

Physician Capability to Electronically Exchange Clinical Information, 2011

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The capability to electronically share and view clinical data has the potential to enable clinical information to follow patients wherever they go to seek care and thereby improve the safety, quality, and efficiency of healthcare. Despite promising benefits, historically physicians have not exchanged clinical information electronically due to the high costs associated with implementation and limited incentives for data sharing.² Exchange activity has largely been confined to regions of the country where there are operational health information organizations that support clinical data exchange within their community.³ Furthermore, physicians have typically had to use stand-alone e-prescribing systems or proprietary portals that support the exchange of specific types of clinical data (eg, viewing lab data), which can be costly, difficult to incorporate into their clinical work flow, and possess limited capability to support integrated data as with an electronic health record (EHR).⁴⁻⁷

A number of federal programs and other initiatives are under way to help address some of these barriers. The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 includes up to \$22.5 billion in financial incentives for eligible professionals who demonstrate “meaningful use” of interoperable EHRs capable of electronic exchange. HITECH also awarded more than \$540 million to the Office of the National Coordinator for Health Information Technology (ONC) State Health Information Exchange (HIE) Program, which provides support for state-designated entities to ensure mechanisms are in place to enable providers to exchange clinical information.⁸ Furthermore, ONC’s Health Information Technology Certification Program seeks to ensure that EHR products include functionality that enables electronic exchange.⁹ In addition to the HITECH incentives and programs, a public-private initiative provides relatively simple technical solutions to enable directed exchange between 2 known providers.¹⁰ A community of participants from the public and private sector focus on providing tools, services, and guidance to promote functional interoperability.¹¹

In the first stage of meaningful use, it was sufficient for providers to perform a test to demonstrate their EHR’s capacity to electronically exchange information.^{12,13} Stage 2 meaningful use requirements related to HIE have

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Objectives: To provide national estimates of physician capability to electronically share clinical information with other providers and to describe variation in exchange capability across states and electronic health record (EHR) vendors using the 2011 National Ambulatory Medical Care Survey Electronic Medical Record Supplement.

Study Design: Survey of a nationally representative sample of nonfederal office-based physicians who provide direct patient care.

Methods: The survey was administered by mail with telephone follow-up and had a 61% weighted response rate. The overall sample consisted of 4326 respondents. We calculated estimates of electronic exchange capability at the national and state levels, and applied multivariate analyses to examine the association between the capability to exchange different types of clinical information and physician and practice characteristics.

Results: In 2011, 55% of physicians had computerized capability to send prescriptions electronically; 67% had the capability to view lab results electronically; 42% were able to incorporate lab results into their EHR; 35% were able to send lab orders electronically; and, 31% exchanged patient clinical summaries with other providers. The strongest predictor of exchange capability is adoption of an EHR. However, substantial variation exists across geography and EHR vendors in exchange capability, especially electronic exchange of clinical summaries.

Conclusions: In 2011, a majority of office-based physicians could exchange lab and medication data, and approximately one-third could exchange clinical summaries with patients or other providers. EHRs serve as a key mechanism by which physicians can exchange clinical data, though physicians’ capability to exchange varies by vendor and by state.

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**For author information and disclosures,
see end of text.**

Take-Away Points

Physicians' ability to access key clinical information electronically in a timely manner can potentially improve the safety, quality, and efficiency of patient care.

- Our findings indicate that the majority of US physicians have the capability to exchange laboratory and pharmacy data electronically.
- One-third of physicians are capable of exchanging clinical summaries with patients or other providers.
- Electronic health records (EHRs) could serve as a primary means for exchange of clinical information, but there is variation in exchange capability among EHR products.

The sample size is sufficient to generate state-level estimates.

Measures of Electronic Exchange of Clinical Information

The NAMCS EMR supplement asks physicians to report on their practices' capability to electronically exchange key types of clinical information, including pharmacy data, laboratory data, and patient clinical summaries (eAppendix A, available at www.ajmc.com).

evolved to become more advanced. Physicians must go beyond demonstrating capability to exchange; they must actually electronically exchange key clinical data among providers and patient-authorized entities. Additionally, physicians must demonstrate the capability to send summary-of-care documents electronically to recipients with a different EHR vendor.¹⁴

Yet little is known about current physician capability to electronically exchange clinical information at a national or state level, both of which are relevant in implementing ONC's strategy and in assessing its potential for success. We used a nationally representative survey of office-based physicians conducted in 2011 to provide a snapshot of physicians' capability to electronically exchange clinical information associated with key national priorities: pharmacy exchange (e-prescribing), laboratory exchange (including receipt of results and lab orders), and clinical summary exchange with patients and providers.¹⁵ This assessment provides both a portrait of exchange capability as of stage 1 meaningful use and a baseline for monitoring progress going forward as new policies and initiatives to accelerate HIE are implemented—in particular, stage 2 meaningful use. Future trends in physicians' HIE capability could help assess the effectiveness of these policies. We describe physician exchange capability geographically across states and by EHR vendor. Finally, we examined the association between physician and practice characteristics, including adoption of EHRs, with physician capability to exchange different types of clinical information.

To assess the capability of physicians to send pharmacy data and to send and receive laboratory data, we examined the percentage of physicians with the ability to send prescriptions electronically, send lab orders electronically, view lab results electronically, and incorporate lab results into the EHR. The latter item provides an indication of whether physicians receive results in a structured format that enables them to view and track individual test results.

To assess the capability of physicians to exchange patient clinical summaries, we examined the percentage of physicians who indicated that they “exchange patient clinical summaries electronically with any other providers” by either receiving and/or sending patient clinical summaries. This measure goes beyond capability to exchange, capturing actual exchange activity.

We used multivariate analyses to examine the association between the capability to exchange different types of clinical information and physician and practice characteristics, including EHR adoption and state fixed effects to control for confounding within each state. Given the dichotomous nature of the dependent variables, we estimated probit regression models and used the regression results to calculate the incremental effects associated with each independent variable (all were categorical variables). These incremental effects represent the percentage point change in the outcome that is associated with a given characteristic (compared with a reference category). Analyses were conducted using Stata 12.0 (StataCorp, College Station, Texas). We used weights to account for nonresponse and standard errors, which were adjusted to account for the complex sample design.

Analysis

We calculated estimates of the electronic exchange measures at the national and state levels, and examined whether physicians' capability to exchange these types of clinical information at the state level differed from the national average. We used *t* tests to test for significant differences at the $P < .05$ level.

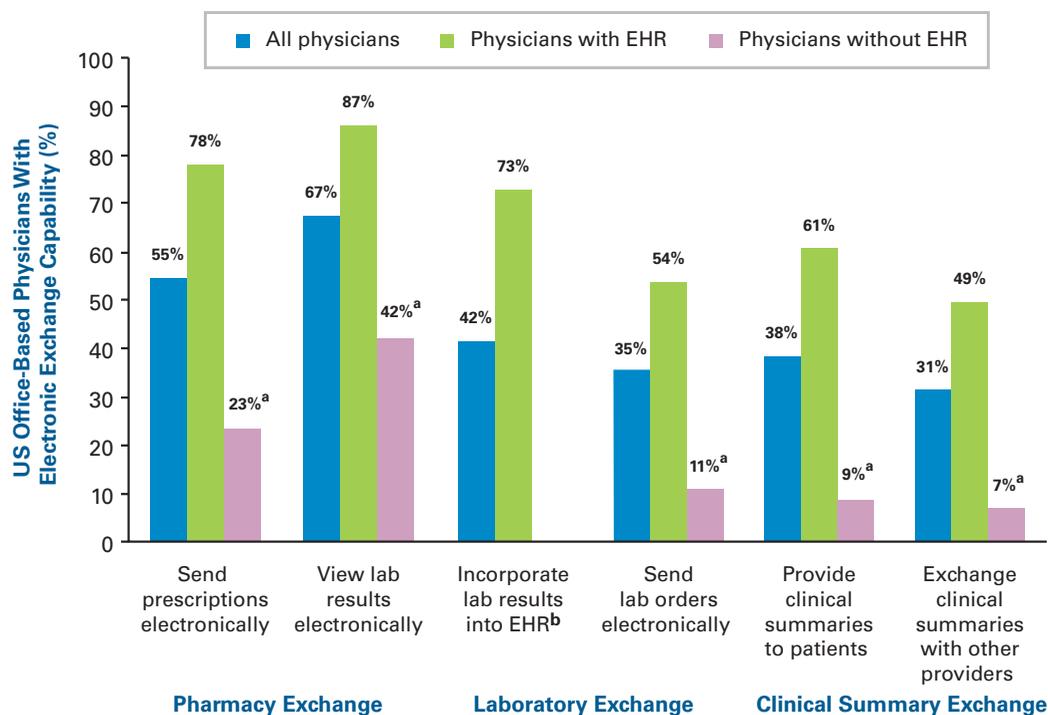
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METHODS

Data Source and Collection

We analyzed the 2011 National Ambulatory Medical Care Survey Electronic Medical Record Supplement (NAMCS EMR supplement), a cross-sectional nationally representative survey of nonfederal office-based physicians who provide direct patient care.¹⁶ The overall sample consisted of 4326 physician respondents, with a 61% weighted response rate.

■ **Figure 1.** Electronic Exchange Capability Among US Office-Based Physicians, 2011



EHR indicates electronic health record.

^aSignificantly different from physicians with EHR at $P < .001$.

^bAssumed that physicians without EHRs lack the capability to incorporate lab results.

Source: National Ambulatory Medical Care Survey Electronic Medical Record Supplement 2011.

We assessed the extent to which exchange capability varied by vendor. We only included vendors that had at least 1% of the market share (representing a total of 55% of physicians with EHRs). Vendors with at least 1% of the market share included the following: Allscripts, Cerner, eClinicalWorks, Epic, eMDs, GE/Centricity, Greenway Medical, NextGen, and Sage.

RESULTS

Physicians' capability to electronically exchange clinical data varied by type of information (Figure 1). More than half of all physicians (55%) reported that their practices have computerized capability to e-prescribe. A majority of physicians (67%) reported that they are able to view lab results electronically, but fewer physicians (42%) were able to incorporate lab results into their EHR. More than one-third (35%) reported they are able to send lab orders electronically. The computerized capability to provide clinical summaries to patients was reported by 38% of physicians.

Among those physicians who reported exchanging clinical summaries with other providers (31%), approximately

three-fourths (76%) reported both sending and receiving clinical summaries (eAppendix B, available at www.ajmc.com). About one-fifth (19%) of physicians reported that they send clinical summaries only to other providers. Of all physicians who exchange clinical summaries with other providers (eAppendix C, available at www.ajmc.com), the most common method of access was through an EHR vendor (64%), followed by a hospital-based system (28%).

Physicians' capability to exchange varies by EHR adoption status (Figure 1). A large majority of physicians with an EHR have the capability to send prescriptions electronically (78%) and view lab results electronically (87%). Substantial minorities of physicians with no EHR also have these capabilities (23% and 42%, respectively), highlighting the role that stand-alone e-prescribing products and proprietary portals continue to play in facilitating physician access to pharmacy and lab result data. However, very few physicians without an EHR have the capability to electronically exchange clinical summaries and lab orders.

Physician Exchange Capability by State

Physicians' capability to exchange clinical information

■ **Table.** Physician and Practice Characteristics Associated With Electronic Exchange Capability Among US Office-Based Physicians, 2011

Characteristics	Percent	Incremental Effects from Probit Regression (SE)					
		Pharmacy Exchange		Laboratory Exchange		Clinical Summary Exchange	
		Send Prescriptions Electronically	Receive Lab Results Electronically	Incorporate Lab Results Into EHR, Conditional on Any EHR Use	Send Lab Orders Electronically	Provide Clinical Summaries to Patients	Exchange Clinical Summaries With Other Providers
Physician							
Age, y							
≥50	61.6	Reference	Reference	Reference	Reference	Reference	Reference
<50	38.4	0.028 (0.020)	0.036 (0.020)	0.035 (0.026)	0.028 (0.020)	0.045 ^a (0.019)	-0.019 (0.019)
Specialty							
Other specialty	52.7	Reference	Reference	Reference	Reference	Reference	Reference
Primary care	47.3	0.081 ^b (0.019)	0.121 ^b (0.021)	0.145 ^b (0.027)	0.102 ^b (0.020)	0.045 ^a (0.019)	-0.035 (0.019)
Practice							
Practice type							
Single specialty	75.6	Reference	Reference	Reference	Reference	Reference	Reference
Multispecialty	24.4	0.068 ^a (0.029)	0.050 (0.031)	0.028 (0.033)	0.106 ^b (0.028)	0.012 (0.025)	0.109 ^b (0.026)
Practice size							
Solo or 2 physicians	38.6	Reference	Reference	Reference	Reference	Reference	Reference
3-5 physicians	26.4	0.047 (0.026)	0.062 ^a (0.026)	0.109 ^c (0.038)	0.043 (0.026)	0.018 (0.024)	-0.031 (0.024)
6-10 physicians	18.2	0.085 ^b (0.030)	0.134 ^b (0.031)	0.150 ^b (0.042)	0.070 ^a (0.030)	-0.006 (0.028)	0.015 (0.028)
11+ physicians	16.8	0.097 ^b (0.037)	0.187 ^b (0.041)	0.206 ^b (0.044)	0.119 ^c (0.037)	-0.0001 (0.034)	0.050 (0.035)
Ownership							
Physician or physician group	62.7	Reference	Reference	Reference	Reference	Reference	Reference
Hospital/academic medical center	16.5	-0.106 ^b (0.025)	0.120 ^b (0.024)	0.037 (0.033)	-0.004 (0.024)	0.023 (0.023)	0.088 ^b (0.025)
HMO/other healthcare corporation	10.0	0.082 ^a (0.034)	0.118 ^b (0.029)	0.163 ^b (0.038)	0.134 ^b (0.037)	0.138 ^b (0.034)	0.137 ^c (0.039)
Community health center	3.7	-0.235 ^b (0.048)	-0.118 ^a (0.057)	-0.115 (0.072)	-0.016 (0.048)	-0.059 (0.048)	-0.052 (0.042)
Other/unknown	7.0	-0.091 (0.048)	-0.080 (0.057)	-0.118 (0.072)	-0.021 (0.047)	-0.093 (0.047)	-0.049 (0.040)
Metropolitan status							
MSA	88.6	Reference	Reference	Reference	Reference	Reference	Reference
Non-MSA	11.4	-0.001 (0.023)	0.030 (0.023)	-0.009 (0.034)	-0.003 (0.025)	-0.022 (0.023)	-0.036 (0.022)
EHR adoption status							
No EHR use	43.0	Reference	Reference		Reference	Reference	Reference
Any EHR use	57.0	0.493 ^b (0.023)	0.333 ^b (0.023)		0.343 ^b (0.022)	0.494 ^b (0.020)	0.368 ^b (0.021)
State fixed effects	—	Yes	Yes	Yes	Yes	Yes	Yes
F statistic	—	9.77	7.68	2.71	6.89	8.57	7.37
Number of respondents	—	4326	4326	2554	4326	4326	4326

EHR indicates electronic health record; HMO, health maintenance organization; MSA, metropolitan statistical area; SE, standard error.

^a*P* < .05

^b*P* < .001.

^c*P* < .01.

These incremental effects represent the percentage point change in the outcome relative to the reference category adjusted for the other variables included in the model.

widely varies by state (eAppendix D, available at www.ajmc.com). The capability to receive lab results electronically ranged from 88% (Wisconsin) to 44% (Louisiana). The capability to then incorporate those results electronically into an EHR among those providers able to receive results electronically varied between 73% (Minnesota) and 21% (Louisiana). Electronic lab ordering ranged from 58% (Washington) to 19% (Delaware). The capacity to electronically exchange clinical summaries with patients varied from 55% (Minnesota) to 18% (Louisiana). The proportion of physicians who exchange clinical summaries with other providers varied from 61% (Wisconsin) to 15% (Alabama).

Although the rates vary widely across states, physicians in certain states exchange these data at consistently higher or lower rates compared with the national average (Figure 2). Physicians in 7 states reported the capability to exchange clinical information at rates significantly higher than the national average across at least 4 out of the 6 measures of exchange: Massachusetts, Minnesota, North Dakota, Oregon, Vermont, Wisconsin, and Washington. Conversely, Louisiana, Nevada, and New Jersey have significantly lower rates of physician reported exchange capability across at least 4 out of the 6 measures.

Physician and Practice Characteristics Associated With Exchange Capability

Practice Characteristics. Although a number of practice characteristics were significantly associated with physicians' capability to exchange different types of clinical information (Table), the single strongest significant predictor was adoption of an EHR ($P < .001$). Adjusting for other physician and practice characteristics, physicians with an EHR were 49 percentage points more likely to have computerized capability to provide clinical summaries to patients and 37 percentage points more likely to exchange clinical summaries with other providers compared with physicians with no EHR. The association between EHR adoption and the capability to exchange pharmacy data and lab data were similarly strong.

Practice ownership was also an important predictor of exchange capability. Practices owned by health maintenance organizations or healthcare corporations were significantly more likely to exchange all 6 types of clinical data compared with physician-owned or physician group-owned practices. Community health centers were significantly less likely to have the capability to e-prescribe ($P < .001$) or receive lab results electronically ($P < .05$) compared with physician-owned or physician group-owned practices. Practices owned by hospitals or academic medical centers were significantly less likely to have the capability to e-prescribe ($P < .001$) but more likely to have

the capability to receive lab results electronically ($P < .001$) and exchange clinical summaries with other providers ($P < .001$).

Larger practice size was significantly associated with the capability to conduct all facets of electronic lab exchange and was a particularly strong predictor of the capability to incorporate lab results into an EHR. Practice size was also significantly associated with the capability to e-prescribe ($P < .001$). However, practice size was not a significant predictor of capability to exchange clinical summaries.

Physicians practicing in multispecialty practices were more likely to have the capability to e-prescribe ($P < .05$), send lab orders electronically ($P < .001$), and exchange clinical summaries with other providers ($P < .001$) compared with single-specialty practices. However, overall, practice type was not a strong predictor of exchange capability.

Physician Characteristics. Primary care physicians were more likely to have the capability to e-prescribe ($P < .001$) and engage in various forms of lab exchange ($P < .001$), as well as provide clinical summaries to patients ($P < .05$) compared with specialists. Age differences were not associated with most forms of exchange capability; physicians aged less than 50 years were only slightly more likely to possess the capability to provide clinical summaries to patients ($P < .05$) compared with older physicians.

Variation in Physician Exchange Capability by EHR Vendor

Among physicians using an EHR, capability to exchange different types of clinical information varied according to EHR vendor (Figure 3). Between 73% and 94% of physicians using an EHR reported that they possess the capability to e-prescribe, depending upon their vendor. Most EHR vendors (between 80% and 99%) provide the capability to receive lab results electronically. Depending upon the EHR vendor, between 62% and 95% of physicians reported the capability to incorporate lab results into their EHR. Physicians' capability to send lab orders electronically ranged from more than one-third (38%) to 87% depending upon the EHR vendor.

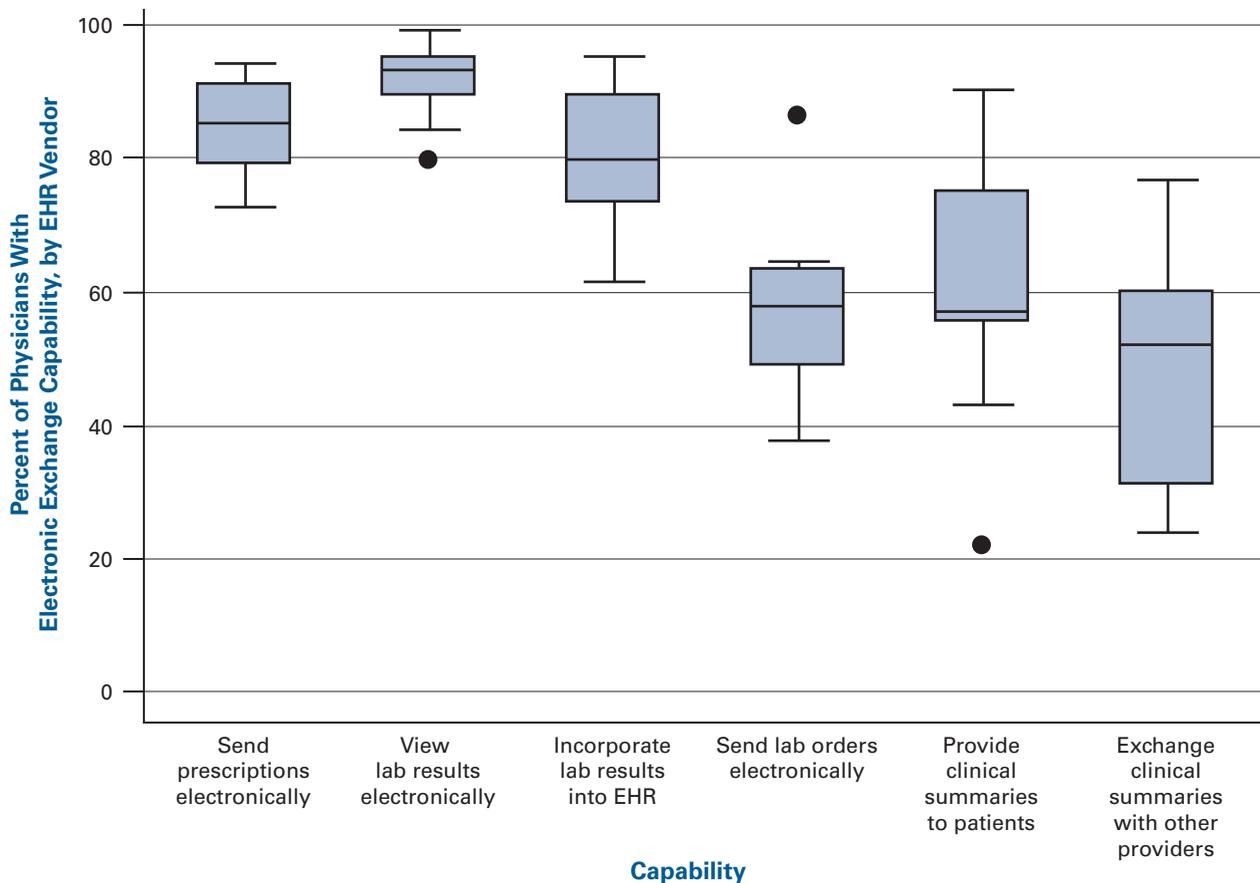
Large differences existed across EHR vendors with regard to capability to exchange clinical summaries. EHR vendor capability to provide clinical summaries to patients ranged from 22% to 90% of physicians. Between one-fourth (24%) and three-fourths (77%) of physicians reported the capability to exchange clinical summaries with other providers, depending upon their EHR vendor.

DISCUSSION

In 2011, a majority of office-based physicians possessed the capability to electronically exchange lab and medication

Physician Capability

■ **Figure 3.** Variation by EHR Vendor in Electronic Exchange Capability Among US Office-Based Physicians, 2011



EHR indicates electronic health record.

to clinical data. Studies demonstrating the impact of HIE in an ambulatory care setting have largely been limited to portal users.^{21,22} Furthermore, EHRs have been criticized for their lack of interoperability, including their inability to facilitate exchange of data easily between providers.²³ We found that a majority of physicians who have EHRs reported they have the capability to exchange different types of clinical information, and multivariate analyses demonstrated that having an EHR was the single strongest predictor of exchange capability for e-prescribing, laboratory test viewing and ordering, and exchanging clinical summaries. Although stand-alone systems may continue to play a significant role, our findings indicate that EHRs have the capability to exchange a wide variety of clinical information with patients, providers, and other entities, in addition to serving as a more comprehensive tool to improve patient care.

However, our findings indicate that EHR systems do not all offer equivalent exchange capability. Although most physicians with EHRs reported capability to e-prescribe and view

laboratory results, we found wide variation across EHR vendors in capabilities for lab ordering and exchange of clinical summaries. This variation may be due to how recently the physician implemented the EHR and whether the product met certification criteria requiring it to support clinical summary exchange. Some EHR vendors have designed products using outdated technology that does not enable interoperability with other systems.²⁴ Variation in HIE capability across vendors may diminish over time as physicians upgrade their systems or purchase newer systems that meet more rigorous stage 2 meaningful use certification criteria related to HIE. The requirement to demonstrate the capability to exchange clinical summaries across different vendor platforms may increase the number of vendors offering products featuring this functionality, paving the way for an increase in the proportion of physicians using EHRs to exchange clinical care summaries with other providers. Evidence suggests that after the implementation of stage 1 meaningful use requiring physicians to e-prescribe, the proportion of providers e-prescribing on the

Surescripts network using an EHR increased almost 7-fold from 7% in 2008 to 48% in 2012.²⁵

Another potential driver of HIE is healthcare payment and delivery reform. As payment and organization continues to evolve, rewarding providers who better manage patient populations and penalizing those that do not will likely spur demand for HIE and the ability to facilitate transitions in care electronically.²⁶ Specifically, accountable care organizations, which allow entities to share cost savings, may create a business case for HIE by giving providers greater financial incentives to exchange information regarding their patients with each other. Additionally, financial penalties for high hospital readmission rates, for example, may spur greater care coordination between hospitals and ambulatory care providers to better manage transitions of care through the use of care summaries.^{27,28}

Physician exchange capability also varied widely across states. Prior state health information technology investment, state legislation and regulations, and existing local/regional health information organizations may help explain some of this variation.²⁹ Furthermore, variation in EHR adoption rates may also explain these differences. Except for Vermont, all the states with above-average (relative to national) exchange capability (across multiple measures) also have significantly higher levels of EHR adoption.³⁰ Understanding how states such as Minnesota have facilitated higher rates of physician exchange capability across a number of measures may provide other states with best practices in promoting greater exchange activity. These findings suggest that ONC's State HIE program has an important role in ensuring that physicians, regardless of their geographic location, have the capability to exchange clinical information with patients and other providers. The measures examined as part of this baseline study of exchange capability are being used by the State HIE program to monitor the performance of states and set national goals.¹⁵

In addition to EHR use, other physician and practice characteristics were associated with greater exchange capability. However, these were not as strong predictors as EHR adoption, nor were the patterns necessarily consistent across the different types of clinical data. Smaller practices have previously reported experiencing barriers to HIE, and our findings suggest that smaller practices do have less capability to exchange with pharmacies and laboratories compared with larger practices; however, we did not find differences with regard to clinical summary exchange.³¹ Primary care physicians' higher rates of exchange capability compared with specialists—which persisted after controlling for EHR use—may be driven in part by primary care physicians' greater need to exchange information with other providers to coordinate and manage their patients care.²⁸

This study has some important limitations. These findings are based on self-reported survey data, which could not be independently verified. The survey did not capture detail on all mechanisms or tools by which physicians may exchange clinical information, including stand-alone systems or proprietary portals. Our measure of pharmacy exchange was limited; the survey did not capture potential exchange from the pharmacy or pharmacy benefit manager such as prescription renewals, eligibility/formulary verification, and medication histories.³² Nor did the survey report on whether physicians exchanged information with providers outside their practice or organization. We were also not able to measure physicians' capability to exchange data across different EHR vendor platforms, which is required for stage 2 meaningful use. In addition to examining trends in exchange capability, future research should examine physicians' actual use of exchange functionality.³³

This baseline study of physician capability to exchange key types of clinical information found room for improvement but also a foundation on which to build and expand physician exchange capability. Our findings suggest that while most physicians possess the capability to meet certain HIE-related meaningful use requirements such as e-prescribing, physicians are less prepared to meet other upcoming stage 2 core HIE requirements such as clinical care summary exchange. It will be important to monitor these key measures of exchange capability as ambulatory providers implement EHRs meeting meaningful use stage 2 requirements and as shifts in health-care delivery require robust exchange of health information.

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■ eAppendix A. National Ambulatory Medical Care Survey Electronic Medical Records Supplement Questions Used to Calculate Key Measures

17. Does the reporting location use an electronic medical record (EMR) or electronic health record (EHR) system? Do not include billing record systems.

- Yes, all electronic
- Yes, part paper and part electronic
- No
- Unknown

17b. What is the name of your current EMR/EHR system? **CHECK ONLY ONE BOX. IF OTHER IS CHECKED, PLEASE SPECIFY THE NAME.**

- | | | |
|---|---|---|
| <input type="checkbox"/> 1 Allscripts | <input type="checkbox"/> 6 eMDs | <input type="checkbox"/> 11 Sage |
| <input type="checkbox"/> 2 Cerner | <input type="checkbox"/> 7 GE/Centricity | <input type="checkbox"/> 12 SOAPware |
| <input type="checkbox"/> 3 CHARTCARE | <input type="checkbox"/> 8 Greenway Medical | <input type="checkbox"/> 13 Practice Fusion |
| <input type="checkbox"/> 4 eClinicalWorks | <input type="checkbox"/> 9 MED3000 | <input type="checkbox"/> 14 Other _____ |
| <input type="checkbox"/> 5 Epic | <input type="checkbox"/> 10 NextGen | <input type="checkbox"/> 15 Unknown |

19. Please indicate whether the reporting location *has* each of the *computerized capabilities* listed below.

CHECK NO MORE THAN ONE BOX PER ROW. Does the reporting location *have* a computerized system for:

	Yes	Yes, but turned off or not used	No	Unknown
19c. Ordering prescriptions?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19c1. If yes, are prescription sent electronically to the pharmacy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19e. Ordering lab tests?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19e1. If yes, are orders sent electronically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19g. Viewing lab results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19g1. If yes, are results incorporated into EMR/EHR?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19i. Providing patients with clinical summaries for each visit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. Do you exchange patient clinical summaries electronically with any other providers?

- Yes, send summaries only
- Yes, receive summaries only
- Yes, send and receive summaries
- No
- Unknown

21a. How do you electronically send or receive patient clinical summaries? **CHECK ALL THAT APPLY**

- Through EMR/EHR vendor
- Through hospital-based system
- Through health information organization or state exchange
- Through secure e-mail attachment
- Other/unknown

Additional details on key measures

Any EHR adoption: Physicians were defined as having any EHR if they responded “Yes, all electronic” or “Yes, part paper and part electronic” to question 17. Physicians who responded “No” or “Unknown” were defined as not having any EHR.

Measures of health information exchange: Physicians were defined as having the capability to e-prescribe, view lab results electronically, send lab orders electronically, and provide patients with after-visit clinical summaries if they responded “Yes” or “Yes, but turned off or not used” for those functionalities in question 19. Physicians who responded “No” or “Unknown” were defined as not having the capability.

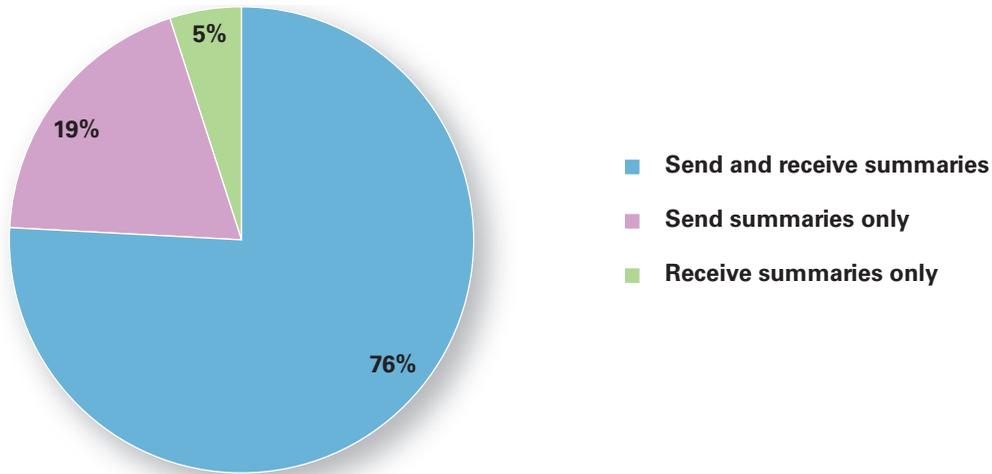
Physicians were defined as having the capability to incorporate lab results into the EHR if they responded “Yes” or “Yes, but turned off or not used” to question 19g1 and they had any EHR. Physicians who responded “No” or “Unknown” or who had no EHR were defined as not having the capability. (A small number of physicians [3.0%] responded “Yes” or “Yes, but turned off or not used” to Question 19g1 but did not have any EHR; these physicians are defined as not having the capability to incorporate lab results in the EHR.)

Physicians were defined as having the capability to exchange clinical summaries with other providers if they gave any of the “Yes” responses to question 21. Our estimate of exchange of clinical care summaries with other providers may also be lower than other measures presented here because the survey assesses actual exchange activity of clinical care summaries with other providers as opposed to the capability to exchange.

Primary care: The National Ambulatory Medical Care Survey defines the following specialties as primary care: general/family practice, internal medicine, obstetrics/gynecology, and pediatrics.

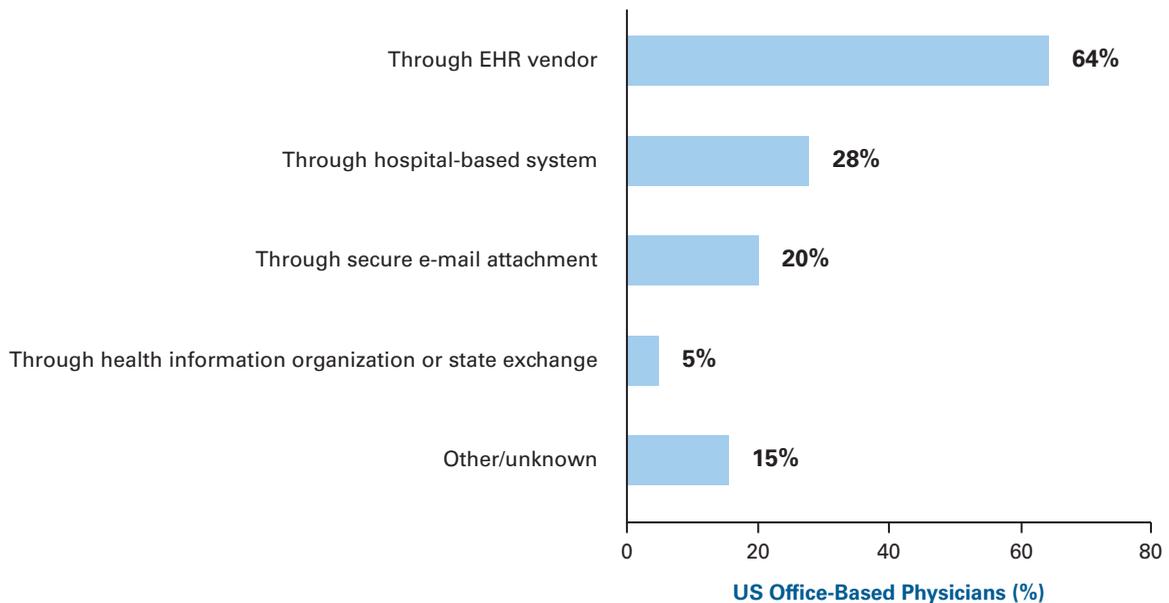
Physician Capability

■ eAppendix B. Extent of Exchange of Clinical Summaries With Other Providers, Conditional on Exchange Capability: US Office-Based Physicians, 2011



Source: National Ambulatory Medical Care Survey Electronic Medical Record Supplement 2011.

■ eAppendix C. Methods of Access^a for Exchange of Clinical Summaries With Other Providers, Conditional on Exchange Capability: US Office-Based Physicians, 2011



EHR indicates electronic health record.

^aRespondents may report more than 1 method of access.

Source: National Ambulatory Medical Care Survey Electronic Medical Record Supplement 2011.

■ POLICY ■

■ **eAppendix D.** Percentage of US Office-Based Physicians with Electronic Exchange Capability by State, 2011

Location	Number of Respondents	EHR Adoption, %	Pharmacy Exchange, %	Laboratory Exchange, %			Clinical Summary Exchange, %	
		Any EHR Use	Send Prescriptions Electronically	Receive Lab Results Electronically	Incorporate Lab Results Into EHR	Send Lab Orders Electronically	Provide Clinical Summaries to Patients	Exchange Clinical Summaries With Other Providers
United States	4326	57.0	54.6	67.4	41.6	35.3	38.3	31.2
Alabama	86	47.3	47.7	60.4	31.5	26.1	30.1	14.5 ^a
Alaska	99	59.2	50.3	69.0	47.0	48.2 ^b	39.5	29.5
Arizona	79	66.7	48.8	61.0	44.1	41.5	33.2	31.1
Arkansas	77	51.2	47.9	67.4	38.0	43.4	42.5	19.6 ^a
California	71	58.6	52.2	61.4	36.4	37.9	42.9	43.2
Colorado	84	65.8	54.3	73.8	48.8	44.3	38.7	33.5
Connecticut	81	61.9	61.8	77.2 ^b	38.3	28.8	30.1	37.7
Delaware	85	59.5	61.0	75.2	43.6	18.8 ^a	34.6	32.8
District of Columbia	61	65.3	50.1	62.5	45.1	42.3	47.3	36.4
Florida	89	48.5	53.9	65.5	31.7	28.0	32.9	23.8
Georgia	88	58.3	50.7	68.9	42.2	37.1	42.5	25.6
Hawaii	87	71.0 ^b	63.6	69.4	58.3 ^b	44.7	44.3	38.2
Idaho	88	52.6	49.2	71.0	40.1	28.0	31.1	25.8
Illinois	65	53.7	47.7	65.3	39.3	38.6	37.1	26.6
Indiana	80	57.7	55.0	72.5	45.8	31.7	33.6	28.8
Iowa	93	73.1 ^b	71.7 ^b	73.3	51.4	48.7 ^b	35.6	38.6
Kansas	89	61.2	58.6	68.8	47.9	33.2	32.4	27.9
Kentucky	87	46.0	41.4 ^a	57.5	27.1 ^a	25.5	31.3	25.5
Louisiana	70	39.5 ^a	28.8 ^a	43.5 ^a	20.7 ^a	20.6 ^a	17.5 ^a	19.2 ^a
Maine	83	62.5	55.9	66.7	47.9	37.8	41.0	35.0
Maryland	74	52.7	54.8	59.5	35.4	35.3	31.9	22.3
Massachusetts	74	71.2 ^b	78.2 ^b	79.5 ^b	58.1 ^b	39.3	41.5	45.1 ^b
Michigan	71	51.9	64.2	62.5	39.9	27.6	37.9	28.4
Minnesota	90	77.6 ^b	72.3 ^b	84.1 ^b	72.8 ^b	56.0 ^b	54.7 ^b	46.5 ^b
Mississippi	79	54.3	45.1	61.8	37.0	23.2 ^a	26.6 ^a	24.5
Missouri	84	57.0	50.8	67.6	44.2	34.5	33.4	33.8
Montana	98	62.3	59.3	71.5	50.4	40.9	41.8	31.1
Nebraska	101	58.5	57.8	75.3	43.5	39.6	30.7	26.7
Nevada	71	52.5	46.9	49.7 ^a	29.6 ^a	29.2	25.3 ^a	20.5 ^a
New Hampshire	92	68.1 ^b	59.1	75.9	59.8 ^b	32.2	37.2	47.8 ^b
New Jersey	72	41.8 ^a	43.7	54.8 ^a	27.8 ^a	21.5 ^a	30.0	16.4 ^a
New Mexico	92	54.1	40.2 ^a	63.7	33.8	34.4	27.1 ^a	27.9
New York	78	55.3	56.3	73.6	42.2	28.4	44.1	25.2
North Carolina	99	58.0	61.0	66.6	43.7	27.2	39.1	33.9
North Dakota	79	84.0 ^b	71.8 ^b	81.7 ^b	65.6 ^b	56.3 ^b	46.9	54.0 ^b
Ohio	77	58.9	45.1	67.8	47.0	41.3	34.1	34.3
Oklahoma	89	54.7	46.9	59.2	37.0	30.7	37.2	29.4
Oregon	86	75.1 ^b	68.3 ^b	82.3 ^b	67.0 ^b	45.5	52.6 ^b	37.5
Pennsylvania	90	50.6	52.1	74.6	38.7	30.7	34.5	28.8
Rhode Island	91	43.8 ^a	55.6	70.1	31.6	25.6 ^a	37.4	20.3 ^a
South Carolina	68	53.4	34.5 ^a	60.8	23.9 ^a	29.8	24.6 ^a	23.1
South Dakota	84	55.4	55.3	71.2	45.0	45.7	36.2	39.3
Tennessee	81	48.2	57.0	58.8	32.9	32.8	27.1 ^a	24.6
Texas	96	52.4	57.1	65.3	40.8	41.2	45.3	24.5
Utah	107	80.8 ^b	52.8	85.5 ^b	65.1 ^b	40.0	47.0	52.9 ^b
Vermont	93	66.8	65.3 ^b	76.2	54.1 ^b	46.7 ^b	45.8	50.5 ^b
Virginia	95	59.5	48.4	68.0	41.1	34.0	40.7	23.5
Washington	82	75.3 ^b	68.7 ^b	79.0 ^b	62.5 ^b	58.3 ^b	49.5	52.1 ^b
West Virginia	91	52.9	45.9	63.6	41.0	27.1	31.7	25.2
Wisconsin	86	75.8 ^b	73.7 ^b	88.4 ^b	67.4 ^b	56.4 ^b	45.7	61.2 ^b
Wyoming	114	50.6	40.1 ^a	57.3	35.1	29.1	28.9	17.6 ^a

EHR indicates electronic health record.

^aSignificantly lower than national average at $P < .05$.

^bSignificantly higher than national average at $P < .05$.

Source: National Ambulatory Medical Care Survey Electronic Medical Record Supplement 2011.