

Consolidation in the Electronic Health Record Market, 2009–2017

BRITTANY MANDEVILLE, MPH; MOMOTAZUR RAHMAN, PhD; REBEKAH GARDNER, MD

ABSTRACT

BACKGROUND: To quantify changes to the electronic health record (EHR) market in Rhode Island and to assess the degree of EHR market consolidation between 2009 and 2017.

METHODS: The EHR market in Rhode Island is represented by three measures: the proportion of physicians who have adopted an EHR, the number of EHR vendors in use, and EHR market competitiveness, captured by the Herfindahl—Hirschman Index (HHI).

RESULTS: The EHR market became more consolidated overall between 2009 and 2017. Among outpatient physicians, the market has remained competitive, despite ongoing consolidation. In contrast, the EHR market among inpatient physicians crossed into the “highly concentrated” zone in 2015.

DISCUSSION: While consolidation in the EHR market may facilitate the exchange of data across health systems, potentially reducing duplicative testing and facilitating timely diagnosis, limiting competition may affect vendors’ responsiveness to calls for improved usability and innovation.

KEYWORDS: electronic health records, competition, consolidation, health information technology

INTRODUCTION

Over the past decade, the federal government has incentivized hospitals and physician practices to adopt and meaningfully use electronic health records (EHRs). Policymakers anticipated that these incentives would stimulate investment in health information technology and transform the EHR marketplace through the creation of new vendors and increased competition.¹ According to economic theory, competition in the EHR vendor market would help to lower costs, improve quality, increase choice, and encourage innovation.^{2,3} However, competition in the EHR vendor market may also limit interoperability and fragment patient care, as competing vendors may not readily exchange patient information.⁴

While there is evidence that the 2009 Health Information

Technology for Economic and Clinical Health (HITECH) Act successfully increased EHR adoption and prompted an initial surge of competition for vendors, less is known about the level of competition in the EHR vendor market today.^{5,6,7} Health policy professionals have voiced concerns about the recent trend towards consolidation in other aspects of healthcare – hospitals, health insurers, and physicians’ services – and the implications of this consolidation for patient care.^{3,8} The objective of this research is to 1) quantify changes to the Rhode Island EHR vendor market between 2009 and 2017 and 2) assess the degree of EHR vendor competition and market consolidation over the same time period.

METHODS

The Rhode Island Department of Health (RIDOH) administers a health information technology survey to all licensed independent practitioners in the state. This survey is administered as part of a legislatively-mandated public reporting program, and the data are used to report clinician-level process measures relating to health information technology adoption and use. The survey was distributed electronically to physicians annually from 2009 to 2015, and biennially since 2015. This study uses data from survey years 2009 to 2015, as well as 2017. The survey response rate ranged from a high of 68.3% of physicians in 2014 (n=2,567) to a low of 42.7% of physicians in 2017 (n =1,792).

The survey population includes all licensed physicians in active practice in Rhode Island. Respondent age was obtained from RIDOH licensure files. Physician respondents provided their specialty, main practice setting (office/outpatient or hospital/inpatient), and practice size. In the survey, an EHR was defined as “an integrated electronic clinical information system that tracks patient health data and may include such functions as visit notes, prescriptions, lab orders, etc.”

We used three measures to describe the EHR market for each year of the study period. For the first measure – the percentage of physicians using an EHR – physicians were asked if they used an EHR at their main practice. If their main practice did not have an EHR, they were asked to answer based on the practice with an EHR in which they spent the most time providing direct patient care. Respondents who reported using an EHR at their main or any secondary practice were considered to use an EHR.

For the second measure – the overall number of EHR vendors in use – each physician was asked to identify their EHR vendor from a single-select list with an open-ended “Other” option. If a physician wrote in two EHR vendors, we only included the first vendor listed. We counted the total number of vendors in use each year. EHR vendors were included independent of certification status. We used Crunchbase, a business information platform, to verify EHR vendor mergers and acquisitions throughout the study period.⁹

Finally, for the third measure, we calculated EHR vendor competition using the Herfindahl-Hirschman Index (HHI), a commonly accepted measure of market competitiveness.^{10,11} The HHI is the sum of each vendor’s squared market share. A higher HHI indicates a lower degree of competitiveness, and an increasing HHI over time suggests market consolidation. Economists consider a market with an HHI score less than 1500 to be “competitive,” between 1500 and 2500 to be “moderately concentrated,” and greater than 2500 to be “concentrated.”^{10,11} We excluded respondents from the HHI calculation if they did not use an EHR, did not know which EHR vendor their practice used, or did not specify a vendor. We stratified all three measures of the EHR market by physician practice setting.

RESULTS

Sample Description

Most physician respondents worked in an office or outpatient setting, at a practice with ten physicians or fewer, and had an MD degree (Table 1). The highest proportion of physician respondents listed internal medicine as their specialty, followed by pediatrics, psychiatry, family medicine, and surgery (including both general and subspecialty). For most survey years, about half of the respondents fell between the ages of 30 and 50. In 2017, the sample differed slightly from previous years, with a lower proportion of younger and outpatient physicians.

EHR market among all physicians

The proportion of physicians using EHRs increased between 2009 and 2017, with 91.1% of respondents indicating that they used an EHR in 2017, compared to 69.2% in 2009 (Table 2). Awareness of EHR vendors also increased throughout the study, as the proportion of EHR users who were able to identify their practice’s EHR vendor by name increased from 58.3% in 2009 to 97.5% in 2017. In 2009, no one EHR vendor had more than 10% of the EHR market, whereas over a third (36.9%) of EHR users used an Epic Systems Corporation product in 2017. eClinicalWorks had the largest market share between 2009 and 2013 until Epic Systems Corporation surpassed it in 2014. Epic Systems Corporation’s market share grew substantially between 2013 and 2017, from 0% of physician EHR users in 2013 to 36.9% in 2017. Together, Epic Systems Corporation and eClinicalWorks accounted

for half of the EHR market in Rhode Island in 2017. Cerner Corporation had the third-largest market share in 2017 at 7.9% of EHR users. The number of EHR vendors in the market increased from 75 in 2011 to 104 in 2015 and then decreased to 82 by 2017. Based on the HHI calculations, the EHR market among all physician respondents was “competitive” between 2009 and 2015, before transitioning to a “moderately concentrated” market in 2017 (Figure 1).

EHR market among outpatient physicians

Among office/outpatient respondents, 59.8% reported using an EHR in 2009 compared to 88.3% in 2017 (Table 2). For most of the study period, eClinicalWorks was the dominant EHR vendor in the office/outpatient market, growing from a market share of 16.3% of outpatient EHR users in 2009 to 27.6% in 2014, before decreasing to 20.4% in 2017. Epic Systems Corporation surpassed eClinicalWorks as the most commonly used EHR vendor in 2017, with a 25.8% market share. Although the HHI increased between 2009 and 2017, the HHI never passed the “concentration” threshold and remained reflective of a highly competitive market (Figure 1).

EHR market among inpatient physicians

Similar to office/outpatient physicians, the proportion of hospital/inpatient respondents using an EHR grew over the study period, from 84.7% in 2009 to 96.9% in 2017 (Table 2). More than half of inpatient EHR users were unaware of their EHR vendor or did not specify their vendor in 2009. However, by 2017, only 1.8% of inpatient EHR users were unaware of their practice’s vendor. Cerner Corporation had the highest market share among inpatient EHR users between 2009 and 2012; a homegrown EHR system (LifeLinks) overtook Cerner Corporation in 2013. By 2015, Epic Systems Corporation had the highest market share. In 2017, the majority of inpatient EHR users (58.1%) used Epic Systems Corporation, and together Epic Systems Corporation and Cerner Corporation accounted for more than 75% of the inpatient market. Between 2009 and 2012, the inpatient EHR market straddled the line between a “competitive” and a “moderately concentrated” market. After 2014, however, the market transitioned to “highly concentrated” (Figure 1). The market consolidation for inpatient EHRs coincided with the transition by a large health system from a homegrown EHR to Epic Systems Corporation in 2015.

DISCUSSION

We found EHR adoption increased substantially over the study period, among both inpatient and outpatient physicians, and we observed a “competitive” market at the start of the study period moving towards consolidation, especially among inpatient physicians.^{4,5,6,7} Unlike previous studies on the EHR vendor market, we did not find an increase in the number of EHR vendors in the state’s outpatient or inpatient

market between 2009 and 2012, immediately after the passage of the HITECH Act.^{5,6,7} This difference is likely because prior studies considered only certified EHRs, while our study included all EHR vendors independent of certification status.

Before 2014, there were a small number of EHR vendors in Rhode Island that controlled a large share of either the

inpatient market or the outpatient market, but no one vendor controlled more than 20% of the entire market. However, starting in 2014, Epic Systems Corporation became a leading vendor in both markets, accounting for more than a third of physician EHR users in Rhode Island by 2017. Consolidation among EHR vendors coincides with the growth of several large health systems in Rhode Island and

Table 1. Characteristics of physician respondents

Characteristics	2009 N=1,995 n (%)	2010 N=1,855 n (%)	2011 N=2,128 n (%)	2012 N=1,958 n (%)	2013 N=2,365 n (%)	2014 N=2,565 n (%)	2015 N=2,570 n (%)	2017 N=1,792 n (%)
Age, years								
30–50	–	974 (52.7%)	1,116 (52.6%)	982 (50.2%)	1,173 (49.7%)	1,174 (45.9%)	1,264 (49.4%)	756 (42.4%)
51–64	–	690 (37.3%)	794 (37.4%)	761 (38.9%)	910 (38.5%)	1,014 (39.7%)	948 (37.0%)	695 (39.0%)
65–90	–	185 (10.0%)	213 (10.0%)	212 (10.8%)	278 (11.8%)	372 (14.5%)	348 (13.6%)	330 (18.5%)
Practice setting								
Office/outpatient	1,245 (62.4%)	1,129 (60.9%)	1,308 (61.5%)	1,184 (60.5%)	1,389 (58.7%)	1,543 (60.2%)	1,659 (64.6%)	1,180 (65.8%)
Hospital/inpatient	750 (37.6%)	726 (39.1%)	820 (38.5%)	774 (39.5%)	976 (41.3%)	1,022 (39.8%)	913 (35.5%)	612 (34.2%)
Practice size								
<=10 clinicians	1,246 (62.9%)	1,096 (59.4%)	1,259 (59.5%)	1,113 (57.3%)	1,347 (57.3%)	1,484 (58.0%)	1,562 (61.2%)	–
10+ clinicians	736 (37.1%)	749 (40.6%)	858 (40.5%)	830 (42.7%)	1,005 (42.7%)	1,074 (42.0%)	990 (38.8%)	–
Specialty								
Emergency medicine	92 (4.6%)	102 (5.5%)	102 (4.8%)	108 (5.5%)	128 (5.4%)	141 (5.5%)	144 (5.6%)	82 (4.6%)
Family medicine	162 (8.2%)	169 (9.1%)	170 (8.0%)	147 (7.5%)	191 (8.1%)	204 (7.9%)	208 (8.1%)	141 (7.9%)
Internal medicine	296 (14.9%)	261 (14.0%)	322 (15.1%)	262 (13.4%)	332 (14.0%)	422 (16.5%)	352 (13.7%)	258 (14.4%)
OB/GYN	99 (5.0%)	83 (4.5%)	117 (5.5%)	101 (5.2%)	128 (5.4%)	119 (4.6%)	133 (5.2%)	97 (5.4%)
Pediatrics	177 (9.0%)	156 (8.4%)	219 (10.3%)	198 (10.1%)	236 (10.0%)	254 (9.9%)	228 (8.9%)	165 (9.2%)
Psychiatry	178 (8.9%)	161 (8.7%)	193 (9.1%)	190 (9.7%)	199 (8.4%)	230 (8.9%)	241 (8.0%)	174 (9.7%)
Surgery*	172 (8.7%)	163 (8.8%)	167 (7.8%)	152 (7.8%)	191 (8.1%)	199 (7.8%)	205 (8.0%)	162 (9.0%)
Other	810 (40.8%)	767 (41.2%)	838 (39.4%)	800 (40.8%)	960 (40.6%)	996 (38.8%)	1,059 (41.2%)	713 (39.8%)
Degree type								
MD	1,887 (94.6%)	1,770 (95.4%)	2,015 (94.7%)	1,852 (94.6%)	2,226 (94.1%)	2,405 (93.8%)	–	1,680 (93.8%)
DO	108 (5.4%)	85 (4.6%)	113 (5.3%)	106 (5.4%)	139 (5.9%)	160 (6.2%)	–	112 (6.3%)

Age was not obtained from licensure files in 2009, degree type was not collected in 2015, and the 2017 survey used different categories for practice size.

Missing data are not shown; fewer than 1% of observations were missing in any one demographic category.

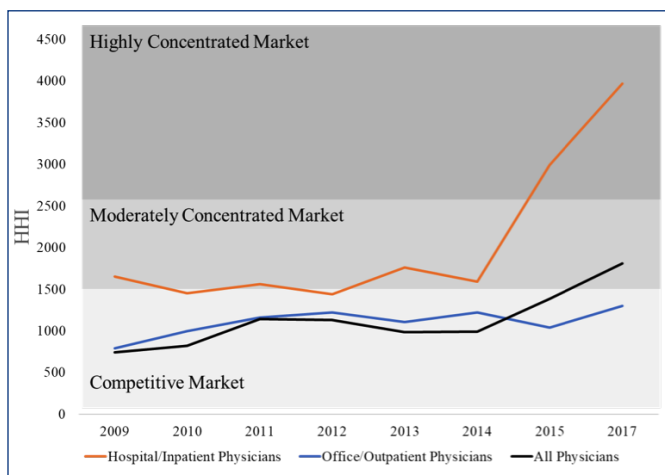
*General surgery & subspecialty surgery

Table 2. Measures describing the electronic health record (EHR) market in Rhode Island, 2009–17

	2009 N=1,995	2010 N=1,855	2011 N=2,128	2012 N=1,958	2013 N=2,365	2014 N=2,565	2015 N=2,570	2017 N=1,792
All physicians								
% of physicians using an EHR	69.2%	74.8%	81.7%	86.8%	88.4%	87.3%	89.3%	91.1%
Number of EHR vendors	79	76	75	88	93	94	104	82
HHI	739	820	1143	1130	982	990	1384	1807
Office/Outpatient								
% of physicians using an EHR	59.8%	66.8%	74.0%	80.8%	83.3%	82.4%	85.5%	88.3%
Number of EHR vendors	73	67	70	78	82	86	93	74
HHI	789	999	1160	1219	1105	1219	1041	1299
Hospital/inpatient								
% of physicians using an EHR	84.7%	87.3%	94.0%	95.0%	95.7%	94.8%	96.3%	96.9%
Number of EHR vendors	25	30	24	28	29	28	35	24
HHI	1649	1452	1561	1440	1763	1592	2994	3965

HHI = Herfindahl-Hirschman Index (HHI), a commonly accepted measure of market competitiveness. A higher HHI indicates a lower degree of competitiveness in the market.

Figure 1. Change in the Herfindahl-Hirschman Index (HHI) for the Rhode Island electronic health record market, 2009-17



an increased proportion of physicians employed by those health systems. Industry researchers anticipate that consolidation in the EHR market will continue, as major players acquire more market share and as healthcare systems consolidate themselves and seek to implement a common vendor across their practice sites.¹² Health system consolidation does not always lead to EHR vendor integration, but when it does, it intensifies EHR market consolidation.¹³ Consolidation in the EHR market has important tradeoffs. The advantages of a less competitive EHR vendor market are primarily related to interoperability and efficiency.¹⁴ The presence of fewer competing vendors, or one large monopolizing vendor, can contribute to common data and interface standards, data sharing, and research and development across different healthcare systems.¹⁵ Despite recent trends in hospital and practice consolidation, patients still see multiple clinicians and are likely to interact with more than one

EHR vendor. Between 2014 and 2016, only 4.5% of Medicare Part A and Part B expenditures were associated with patients who had their medical records in a single vendor, as compared to 20% of expenditures associated with patients with records spread across eight or more vendors.⁴ Greater consolidation in the EHR market may mean that patients will have their health information spread across fewer vendors, but limiting competition can have important disadvantages related to costs and stifled innovation.^{14,15}

The early competition in the EHR market post-HITECH occurred alongside EHR vendor business-model innovation, including repositioning to attract smaller office practices and adapting the EHR for e-prescribing.⁶ There is lack of consensus whether the trend towards market concentration will encourage or discourage innovation. On one hand, consolidation in the EHR market could lead to more innovation, as vendors compete on the value and usability of their products.¹⁶ On the other hand, consolidation to the point of a near monopoly has been associated with lower levels of innovation.^{14,16} The large market share of a small number of vendors and the costly barriers to EHR market entry make it very difficult for disruptive innovation to occur.^{15,16}

There have been recent efforts to achieve interoperability and encourage innovation through regulation. The 21st Century Cures Act was passed in 2016 with the goal of improving interoperability, data usability, and patient access to their health information.^{17,18} The Office of the National Coordinator for Health Information Technology added a new interoperability rule to the 21st Century Cures Act in March 2020.¹⁹ This rule attempts to limit patient information blocking and puts pressure on EHR vendors and other medical providers to make data available through standard interfaces within their operating systems.¹⁹ These interfaces would allow for third-party apps and vendors to access the data and make it available to patients. This rule has the potential to

increase interoperability without sacrificing competition. The interface could also allow use of EHR data to drive clinical innovation from third-party vendors.¹⁵ Future studies should explore the relationship between interoperability, innovation, and market competition.

LIMITATIONS

There are various limitations to this study. First, all data are self-reported. Physicians, particularly in the early years of the study period, may not have known their practice's EHR vendor or may have provided an incorrect EHR vendor. The relatively high proportion of physicians who did not know their EHR vendors early on may skew the HHI estimate if they disproportionately used one vendor. Second, the 2017 survey had a lower response rate than previous survey years. We suspect this dip in response rate is related to the 2015 transition from an annual to a biennial survey administration. Third, the survey was not conducted prior to 2009, so we are unable to describe how the market differed before the passage of HITECH. Finally, this survey was distributed electronically. Electronic distribution may bias the sample toward physicians more comfortable with technology and result in an overestimation of EHR use.

CONCLUSION

We found significant EHR vendor consolidation over the past decade among Rhode Island physicians practicing in the inpatient setting, while the EHR market has remained relatively competitive for outpatient physicians. Between 2015 and 2017, one existing EHR vendor gained significant market share in both the outpatient and inpatient settings. While a gain in market share may facilitate the exchange of data across health systems, potentially reducing duplicative testing and facilitating timely diagnosis, limiting competition may affect innovation in the EHR market.

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Authors

Brittany Mandeville, MPH, is a Research Assistant at Healthcentric Advisors.

Momotazur Rahman, PhD, is an Associate Professor of Health Services, Policy and Practice at Brown University.

Rebekah L. Gardner, MD, is Senior Medical Scientist at Healthcentric Advisors, Associate Professor of Medicine at the Warren Alpert Medical School of Brown University and a practicing internist at Rhode Island Hospital.

Correspondence

Brittany Mandeville, MPH
mandevillebrittany@gmail.com