☐ No

        If you would like more information on the Arizona Regional Extension Center you can contact them at 602-688-7200 or *her@azhec.org* Or
        Would you like us to submit a request with your name and address but not reveal any other information included on this survey? ☐ Yes ☐ No

{if (3a=yes then code 9ai=yes skip to wind up question); else ask:

10. Are you the person who would decide to purchase an EMR/EHR system?
    a. Sole decision maker ☐Yes ☐No
    b. Shared decision ☐Yes ☐No
    c. Decided by others ☐Yes ☐No
11. Are there plans for installing an EMR/EHR system in the future?
    a. ☐No
    b. ☐Don't know
    c. ☐Yes, in the next ☐6 months ☐7-12 months ☐more than 12 months
        i. {if yes}What system are you planning to install?

Allscripts ☐Yes ☐No	Greenway Medical ☐Yes ☐No
Amazing Charts ☐Yes ☐No	HealthPort ☐Yes ☐No
Aprima ☐Yes ☐No	McKesson ☐Yes ☐No
Athena Health ☐Yes ☐No	Meditech ☐Yes ☐No
Centricity ☐Yes ☐No	NextGen ☐Yes ☐No
Cerner ☐Yes ☐No	Noteworthy ☐Yes ☐No
CHARTCARE ☐Yes ☐No	Office Practic.com ☐Yes ☐No
eClinicalWorks ☐Yes ☐No	Sage ☐Yes ☐No
Epic ☐Yes ☐No	SOAP ware ☐Yes ☐No
eMDs ☐Yes ☐No	Other_____
GE Centricity ☐Yes ☐No	Don't Know ☐Yes ☐No

Thank you very much for providing a physician's evaluation of the use and value of electronic health records. Any additional comments are most welcome:

_____

SURVEY QUESTIONS FOR PHYSICIANS WITH AZ LICENSES WHO DO NOT PRACTICE IN ARIZONA

1. When did you leave Arizona?
    a. ☐ I left Arizona in _____,(year) or
    b. ☐ I have never practiced in Arizona

    c. ☐I serve patients in multiple states via Telemedicine
    d. ☐ Travel among states at different times of year
        The states in which I serve patients
        i. ☐include Arizona
        ii. ☐ do not include Arizona

Please rate the importance of *each of the following* as an influence on your choice to practice in your current country/state/territory rather than Arizona

Code #	Factor	Important	Not Important	Does Not Apply
1.	To be Closer to Family/Friends……..	☐	☐	☐
2.	Better Elementary/Secondary Schools	☐	☐	☐No school age kids
3.	Better Climate	☐	☐	☐
4.	Better salary/compensation/career opportunity	☐	☐	☐
5.	Unable to find a position in my field in Arizona	☐	☐	☐
6.	Lower Medical Malpractice Premiums	☐	☐	☐
7.	Career Opportunity for Spouse/Partner	☐	☐	☐No spouse/partner
8.	Better Lifestyle	☐	☐	☐
9.	Better Political Climate	☐	☐	☐
10.	Transferred by the Military	☐	☐	☐
11.	To continue training (residency, fellowship)	☐	☐	☐
14.	To Practice near my Residency location	☐	☐	☐
15.	Availability of Part-time Positions/Locum Tenens	☐	☐	☐
16.	Fulfill loan repayment obligation	☐	☐	☐
17.	If other important factor, specify_____			

_____

2. Are you planning to return to practice in Arizona?
    ☐Yes ☐No
    {if yes then ask}
    a. When do you plan to return?
        i. ☐Upon completion of postgraduate training
        ii. ☐In the next 5 years.
        iii. ☐Other
3. Which one of the following **best** describes the organization in which you practice?
    a. A physician owned solo practice ☐Yes ☐No *{if yes, auto fill 3a=yes; skip to 4};*
    b. A physician owned group practice ☐Yes ☐No
    {if yes then ask}
        i. Approximately how many physicians are associated with this group?
            1. 2-5 physicians ☐Yes ☐No
            2. 6-50 physicians ☐Yes ☐No
            3. 51-94 physicians ☐Yes ☐No
            4. 95 or more physicians ☐Yes ☐No
    c. A hospital or medical school physician group practice ☐Yes ☐No
    {if yes then ask}
        i. Approximately how many physicians are associated with this center?

1. 2-5 physicians ☐Yes ☐No
2. 6-50 physicians ☐Yes ☐No
3. 51-94 physicians ☐Yes ☐No
4. 95 or more physicians ☐Yes ☐No

d. A community or rural health center(e.g. federally qualified CHC) ☐Yes ☐No
{if yes then ask}
   i. Approximately how many physicians are associated with this center?
      1. 2-5 physicians ☐Yes ☐No
      2. 6-50 physicians ☐Yes ☐No
      3. 51-94 physicians ☐Yes ☐No
      4. 95 or more physicians ☐Yes ☐No

e. Federal Government hospital or clinic (e.g. VA, HIS etc.) ☐Yes ☐No { *if yes skip to 5}*
f. State or County hospital system ☐Yes ☐No {*if yes skip to 4}*
g. Private Hospital system ☐Yes ☐No
h. Private Outpatient Facility not part of a hospital system (e.g. Urgent Care center, insurer owned clinic,) ☐Yes ☐No
{if yes then ask}
   i. Approximately how many physicians are associated with this facility?
      1. 2-5 physicians ☐Yes ☐No
      2. 6-50 physicians ☐Yes ☐No
      3. 51-94 physicians ☐Yes ☐No
      4. 95 or more physicians ☐Yes ☐No

i. Medical school ,university, research center ☐Yes ☐No
j. Public or private health Insurer, pharmaceutical company or other health related organization that does not provide care. ☐Yes ☐No *{if yes then skip to end; auto code intermediate q's as DNA}*
k. Other_____ ☐Yes ☐No

4. Which of the following **best** describes your primary role in the organization in which you practice? *{(if 5d=yes or 5e=yes or 5f=yes) then set 6a=yes)}*
   a. Owner, partner, part-owner ☐Yes ☐No
   {if yes then ask}
      i. Approximately how many of each of the following providers are associated with this practice:
         1. ____PAs
         2. ____RNs
         3. ____NPs
         4. ____Other licensed health care providers
      ii. Employee/contractor/locum tenens ☐Yes ☐No
      iii. Faculty ☐Yes ☐No
      iv. Student (include residents, fellows etc.) ☐Yes ☐No

5. Which of the following are available at your practice location? (check all that apply)
   a. Email ☐Yes ☐No
   b. Internet (FTP etc.) ☐Yes ☐No
   c. Fax ☐Yes ☐No
   d. US Mail ☐Yes ☐No
   e. Don't Know ☐Yes ☐No

6. How does the organization in which you practice submit bills/claims to insurers or other payers? (check all that apply)
   a. Email ☐Yes ☐No
   b. Internet (FTP etc.) ☐Yes ☐No
   c. Fax ☐Yes ☐No
   d. US Mail ☐Yes ☐No
   e. Don't Know ☐Yes ☐No

7. How does the organization in which you practice store its medical records? (Check all that apply);

a. Paper ☐Yes ☐No
b. Scanned images of paper records ☐Yes ☐No
c. Electronic files (an electronic version of a patient's medical history, including progress notes, problems, medications and other information used in treatment.) ☐Yes ☐No
{if yes then ask}
    i. What is the name of your EMR/EHR system*?*
        1. Allscripts ☐Yes ☐ No
        2. Amazing Charts ☐ Yes ☐No
        3. Aprima ☐Yes ☐ No
        4. Athena Health ☐ Yes ☐No
        5. Centricity ☐Yes ☐No
        6. Cerner ☐Yes ☐ No
        7. CHARTCARE ☐ Yes ☐No
        8. eClinicalWorks ☐ Yes ☐No
        9. Epic ☐Yes ☐No
        10. eMDs ☐Yes ☐No
        11. GE ☐Yes ☐No
        12. Greenway Medical ☐Yes ☐No
        13. HealthPort ☐Yes ☐No
        14. McKesson ☐Yes ☐No
        15. Meditech ☐Yes ☐ No
        16. NextGen ☐Yes ☐ No
        17. Noteworthy ☐Yes ☐No
        18. Office Practic.com ☐Yes ☐No
        19. Sage ☐Yes ☐No
        20. SOAP ware ☐Yes ☐No
        21. Other_____ _____ ☐Yes ☐ No
        22. Don't Know ☐Yes ☐No

8. On a scale of 1 (awful) to 5 (outstanding), how would you rate your EMR/HER system in terms of:
    a. Ease of use ☐1 ☐2 ☐3 ☐4 ☐5
    b. Effect on your productivity ☐1 ☐2 ☐3 ☐4 ☐5
    c. Effect on staff productivity ☐1 ☐2 ☐3 ☐4 ☐5
    d. Reliability ☐1 ☐2 ☐3 ☐4 ☐5
    e. Performance versus vendor's promises ☐1 ☐2 ☐3 ☐4 ☐5

Thank you very much for providing valuable insights into physicians' choice of practice locations and the use and value of electronic health records. Any additional comments are most welcome:

_____

Appendix D: New Survey Instrument April 2015-April 2016

Since 1991, the Arizona Physician Survey has, with the cooperation of physicians, their licensing boards and their professional associations, collected important information on the physician workforce. The current survey focuses on the use of medical records that are electronic (often called electronic medical records (EMRs) or electronic health records (EHRs). Your participation is encouraged by the ***Arizona Medical Association*** and the ***Arizona Osteopathic Medical Association***. The survey includes an opportunity for you to express your opinions on the benefits and limitations of EMRs. Your answers are confidential and results are published only in aggregate form.

1. Which one of the following **best** describes your employment status? **(check one)**

a) Actively employed in Arizona in direct patient care ☐ *{if checked ask:}*
   i. I usually treat _____patients in a typical work week.
   ii. I usually work _____hours/day, _____days/week, and _____weeks/year.

b) Provide telemedicine services to Arizona patients ☐

c) Actively employed in Arizona but not in direct patient care ☐

d) Actively employed outside of Arizona ☐ *{if checked skip to separate survey questions for out of state physicians*}

e) Retired/ Semi-retired/on leave ☐ *{if checked go to end fill all intermediate questions with DNA}*

2. Have you joined a different organization since your last licensing application?
☐ Yes ☐ No *{if yes, go to 3}*

3. Which one of the following **best** describes the organization in which you practice

a) ☐A physician owned solo practice *{if checked, skip to 4 d);*

b) ☐A physician owned group practice
   i. Approximately how many physicians are associated with this organization? [check one]
      i. 2-5 physicians ☐
      ii. 6-50 physicians ☐
      iii. 51-94 physicians ☐
      iv. 95 or more physicians ☐

c) ☐A hospital or medical school physician group practice ☐
   i. Approximately how many physicians are associated with this organization? [check one]
      i. 2-5 physicians ☐
      ii. 6-50 physicians ☐
      iii. 51-94 physician ☐
      iv. 95 or more physicians ☐

d) ☐A community or rural health center(e.g. federally qualified CHC) ☐
   i. Approximately how many physicians are associated with this organization? [check one]
      i. 2-5 physicians ☐
      ii. 6-50 physicians ☐
      iii. 51-94 physician ☐
      iv. 95 or more physicians ☐

e) ☐Private Outpatient Facility not part of a hospital system (e.g. Urgent Care center, insurer owned clinic, etc.)
   i. Approximately how many physicians are associated with this organization? [check one]
      i. 2-5 physicians ☐
      ii. 6-50 physicians ☐
      iii. 51-94 physician ☐
      iv. 95 or more physicians ☐

{*if 3f or 3g or 3h or 3i or 3j checked, then check 4a) and ask 6}*

f) ☐Federal Government hospital or clinic (e.g. VA, IHS)
g) ☐ City, State or County clinic or hospital
h) ☐ Private For Profit Hospital system
i) ☐ Private Not for Profit Hospital System
j) ☐ Public or private health Insurer, pharmaceutical company or other health related organization that does **not** provide care. ☐ Medical school ,university, research center
k) ☐ Independent Consultant
l) ☐ Public Health Agency or Department *{if checked then check 4 a) & skip to 17; auto code intermediate questions as DNA}*
m) ☐ Other_____

4. Which of the following **best** describes your primary role in the organization in which you practice? **Please Check Only One Box**
   a) ☐Employee/contractor/locum tenens
   b) ☐Faculty
   c) ☐Student (include residents, fellows etc.)
   d) ☐Owner , partner, partner, part-owner *{if checked then ask}*

5. Are you the person who decides or would decide to purchase or replace an EMR/EHR system?
   a) ☐Sole decision maker
   b) ☐Shared decision
   c) ☐Decided by others

6. How does the organization in which you practice store its medical records**? (Please answer Yes or No to <u>each part</u> a, b, c)**

a) Paper ☐ Yes ☐ No
b) Scanned images of paper records ☐ Yes ☐ No
c) Electronic files (an electronic version of a patient's medical history, including progress notes, diagnosis, medications and other information used in treatment.)
☐ Yes ☐ No

{*if 6 c) checked no, skip to 11; code 6 c) i, ii, iii, iv, v and 7 (all parts) and 8 (all parts) as DNA; if yes, continue}*

i. What is the name of your current EMR/EHR system **Please check only one box**

1. ☐ ADP AdvancedMD
2. ☐ ALERT
3. ☐ Allscripts
4. ☐ AltaPoint
5. ☐ Amazing Charts
6. ☐ Aprima
7. ☐ Artemis/digiChart
8. ☐ Athena Health
9. ☐ Avatar
10. ☐ Cerner
11. ☐ Chart Logic
12. ☐ Chart Source
13. ☐ ClaimTrak
14. ☐ eClinicalWorks
15. ☐ Empower
16. ☐ Epic
17. ☐ eMDs
18. ☐ GE Centricity
19. ☐ Glo Stream
20. ☐ gMed/gGastro
21. ☐ Greenway Medical
22. ☐ HealthPort
23. ☐ MacPractice
24. ☐ McKesson
25. ☐ Medhost/HMS HealthTech/ PatientLogic
26. ☐ Meditech
27. ☐ NextGen
28. ☐ Noteworthy
29. ☐ Office Ally
30. ☐ Office Practice
31. ☐ Optum/CareTracker
32. ☐ Picis
33. ☐ Practice Fusion
34. ☐ Sage
35. ☐ SOAP ware
36. ☐ Sunrise
37. ☐ Other_____ (**please insert name**)
38. ☐ Don't Know

ii. On a scale of 1 (awful) to 5 (outstanding), how would you rate your EMR/EHR system in terms of:

a.	Ease of use	☐1	☐2	☐3	☐4	☐5
b.	Effect on your productivity	☐1	☐2	☐3	☐4	☐5
c.	Effect on staff productivity	☐1	☐2	☐3	☐4	☐5
d.	Effect on patient satisfaction	☐1	☐2	☐3	☐4	☐5
e.	Reliability	☐1	☐2	☐3	☐4	☐5
f.	Performance versus vendor's promises	☐1	☐2	☐3	☐4	☐5

iii. Do you have a scribe enter the data while you examine and communicate with the patient? ☐ Yes ☐ No

iv. In approximately what year did you first use your current electronic medical record?

☐Before 2005 ☐2009 ☐2013

☐2006 ☐2010 ☐2014

☐2007 ☐2011

☐2008 ☐2012

1. Was this a replacement for a different brand of electronic medical record? ☐ Yes {go to a} ☐ No ☐ Don't Know

7. Does your EMR/EHR system include the following functions? **(CHECK ALL THAT APPLY)**

Functions	**7 a) Is the Function Included in the EMR?**	**7 b) Do You Use the Function?**	**7 c) Do you exchange this information using your EMR/EHR to organizations outside your practice or the hospital system in which you practice?"**
i. Patient Care Summary	☐Yes ☐No ☐ Don't Know *{If ne yes set 7 b)i and 7 c) i equal No; then go to 7 a) ii else continue}*	☐ Yes ☐ No *{if No set 7 c) i to no and go to 7 a) ii}*	☐Yes ☐No ☐Don't Know *{if ne yes, go to 7 a) ii f yes then ask*: *A Health Information Exchange (HIE) an organization that provides for the electronic exchange of health information according to nationally recognized standards}* 7 c)-1: I exchange the information by ☐ email ☐ a health information exchange Other _____
ii. Prescriptions (e-prescribing)	☐ Yes ☐ No ☐ Don't Know *{If ne yes set 7 b)ii and 7 c) ii equal No then go to 7 a) iii else continue* }	☐ Yes ☐ No *{if No set 7 c) ii to no and go to 7 a) iii}*	☐Yes ☐No ☐Don't Know *{if ne yes, go to 7 a) iii if yes then ask* : *A Health Information Exchange (HIE) an organization that provides for the electronic exchange of health information according to nationally recognized standards}* 7 c)-2: I exchange the information by ☐ email ☐ a health information exchange Other _____
iii. Lab Test Results	☐Yes ☐No ☐ Don't Know *{If ne yes set 7 b)iii and 7 c) iii equal No; then go to 7a) iv else continue }*	☐ Yes ☐ No *{if No set 7 c) iii to no and go to 7 a) iv}*	☐Yes ☐No ☐Don't Know *{if ne yes, go to 7 a) iv. if yes then ask* : *A Health Information Exchange (HIE) an organization that provides for the electronic exchange of health information according to nationally recognized standards}* 7 c)-3: I exchange the information by ☐

			email ☐ a health information exchange Other _____
iv. Reminders for Guideline Based Interventions	☐Yes ☐No ☐ Don't Know *{If ne yes set 7 b)ii and 7 c) iv equal No then go to 7 a) v else continue }*	☐ Yes ☐ No *{if No set 7 c) iv to no and go to 7 a) v}*	☐Yes ☐No ☐Don't Know *{if ne yes, go to 7a) v. if yes then ask: A Health Information Exchange (HIE) an organization that provides for the electronic exchange of health information according to nationally recognized standards }* 7 c)-4 : I exchange the information by ☐ email ☐ a health information exchange Other _____
v. Public Health Reports: immunizations, notifiable diseases	☐Yes ☐No ☐ Don't Know *{If ne yes set 7 b)v and 7 c) v equal No; then go to 8 else continue }*	☐ Yes ☐ No *{if No set 7 c) v to no and go to 8}*	☐Yes ☐No ☐Don't Know *{if ne yes, go to 8 if yes then ask: A Health Information Exchange (HIE) an organization that provides for the electronic exchange of health information according to nationally recognized standards}* 7 c)-5: I exchange the information by ☐ email ☐ a health information exchange Other _____

8. In your opinion, what are the most important obstacles to exchanging clinical information with other health care providers electronically (not fax)? (check all that apply)

a) ☐ Lack of a health information exchange
b) ☐ Concerns with maintaining patient confidentiality
c) ☐ Lack of technological support for problems
d) ☐ Cost
e) ☐ Other_____

☐ No

{Note: the next question is the first question to be answered by physicians without EMRs after they answer question #6)

9. Does the organization in which you practice plan to install an EMR/EHR system?

a) ☐ No *{go to 15}*
b) ☐ Yes, in the next:
   i. ☐6 months ☐7-12 months ☐more than 12 months ☐Don't know the timing
c) What systems are you considering (check all that apply)?

1. ☐ ADP AdvancedMD
2. ☐ ALERT
3. ☐ Allscripts
4. ☐ AltaPoint
5. ☐ Amazing Charts
6. ☐ Aprima
7. ☐ Artemis/digiChart
8. ☐ Athena Health
9. ☐ Avatar
10. ☐ Cerner
11. ☐ Chart Logic
12. ☐ Chart Source
13. ☐ ClaimTrak
14. ☐ eClinicalWorks
15. ☐ Empower
16. ☐ Epic
17. ☐ eMDs
18. ☐ GE Centricity
19. ☐ Glo Stream
20. ☐ gMed/gGastro
21. ☐ Greenway Medical
22. ☐ HealthPort
23. ☐ MacPractice
24. ☐ McKesson
25. ☐ Medhost/HMS HealthTech/ PatientLogic
26. ☐ Meditech
27. ☐ NextGen
28. ☐ Noteworthy
29. ☐ Office Ally
30. ☐ Office Practice
31. ☐ Optum/CareTracker
32. ☐ Picis
33. ☐ Practice Fusion
34. ☐ Sage
35. ☐ SOAP ware
36. ☐ Sunrise
37. ☐ Other_____ (**please insert name**)
38. ☐ Don't Know

10. Which of the following factors influenced your practice's decision to acquire an EHR? **Check all that apply**.

a) ☐ Lower costs for implementation
b) ☐ Medicare based incentives
c) ☐ Medicaid based incentives
d) ☐ Clear direction on market leading vendors
e) ☐ Easily customizable systems to fit our needs
f) ☐ Cost effective access to EMR training
g) ☐ Ease of integration with our legacy systems
h) ☐ Low learning curve
i) ☐ Agreed upon and published industry standards for EMRs
j) ☐ Confidence in security and privacy of the system
k) ☐ Access to technical resources to support the system
l) ☐ Other (please specify) _____

11. In what ways do you use information from **EMRs**?

a. ☐ Population health management {if checked ask i)
   i. Do you have a separate vendor for population management
b. ☐ Tracking contagious diseases/infections
c. ☐ Outreach to patients based on analysis of EMR data
d. ☐ Evaluating appropriate utilization of care
e. ☐ Analyzing costs or cost effectiveness of care
f. ☐ Post market analysis of side effects of pharmaceuticals
g. ☐ Other_____

12. In what ways do you use information from **Claims Data**?

h. ☐ Population health management
i. ☐ Tracking contagious diseases/infections
j. ☐ Outreach to patients based on analysis of claims data
k. ☐ Evaluating appropriate utilization of care
l. ☐ Analyzing costs or cost effectiveness of care
m. ☐ Post market analysis of side effects of pharmaceuticals
n. ☐ Other_____

13. Please enter any comments that you would like to contribute.

Thank you very much for helping to create an accurate description of how practicing physicians use and rank electronic medical records.

THIS SECTION APPLIES TO PHYSICIANS WITH AZ LICENSES WHO DO NOT PRACTICE IN AZ

{Variable names should indicate that they apply to out of state physicians}

1. When did you leave Arizona?
   a. ☐ I left Arizona in _____,(year) or
   b. ☐ I have never practiced in Arizona

2. I serve patients in multiple states ☐Yes (if yes, check all that apply) ☐No (go to 3)
   a. ☐Telemedicine
   b. ☐Travel among states at different times of year
   c. The states in which I serve patients
      i. ☐include Arizona
      ii. ☐ do not include Arizona

3. Please rate the importance of *each of the following* as an influence on your choice to practice in your current country/state/territory rather than Arizona

		Important	Not Important	Not Applicable
a.	☐ To be Closer to Family/Friends……..	☐	☐	☐
b.	☐ Better Elementary/Secondary Schools	☐	☐	☐
c.	☐ Better Climate	☐	☐	☐
d.	☐ Better salary/compensation/career opportunity	☐	☐	☐
e.	☐ Unable to find a position in my field in Arizona	☐	☐	☐
f.	☐ Lower Medical Malpractice Premiums	☐	☐	☐
g.	☐ Career Opportunity for Spouse/Partner	☐	☐	☐
h.	☐ Better Lifestyle	☐	☐	☐
i.	☐ Better Political Climate	☐	☐	☐
j.	☐ Transferred by the Military	☐	☐	☐
k.	☐ To continue training (residency, fellowship)	☐	☐	☐
l.	☐ To Practice near my Residency location	☐	☐	☐
m.	☐ Availability of Part-time Positions/Locum Tenens	☐	☐	☐
n.	☐ Fulfill loan repayment obligation	☐	☐	☐

o. If other important factor,
specify_____

4. Which of the influences that you checked in #3 was the most important reason for practicing outside of Arizona? (please check only one)

   a. ☐ To be Closer to Family/Friends
   b. ☐ . Better Elementary/Secondary Schools
   c. ☐ . Better Climate
   d. ☐ . Better salary/compensation/career opportunity
   e. ☐ Unable to find a position in my field in Arizona
   f. ☐ . Lower Medical Malpractice Premiums
   g. ☐ . Career Opportunity for Spouse/Partner
   h. ☐ . Better Lifestyle
   i. ☐ . Better Political Climate
   j. ☐ . Transferred by the Military
   k. ☐ . To continue training (residency, fellowship)
   l. ☐ . To Practice near my Residency location
   m. ☐ . Availability of Part-time Positions/Locum Tenens
   n. ☐ . Fulfill loan repayment obligation
   o. ☐ Other important factor

5. Are you planning to return to practice in Arizona?
   a. ☐ Definitely yes
      i. When do you plan to return?
         1. ☐ Upon completion of postgraduate training
         2. ☐ In the next 5 years.
         3. ☐ Other(SPECIFY)_____
   b. ☐ Maybe
   c. ☐ Definitely no

6. In your opinion, what changes would make Arizona more attractive to physicians as a place in which to practice?

_____

Appendix E: Comparisons of Respondents to Non-Respondents

Table E- 1. Comparison of Respondents to Non-Respondents, 2012-2014

2012-2014					
Characteristic	*Respondents (N =12,957)*		*Non-Respondents (N = 2,910)*		*P-Value*
Sex					
Female	3,719	28.7%	832	28.5%	NS
Male	8,805	67.9%	2,002	68.7%	NS
Total	12,524	96.6%	2,834	97.3%	
Age Group					
25 - 34	1,637	12.6%	573	19.6%	<0.01
35 - 44	4,067	31.5%	635	21.8%	<0.01
45 - 54	3,471	26.7%	596	20.4%	<0.01
55 - 64	2,664	20.5%	587	20.1%	NS
65+	900	6.9%	437	15.0%	<0.01
Total	12,739	98.3%	2,828	97.1%	
Specialty					
Primary Care	4,671	36.0%	1,050	35.0%	NS
Medical	2,944	22.7%	701	24.0%	NS
Hospital-Based	3,016	23.2%	535	18.3%	<0.01
Pediatric	1,108	8.5%	254	8.7%	NS
Surgical	1,183	9.1%	351	12.0%	<0.01
Total	12,922	99.7%	2,891	99.3%	
Location					
Maricopa County	8,061	62.2%	1,740	59.7%	NS
Pima County	2,344	18.0%	533	18.3%	NS
All Other Counties	2,129	16.4%	409	14.0%	<0.05
Total	12,534	96.7%	2,682	92.1%	

Source: AMB, ABOE Administrative/Survey Data, 2012-2014. Data include retired and semi-retired physicians.

Note: A p-value of .05 or less implies only a 5% probability of declaring the relationship significant when in fact it is not. NS = no significant difference. Gender was unknown for 433 (3.3%) respondents and 76 (2.6%) non-respondents. Age was unknown for 218 (1.6%) respondents and 82 (2.6%) non-respondents. Specialty was unknown for 35 (0.2%) respondents and 19 (0.6%) non-respondents. Location was unknown for 423 (3.2%) respondents and 228 (7.8%) non-respondents.

Table E- 2. Comparison of Respondents to Non-Respondents, 2007-2011

Characteristic	*2009-2011*					*2007-2009*				
	Respondents N = 12,181		*Non-Respondents N = 3,607*		*P-Value*	*Respondents N =6,777*		*Non-Respondents N =6,594*		*P-Value*
Gender					N.S.					<0.05
Female	3,325	28.3%	932	26.4%		1,791	27.3%	1,640	25.9%	
Male	8,418	71.7%	2,595	73.6%		4,769	72.7%	4,689	74.1%	
Total	11,743	100.0%	3,527	100.0%		6,560	100.0%	6,329	100.0%	
Age Group										
25-34	749	6.2%	372	10.3%	<0.01	438	6.5%	758	11.5%	<0.01
35-44	3,682	30.2%	840	23.3%	<0.01	1,976	29.2%	2,024	30.7%	<0.01
45-54	3,422	28.1%	720	20.0%	<0.01	2,012	29.7%	1,855	28.1%	<0.05
55-64	2,873	23.6%	758	21.0%	<0.01	1,590	23.5%	1,328	20.1%	
65+	1,455	11.9%	916	25.4%		758	11.2%	627	9.5%	
Total	12,181	100.0%	3,606	100.0%		6,774	100.0%	6,592	100.0%	
Specialty					<0.01					<0.01
Primary Care	5,753	47.3%	1,566	43.7%		2,945	43.6%	2,501	38.2%	
Specialty Care	6,401	52.7%	2,016	56.3%		3,812	56.4%	4,053	61.8%	
Total	12,154	100.0%	3,582	100.0%		6,757	100.0%	6,554	100.0%	
Location					N.S.					N.S.
Maricopa County	7,990	65.6%	2,365	65.6%		4,371	64.5%	4,421	67.0%	
Pima County	2,416	19.8%	757	21.0%		1,376	20.3%	1,250	19.0%	
All Other Counties	1,775	14.6%	485	13.5%		1,030	15.2%	923	14.0%	
Total	12,181	100.0%	3,607	100.0%		6,777	100.0%	6,594	100.0%	

Source: AMB, ABOE Administrative/Survey Data, 2007-2009; 2009–2011.

Note: Percentages are calculated on numbers of cases with non-missing values. A p-value of .05 or less implies only a 5% probability of declaring the relationship significant when in fact it is not. N.S. =no significant difference.

Appendix F: EMR Rankings and Meaningful Use Results by Vendor

The results in this section summarize the scores for each of the five criteria and the mean score that characterizes the overall ranking of each EMR package. Individual results for vendors with less than 10 users are excluded but the information is included in calculating the total scores and total number of respondents.

Table F - 1. Summary of EMR Ranking Weighted Means by Vendor (N = 7,814)

Vendor	*Total Weighted Average Rank*	*Ease of Use*	*Doc Productivity*	*Staff Productivity*	*Reliability*	*Performance vs. Promise*	*Total Respondents*
ADP AdvancedMD	3.4	3.4	3	3.4	3.8	3.4	30
AHLTA	2	2	2	2	2	2	1
ALERT	1.4	1.4	1.4	1.4	1.4	1.4	5
Allscripts	3	3.1	2.8	2.9	3.3	3	714
AltaPoint	2.9	3.2	2.9	3	2.9	2.7	12
Amazing Charts	3.7	4	3.4	3.5	3.9	3.8	92
Aprima	3.4	3.5	3.2	3.3	3.6	3.2	63
ARIA	3.1	3.1	2.9	3.1	3.4	2.8	24
Athena Health	3.3	3.5	2.9	3.2	3.8	3.3	217
Avatar	2.4	2.4	2.5	2.4	2.5	2.3	16
Cerner	3	3.1	2.8	2.8	3.4	2.9	1,579
Chart Logic	3.4	3.7	3.4	3.5	3.4	3	26
Chart Source	2.5	2	2.3	2.3	3	2.8	4
CHARTCARE	2.9	3	2.5	3.5	2.5	3	2
ClaimTrak	2.4	2.4	2.4	2.5	2.5	2	34
digiChart	3.8	3.8	3.7	3.8	4	3.8	17
DocuTAB	3.9	4.3	3.9	3.7	3.8	3.9	10
Don't Know	3.1	3.1	2.9	3	3.3	3	489
EBIO	3.6	4	3.3	3.3	3.8	3.8	4
eClinicalWorks	3.6	3.7	3.3	3.5	3.8	3.5	510
EMA Modernizing	3.7	3.9	3.2	3.4	4	3.8	31
e-MDs	3.6	3.8	3.4	3.5	3.7	3.5	113
Emergisoft	2.2	1	3	3	2	2	1
Empower	4.6	5	5	4.5	4	4.5	2
EncounterPro	3	3	3.2	3.2	3.2	2.6	5
Epic	3.3	3.5	3.1	3.1	3.7	3.3	809
GE Centricity	3.6	3.7	3.4	3.5	3.8	3.6	208
gloStream	3	3.3	3.1	3.3	2.8	2.5	8
gMed/gGastro	3.5	3.8	3.4	3.4	3.7	3.3	59
Greenway Medical	3.4	3.5	3.1	3.3	3.7	3.2	158

Source: AMB, ABOE Survey Data, 2013–2015.

Table F - 1. Summary of EMR Ranking Weighted Means by Vendor (N = 7,814) (cont.)

Vendor	*Total Weighted Average Rank*	*Ease of Use*	*Doc Productivity*	*Staff Productivity*	*Reliability*	*Performance vs. Promise*	*Total Respondents*
Health Fusion	3.1	3.5	2.6	2.6	3.6	3.1	15
IC-Chart	5	5	5	5	5	5	36
IKnowMed	3.6	3.5	3	5	3.5	3	2
Indian Health Se	2.7	3	2	2.3	3.3	3	3
Intelligent Medi	3.2	3.3	2.9	3.3	3.6	2.9	7
MacPractice	3.7	3.7	3.5	3.7	3.9	3.5	26
McKesson	2.8	3	2.6	2.7	3	2.7	248
MD Plus	3.2	3.5	3.1	3.3	3.2	3.3	16
MEDHOST	3	3.2	2.8	2.9	3.3	2.9	57
Medinformatix	2.9	3.1	3.1	3	2.8	2.4	9
Medinotes	2.9	2.8	2.8	2.8	3.5	2.8	4
Meditech	2.8	2.9	2.5	2.6	3.2	2.8	74
Modernizing Medi	4.1	4.3	3.6	3.7	4.4	4.4	15
NexTech	3.4	3.6	3.1	3.3	3.7	3.5	34
NextGen	2.7	2.8	2.5	2.6	3.1	2.7	705
Noteworthy	3.4	3.6	3.3	3.4	3.6	3.3	22
Office Ally	3.6	3.8	3.4	3.5	3.7	3.7	28
Office Practicum	3.8	3.9	3.6	3.6	4.1	3.9	55
ONCO	4.5	4.7	4.5	4.5	4.5	4.4	10
OptumInsight	3.4	3.6	3.3	3.2	3.7	3.3	22
Other	3.4	3.5	3.2	3.2	3.6	3.3	748
Patient Now	3.8	3.9	3.8	4	4	3.4	8
Picis	3.1	3.6	3	2.8	3.2	3.2	18
Point N Click	4.1	4.6	3.6	3.7	4.7	4	12
Practice Fusion	3.5	3.8	3.2	3.3	3.8	3.7	150
Practice Partner	3.8	3.7	3.7	4	3.7	4	3
Praxis	2.9	3	2.9	2.9	2.8	2.9	16
PrognoCIS	3.7	3.8	3.4	3.9	3.7	3.6	9
Prorietary	3.1	3.3	3	3	3.3	3	3
Sage	3.2	3.3	2.8	3.1	3.5	3.1	141
SOAPware	3.5	3.8	3.2	3.3	3.6	3.2	28
SpringChart	3.1	3.6	3.3	3.1	2.9	2.9	7
Sunrise	3.4	3.5	3.3	3.2	3.8	3.4	13
Valant	3.4	3.4	3	3.3	3.7	3.4	10
VistA	3.4	3.5	3.2	3.3	3.6	3.4	17
Average	3.2	3.3	3.0	3.0	3.5	3.1	7,814

Source: AMB, ABOE Survey Data, 2013–2015.

The top ranked EMRs are *IC-Chart* with a rank of 5, followed by *Empower* ranked at 4.6 and, *ONCO* with a rank equal to 4.5. One reason for their high rankings is that *IC-Chart* received an outstanding (rank=5) for all the criteria. *ONCO* received a score of 4.7 on the ease of use

criterion and also were ranked as a 4.5 on physician productivity, staff productivity, and reliability. There were two other EMRs with overall scores of 4.1, sufficiently close to the top ranked three EMRs to be considered effectively the same ranking.

The lowest ranked EMR was *ALERT* which had a score of 1.4 for each of the five criteria.

Table F - 2. Summary of EMR Ranking Criteria by Vendor

Vendor	*Ease of Use*	*Doc Productivity*	*Staff Productivity*	*Reliability*	*Performance vs. Promise*
ADP AdvancedMD	30	30	30	30	30
AHLTA	1	1	1	1	1
ALERT	5	5	5	5	5
Allscripts	713	713	709	709	700
AltaPoint	12	12	12	12	12
Amazing Charts	92	92	91	92	91
Aprima	63	63	63	62	63
ARIA	24	24	24	23	23
Athena Health	215	216	215	216	214
Avatar	16	16	16	16	16
Cerner	1,578	1,579	1,569	1,575	1,545
Chart Logic	26	26	26	26	26
Chart Source	4	4	4	4	4
CHARTCARE	2	2	2	2	2
ClaimTrak	34	34	33	34	33
digiChart	17	17	17	17	17
DocuTAB	10	10	10	10	10
Don't Know	489	485	479	478	465
EBIO	4	4	4	4	4
eClinicalWorks	510	510	509	504	504
EMA Modernizing	31	31	30	31	30
e-MDs	113	112	113	112	113
Emergisoft	1	1	1	1	1
Empower	2	2	2	2	2
EncounterPro	5	5	5	5	5
Epic	809	807	802	802	790
GE Centricity	208	208	205	206	202
gloStream	8	8	8	8	8
gMed/gGastro	59	59	59	59	59
Greenway Medical	158	158	157	158	157
Health Fusion	15	14	14	14	14
IC-Chart	36	36	36	36	35
IKnowMed	2	2	2	2	2
Indian Health Se	3	3	3	3	3
Intelligent Medi	7	7	7	7	7
MacPractice	26	26	26	26	26
McKesson	248	248	246	246	243
MD Plus	16	16	16	16	14
MEDHOST	57	56	56	57	56
Medinformatix	9	9	9	9	9
Medinotes	4	4	4	4	4
Meditech	74	74	74	73	73
Modernizing Medi	15	14	14	14	14
NexTech	34	34	34	34	32
NextGen	705	704	703	703	687

Source: AMB, ABOE Survey Data, 2013–2015.

Table F - 2. Summary of EMR Ranking Criteria by Vendor (cont.)

Vendor	*Ease of Use*	*Doc Productivity*	*Staff Productivity*	*Reliability*	*Performance vs. Promise*
Noteworthy	22	22	22	22	22
Office Ally	28	28	28	28	28
Office Practicum	55	55	55	55	54
ONCO	10	10	10	10	10
OptumInsight	22	22	22	22	22
Other	748	745	739	741	725
Patient Now	8	8	7	8	8
Picis	18	18	18	17	18
Point N Click	12	12	12	12	12
Practice Fusion	149	150	144	148	148
Practice Partner	3	3	3	3	3
Praxis	16	15	15	16	15
PrognoCIS	9	9	9	9	9
Prorietary	3	3	3	3	3
Sage	141	141	141	141	136
SOAPware	28	27	27	27	27
SpringChart	7	7	7	7	7
Sunrise	13	13	13	13	13
Valant	10	10	8	10	9
VistA	17	17	17	17	15
Total	7,809	7,796	7,745	7,757	7,635

Source: AMB, ABOE Survey Data, 2013–2015.

Table F - 3. Are Vendors Helping Physicians Achieve Meaningful Use? - Results by Vendor (N = 4,779)

Vendor	No		Yes		Total
	Number of Physicians	Percent	Number of Physicians	Percent	
ADP AdvancedMD	14	53.8%	12	46.1%	26
ALERT	2	100.0%	0	0.0%	2
Allscripts	66	13.4%	423	86.5%	489
AltaPoint	2	16.6%	10	83.3%	12
Amazing Charts	13	18.3%	58	81.6%	71
Aprima	5	9.2%	49	90.7%	54
ARIA	4	17.3%	19	82.6%	23
Athena Health	10	5.2%	179	94.7%	189
Avatar	1	25.0%	3	75.0%	4
Cerner	130	19.9%	523	80.0%	653
Chart Logic	1	4.1%	23	95.8%	24
ClaimTrak	2	20.0%	8	80.0%	10
digiChart	5	31.2%	11	68.7%	16
DocuTAB	0	0.0%	3	100.0%	3
EBIO	0	0.0%	3	100.0%	3
eClinicalWorks	47	11.2%	369	88.7%	416
EMA Modernizing	1	3.5%	27	96.4%	28
e-MDs	22	23.9%	70	76.0%	92
Empower	0	0.0%	1	100.0%	1
EncounterPro	0	0.0%	2	100.0%	2
Epic	45	9.3%	434	90.6%	479
GE Centricity	16	11.1%	128	88.8%	144
gloStream	3	42.8%	4	57.1%	7
gMed/gGastro	9	16.0%	47	83.9%	56
Greenway Medical	29	20.1%	115	79.8%	144
Health Fusion	2	15.3%	11	84.6%	13
IC-Chart	4	11.1%	32	88.8%	36
IKnowMed	0	0.0%	2	100.0%	2
Indian Health Se	0	0.0%	1	100.0%	1
Intelligent Medi	1	14.2%	6	85.7%	7
MacPractice	5	26.3%	14	73.6%	19
McKesson	38	26.0%	108	73.9%	146
MD Plus	3	27.2%	8	72.7%	11
MEDHOST	1	5.0%	19	95.0%	20
Medinformatix	2	33.3%	4	66.6%	6
Medinotes	0	0.0%	2	100.0%	2
Meditech	8	25.8%	23	74.1%	31
Modernizing Medi	1	10.0%	9	90.0%	10
NexTech	2	8.3%	22	91.6%	24
NextGen	75	14.4%	445	85.5%	520

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 3,254 physicians did not identify their EMR.

Table F - 3. Are Vendors Helping Physicians Achieve Meaningful Use? - Results by Vendor (N = 4,779) (cont.)

Vendor	*No*		*Yes*		*Total*
	Number of Physicians	*Percent*	*Number of Physicians*	*Percent*	
Noteworthy	3	18.7%	13	81.2%	16
Office Ally	4	16.6%	20	83.3%	24
Office Practicum	2	5.2%	36	94.7%	38
ONCO	0	0.0%	10	100.0%	10
OptumInsight	1	5.0%	19	95.0%	20
Other	59	15.7%	316	84.2%	375
Patient Now	0	0.0%	3	100.0%	3
Picis	5	35.7%	9	64.2%	14
Point N Click	0	0.0%	2	100.0%	2
Practice Fusion	20	18.5%	88	81.4%	108
Practice Partner	1	50.0%	1	50.0%	2
Praxis	5	41.6%	7	58.3%	12
PrognoCIS	1	14.2%	6	85.7%	7
Sage	13	10.7%	108	89.2%	121
SOAPware	2	11.7%	15	88.2%	17
SpringChart	0	0.0%	7	100.0%	7
Sunrise	1	14.2%	6	85.7%	7
VistA	1	8.3%	11	91.6%	12
Total	687	14.9%	3,904	85.0%	4,591

Source: AMB, ABOE Survey Data, 2013–2015.

Note: Physicians practicing in government settings have been excluded from these results. 3,254 physicians did not identify their EMR.

Appendix G: EMR Software Descriptions

Table G - 1. Intended Use of EMR Software for Most Popular Vendors

EMR Vendor	*Intended Use*
Allscripts	Different versions for solo/mid-size practices vs. large/multi practices; Access info anywhere on any device; Connected to pharmacies, labs, payers & patients; Practice management/claims processing; Templates for >20 specialties
Amazing Charts	For solo or multi-clinician practices; Includes office flow, charting, scheduling, messaging, e-prescribing, reporting, billing & templates
Aprima	Transcription/dictation; e-prescribing; diagnosis & payer Info; electronic lab orders & results; patient portal; patient compliance alerts; Meaningful Use stage 2 certified
Athena Health	Quality management for Meaningful Use, pay-for-performance; cloud-based full-service solution; interfaces w/pharmacies, hospitals, registries and HIEs
Cerner	Clinical summary; chart search; e-prescribe; computer assisted coding; electronic orders & results; pre-completed notes for documentation; electronic immunization download/upload; Meaningful Use
ClaimTrak	Solution for clinicians & administrators; clinical forms for assessments, treatment plans, progress notes, discharge summaries, medication administration, etc.; access and manage all aspects of caseloads; electronic billing, scheduling, reports; document scanning to records
eClinicalWorks	Caters to all size private practices, CHCs & hospitals; supports >50 specialties; patient management system; clinical decision support; access lab/test results; registry & quality measure reporting; exchange data electronically; e-prescribing; meets Meaningful Use
eMDs	Adaptable to multiple clinical settings & sizes; clinical decision support; customizable templates & patient flow sheets; e-prescribing
Epic	Meaningful Use stage 2 certified; accommodates >40 specialties; chart review; order management; documentation; clinical & financial decision support; telemedicine options
GE Centricity	Caters to physician practices of all sizes; Fully interoperable; meets Meaningful Use; automated workflows; ICD-9/ICD-10 compatible; clinical decision support; e-prescribing
gloStream	Customizable to individual physicians in a multi-physician setting; Cloud-based; Meaningful Use certified; e-prescribing; labs/orders; scheduling and tasking; note taking
GMed	Caters to small, large & surgery centers and hospitals for gastro, cardio & urology practices; customizable workflow; interoperable; clinical decision support
Greenway Medical	Combined EHR/Practice Management solution integrating clinical/financial/administrative functions for primary care & >30 specialties in all types/sizes of practices; interoperable; Meaningful Use certified;
McKesson	Certified Meaningful Use stage 1; separate web-based solutions for different types/sizes of practices; complete medical billing, scheduling & clinical functionality
Meditech	Integrated medical and practice management solution for all types/sizes of practices which includes scheduling, labs, registration, EHRs, billing, ordering, reporting
NextGen	Certified Meaningful Use stage 2; scalable; ICD-10 ready; accommodates 25 specialties; patient workflows/summaries; health information exchange
Noteworthy	Certified Meaningful Use stage 1; full EHR/PM solution scalable for all physician practices
Office Practicum	Pediatric only EHR solution that includes encounters/flow sheets; prescriptions/diagnostic tests; vaccine recording/forecasting; billing; practice management

Table G - 2. Intended Use of EMR Software by Vendor (cont.)

EMR Vendor	*Intended Use*
Practice Fusion	Free, web-based EHR/PM solution for >25 specialties; scalable to all practice types/sizes; includes e-prescribing; charting; scheduling mobile access; labs/imaging; patient health record; Meaningful Use certified
Sage	Certified Meaningful Use; scalable for practice size and multiple specialties; charting; scheduling; orders; labs; e-prescribing; quality measure reporting; HL7 interoperable
SOAPware	scheduling; coding; integrate data from specific medical devices; order entry; e-prescribing; patient education/maintenance; additional practice management tools
Sunrise	EHR solution specifically for hospitals and health systems; addresses Meaningful Use; contains interoperable, fully connected care with order entry, clinical decision support, e-prescribing/medication management

Source: EMR Vendors' individual websites.