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Adoption of Electronic Health Record Systems among U.S. Non-Federal Acute Care Hospitals: 2008-2015

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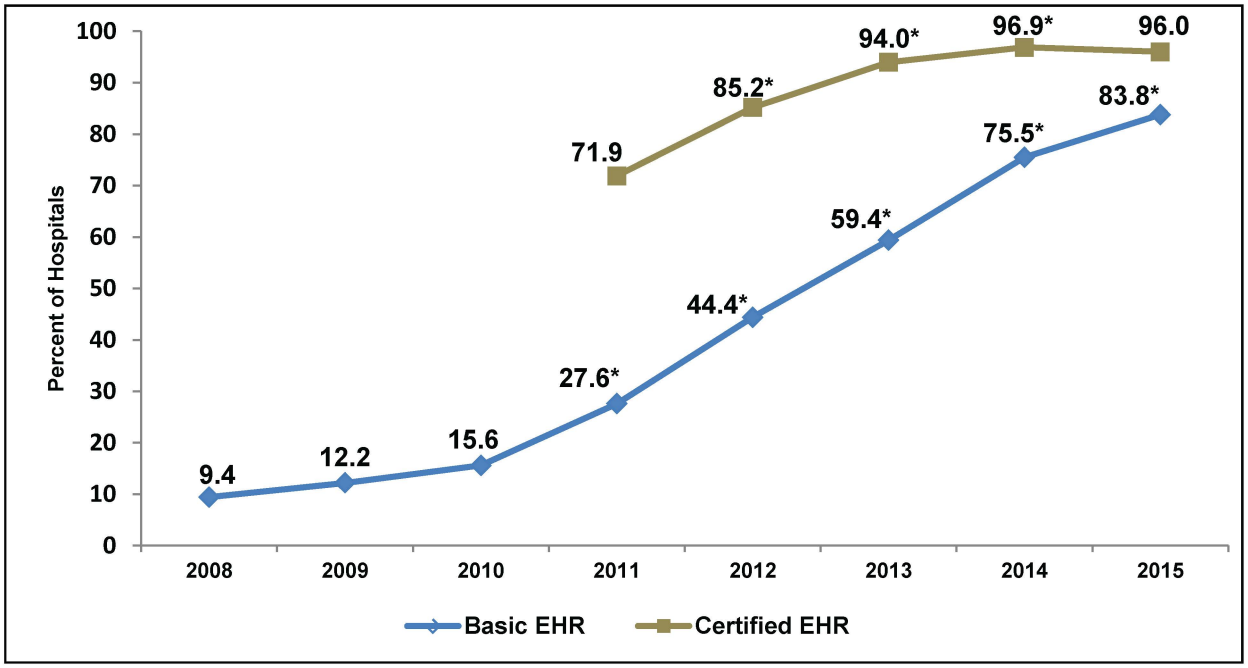
The adoption and meaningful use of electronic health records (EHRs) are key objectives of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 and the Federal Health IT Strategic Plan (1). This brief uses data from the American Hospital Association to describe trends in adoption of EHR technology among non-federal acute care hospitals from 2008 to 2015. It tracks the adoption of Basic EHR systems and the possession of certified EHR technology. Unless otherwise stated, this brief refers to Basic EHR adoption with clinical notes, a measure which represents a minimum use of 10 core functionalities determined to be essential to an EHR system (see Table A1)(2).

Basic EHR adoption increased while certified EHR adoption remained high.

Figure 1: Percent of non-Federal acute care hospitals with adoption of at least a Basic EHR with notes system and possession of a certified EHR: 2008-2015.

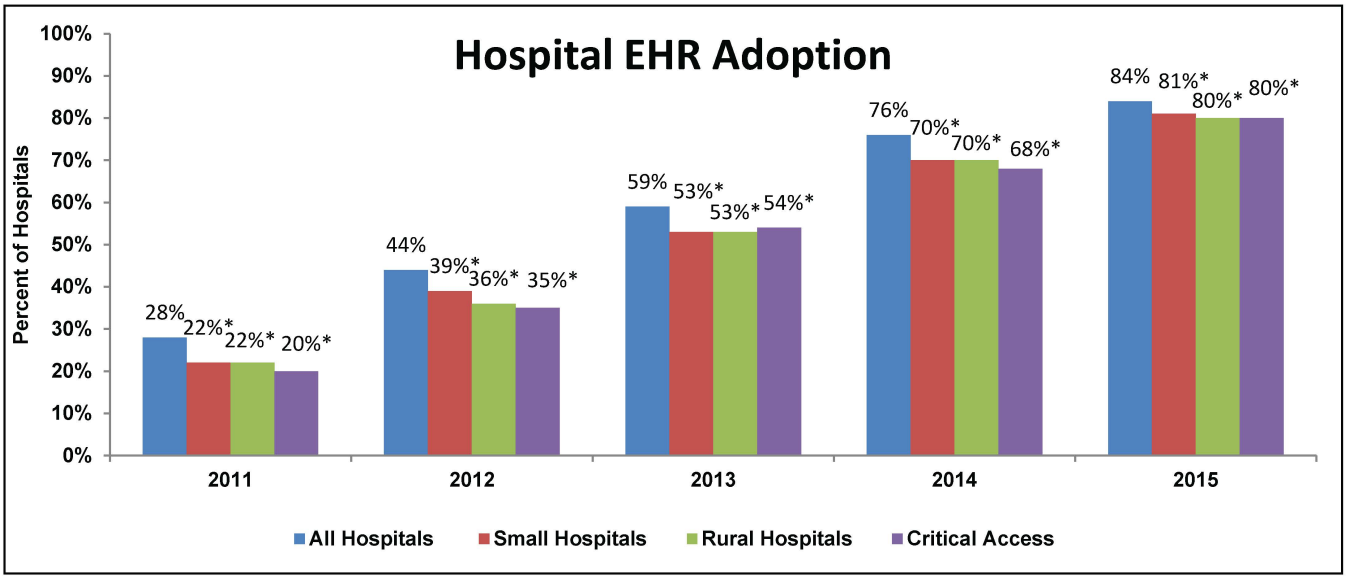


NOTES: Basic EHR adoption requires the EHR system to have a set of EHR functions defined in Table A1. A certified EHR is EHR technology that meets the technological capability, functionality, and security requirements adopted by the Department of Health and Human Services. Possession means that the hospital has a legal agreement with the EHR vendor, but is not equivalent to adoption.
*Significantly different from previous year ($p < 0.05$).
SOURCE: ONC/American Hospital Association (AHA), AHA Annual Survey Information Technology Supplement.

- ★ Nearly all reported hospitals (96%) possessed a certified EHR technology in 2015.
- ★ In 2015, 84% of hospitals adopted at least a Basic EHR system; this represents a 9-fold increase since 2008.
- ★ In 2015, Basic EHR adoption rates increased by 11 % from 2014.

At least 8 out of 10 small, rural, and critical access hospitals adopted a Basic EHR.

Figure 2: Percent of non-federal acute care hospitals with adoption of at least a Basic EHR system by hospital type.

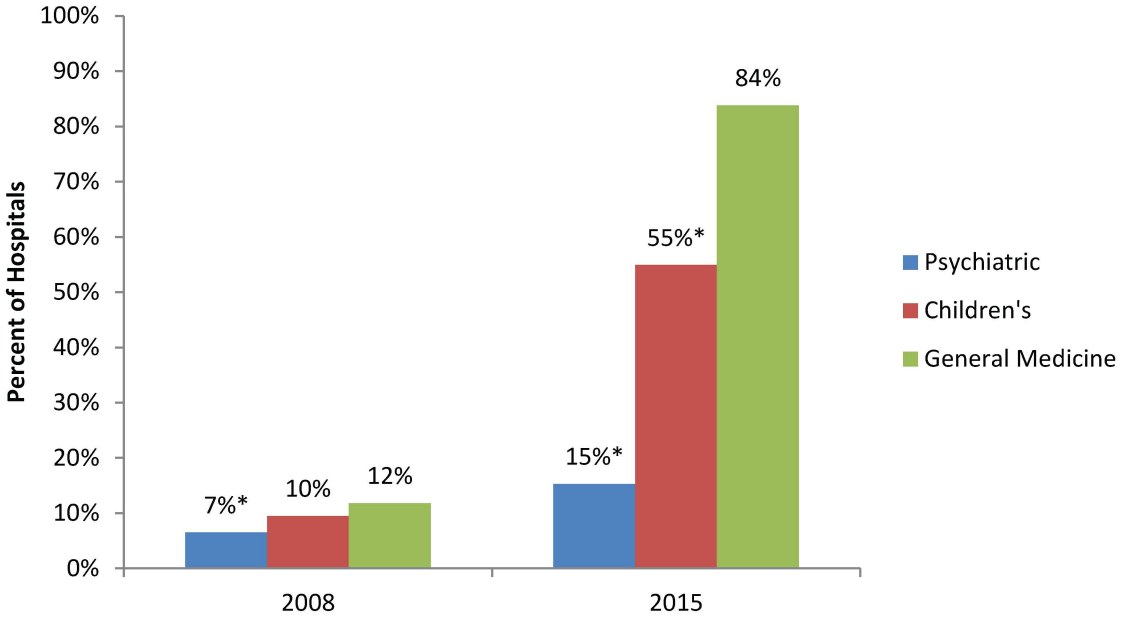


NOTES: *Significantly different from all hospitals. Basic EHR adoption requires the EHR system to have a set of EHR functions defined in Table A1.
SOURCE: ONC/AHA, AHA Annual Survey Information Technology Supplement.

- ★ Small, rural, and critical access hospitals continue to have significantly lower Basic EHR adoption rates compared to all hospitals.
- ★ Since 2014, small and rural hospitals increased their adoption of Basic EHRs by at least 14% and critical access hospitals increased their adoption of Basic EHRs by 18%.

Basic EHR adoption among children's and psychiatric hospitals is significantly lower than general medicine hospitals.

Figure 3: Percent of non-federal acute care hospitals with adoption of at least a Basic EHR system by hospital specialty.

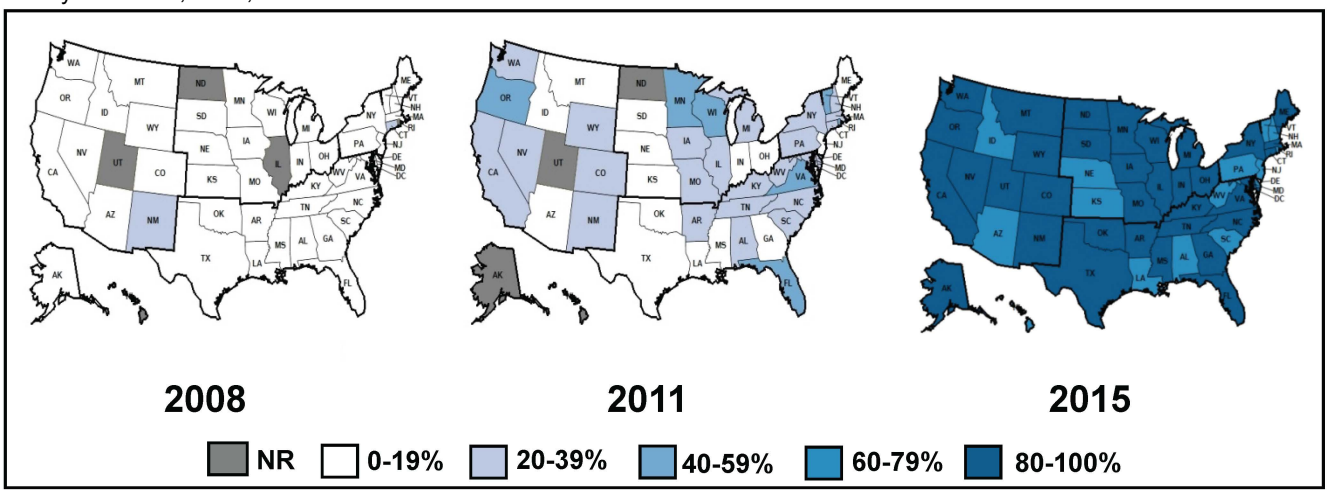


Note: *Significantly different from General Medicine. Children's hospitals include general medicine and specialty hospitals.
SOURCE: ONC/AHA, AHA Annual Survey Information Technology Supplement.

- ★ In 2015, while over 8 in 10 general medicine hospitals adopted a Basic EHR, a little over half of children's hospitals adopted a Basic EHR and only 15% of psychiatric hospitals adopted a Basic EHR.
- ★ In 2008, there were no significant differences in Basic EHR adoption rates between children's and general medicine hospitals; whereas, psychiatric hospitals were significantly lower than general medicine hospitals.
- ★ Between 2008 and 2015, adoption of Basic EHR doubled among psychiatric hospitals, increased five-fold for children's hospitals, and increased seven-fold for general medicine hospitals.

For all states, at least 6 in 10 hospitals adopted a Basic EHR.

Figure 4: Percent of non-federal acute care hospitals with adoption of at least a Basic EHR system at the State-Level for years 2008, 2011, and 2015.

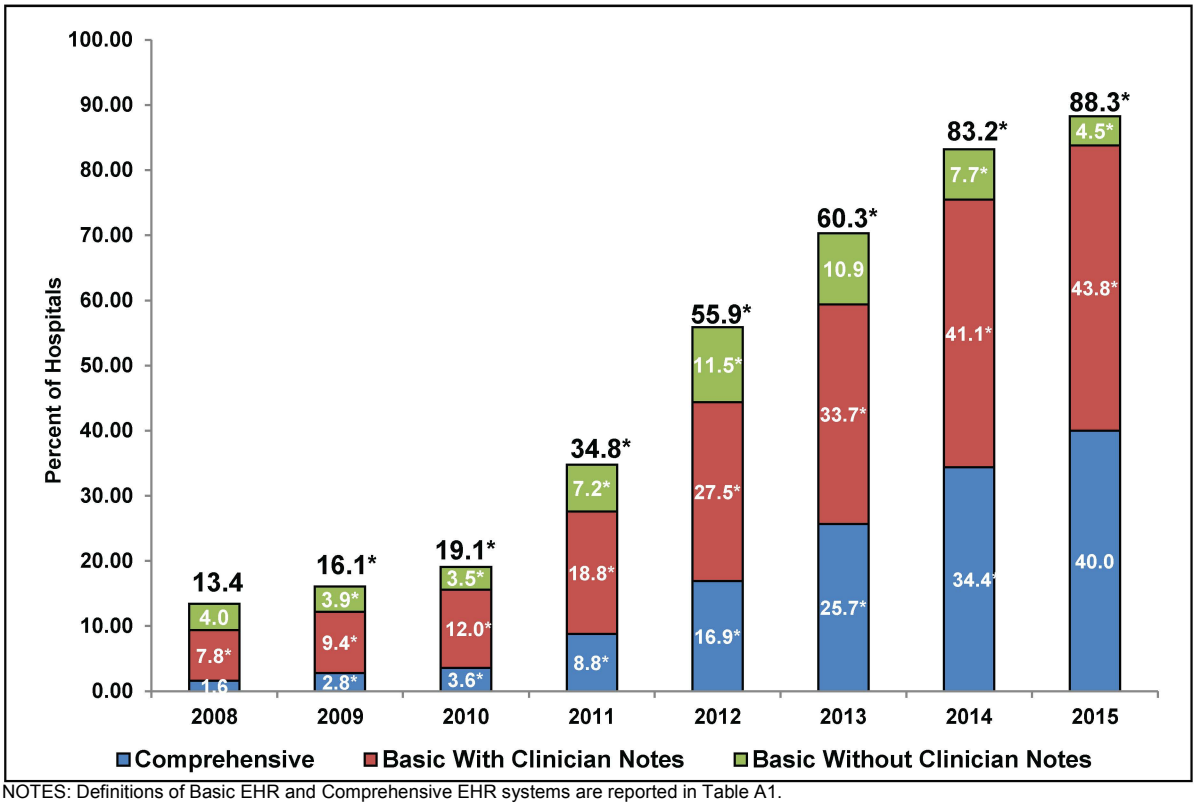


NOTES: Basic EHR adoption requires the EHR system to have at least a basic set of EHR functions, including clinician notes, as defined in Table A1. Estimates for states shaded gray did not meet the standards for reliability (NR). See the Table A2 for a complete list of 2008, 2011, and 2015 hospital adoption by state.
SOURCE: ONC/AHA, AHA Annual Survey Information Technology Supplement.

- ★ In 2015, hospital Basic EHR adoption rates were above 65% across all states, whereas in 2008, all states had Basic EHR adoption rates at or below 22%.
- ★ In 2011, hospital adoption of Basic EHRs across a majority of states (n=28) was between 20 and 39%.
- ★ State-level hospital adoption of Basic EHR systems was 80% or higher in 35 states in 2015, whereas no states in 2011 had hospital Basic EHR adoption rates at 80% or higher.

Trends in EHR adoption show increasing use of advanced functionality.

Figure 5: Percent of non-federal acute care hospitals with adoption of EHR systems by level of functionality: 2008-2015.



NOTES: Definitions of Basic EHR and Comprehensive EHR systems are reported in Table A1.
*Significantly different from previous year ($p < 0.05$).
SOURCE: ONC/AHA, AHA Annual Survey Information Technology Supplement.

- ★ In 2015, 8 out of 10 hospitals (84%) adopted EHRs with advanced levels of functionality above Basic EHRs without Clinician Notes; this refers to the adoption of Comprehensive EHRs (40%) and Basic EHRs with Clinician Notes (44 %).
- ★ While there was an 11% increase in the adoption of EHRs with advanced levels of functionality above Basic EHRs between 2014 and 2015, there was a 42% decrease in the use of less advanced EHRs (Basic without Clinician Notes functionality).

Summary

Adoption of EHRs among non-federal acute care hospitals is nearly universal. In 2015, nearly all reported hospitals (96%) possess certified EHR technology. This rate is similar to 2014, suggesting that adoption of certified EHR systems may be plateauing. In 2015, over 8 in 10 non-federal acute care hospitals adopted all the functionalities associated with a 'Basic' EHR; this represents a nine-fold increase since 2008, prior to the HITECH Act of 2009. Basic EHRs, a historical measure of EHR adoption, includes functionalities, such as viewing imaging results, which are not included in certified EHRs. Hospital adoption of EHRs with more advanced functionality is also increasing while adoption of EHRs with less advanced functionality is declining. Although EHR adoption rates differ depending upon the specific measure, both key measures of EHR adoption—certified EHRs and Basic EHRs—consistently show widespread adoption of EHRs.

Similar to national trends, EHR adoption is also widespread at the state-level. Basic EHR adoption was above 80% for 35 states in 2015; whereas no states in 2011 had basic EHR adoption rates at or above 80%. In 2008, all states had adoption rates of 22% or less. This change represents a substantial increase in EHR adoption at the state-level.

Certain types of hospitals that have traditionally lagged behind in EHR adoption, such as small, rural, and critical access hospitals are now closing the gap with other non-federal acute care hospitals (3). Although still significantly lower compared to all non-federal acute care hospitals, at least 8 in 10 of small, rural and critical access hospitals have adopted Basic EHRs. Between 2014 and 2015, Basic EHR adoption increased by at least 14% across small and rural hospitals and increased by 18% among critical access hospitals. However, compared to general medicine hospitals, children's and psychiatric hospitals have substantially lower rates of Basic EHR adoption. This is not altogether surprising as only 69% of children's hospitals successfully attested to Stage 1 of the CMS Medicaid EHR Incentive Program and psychiatric hospitals are not eligible for CMS Medicaid or Medicare EHR Incentive Program (4).

In summary, EHR adoption is widespread across most hospitals and at the state-level. Efforts that have focused on EHR adoption now are shifting to interoperability of health information, and the use of health information technology to support care delivery system reform (1, 5). Realizing the full value of widespread EHR adoption will require focusing on these new challenges and it will be important to shift our focus from hospital adoption of EHRs to monitoring progress in these new areas. This would not only include hospitals' interoperability but also examining health IT adoption and interoperability across additional settings including long-term care providers and behavioral health care providers, and beyond the care continuum, such as social services and public health (5).

Definitions

Non-federal acute care hospital: Includes acute care general medical and surgical, general children's, and cancer hospitals owned by private/not-for-profit, investor-owned/for-profit, or state/local government and located within the 50 states and District of Columbia. The inclusion of children's general and cancer hospitals makes this definition different from previous peer-reviewed research. However, it is more consistent with the population of hospitals eligible for federal health IT adoption incentives.

Adoption of Basic EHR: Table A1 defines the electronic functions required for hospital adoption of a Basic or Comprehensive EHR system, which a consensus expert panel established (2). Basic EHR adoption requires that each function be implemented in at least one unit in the hospital. However, Comprehensive EHR adoption requires that each function be implemented in all units.

Because the panel disagreed on the need to include physician notes and nursing assessments to classify a Basic system, so they developed two definitions of Basic EHR adoption (Basic EHR without Notes and Basic EHR with Notes) (2). Since the first stage of the CMS EHR Incentive Program did not require clinician notes, an earlier brief reported Basic EHR without Clinician Notes. However, clinician notes are now a requirement for the second stage, the definition of Basic EHR in this brief includes clinician notes as a requirement for at least a Basic EHR system.

Possession of Certified EHR: A certified EHR is EHR technology that meets the technological capability, functionality, and security requirements adopted by the Department of Health and Human Services. This includes the capability to securely work with other certified EHR systems to share information (interoperability). "Possession" of certified EHR technology is considered to be either the physical possession of the medium on which a certified EHR system resides or a legally enforceable right by a health care provider to access and use, at its discretion, the capabilities of a certified EHR system.

Data Source and Methods

Data are from the American Hospital Association (AHA) Information Technology (IT) Supplement to the AHA Annual Survey. Since 2008, ONC has partnered with the AHA to measure the adoption and use of health IT in U.S. hospitals. ONC funded the 2014 AHA IT Supplement to track hospital adoption and use of EHRs and the exchange of clinical data.

The chief executive officer of each U.S. hospital was invited to participate in the survey regardless of AHA membership status. The person most knowledgeable about the hospital's health IT (typically the chief information officer) was requested to provide the information via a mail survey or secure online site. Non-respondents received follow-up mailings and phone calls to encourage response. The survey was fielded from October 2015 to the end of February 2016.

This analysis consisted of non-federal, acute care hospitals, including children's and cancer hospitals. Differences in the estimates in this brief from a prior study reporting Basic EHR adoption with clinician notes are due to the inclusion of children's and cancer hospitals and small differences in the calculation of hospital-level weights.

The response rate for non-federal acute care hospitals was 56.15%. A logistic regression model was used to predict the propensity of survey response as a function of hospital characteristics, including size, ownership, teaching status, system membership, availability of a cardiac intensive care unit, urban status, and region. Hospital-level weights were derived by the inverse of the predicted propensity.

Estimates considered unreliable had a relative standard error adjusted for finite populations greater than 0.49. Responses with missing values were assigned zero values. Significant differences were tested using $p < 0.05$ as the threshold.

References

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4. Office of the National Coordinator for Health Information Technology. 'Hospital Progress to Meaningful Use by Size, Type, and Urban/Rural Location,' Health IT Quick-Stat #5. dashboard.healthit.gov/quickstats/pages/FIG-Hospital-Progress-to-Meaningful-Use-by-size-practice-setting-area-type.php. May 2016.

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Appendix

Table A1: Electronic Functions Required for Hospital Adoption of Basic or Comprehensive EHR Systems

EHR Functions Required	Basic EHR without Clinician Notes	Basic EHR with Clinician Notes	Comprehensive EHR
Electronic Clinical Information			
Patient demographics	★	★	★
Physician notes		★	★
Nursing assessments		★	★
Problem lists	★	★	★
Medication lists	★	★	★
Discharge summaries	★	★	★
Advance directives			★
Computerized Provider Order Entry			
Lab reports			★
Radiology tests			★
Medications	★	★	★
Consultation requests			★
Nursing orders			★
Results Management			
View lab reports	★	★	★
View radiology reports	★	★	★
View radiology images			★
View diagnostic test results	★	★	★
View diagnostic test images			★
View consultant report			★
Decision Support			
Clinical guidelines			★
Clinical reminders			★
Drug allergy results			★
Drug-drug interactions			★
Drug-lab interactions			★
Drug dosing support			★

NOTES: Basic EHR adoption requires each function to be implemented in at least one clinical unit, and Comprehensive EHR adoption requires each function to be implemented in all clinical units

Table A2: Percent of non-federal acute care hospitals with adoption of at least a Basic EHR system by U.S. State, 2008, 2011, and 2015.

State	2008 Basic EHR, %	n (N)	2011 Basic EHR, %	n (N)	2015 Basic EHR, %	n (N)
United States						
Alabama	9%	34(99)	22%	44(95)	80%	35(87)
Alaska	0%	7(21)	NR	13(22)	89%	9(20)
Arizona	14%	31(60)	17%	31(62)	78%	25(60)
Arkansas	9%	53(75)	32%	40(72)	90%	35(69)
California	9%	179(343)	22%	153(333)	85%	198(320)
Colorado	11%	41(70)	30%	42(72)	87%	46(72)
Connecticut	22%	24(31)	22%	22(30)	83%	21(28)
Delaware	0%	4(6)	39%	5(6)	67%	6(6)
District of Columbia	NR	5(9)	37%	8(9)	85%	6(8)
Florida	11%	96(186)	51%	93(183)	87%	118(182)
Georgia	5%	78(140)	15%	53(139)	85%	70(129)
Hawaii	NR	11(22)	NR	9(23)	71%	7(22)
Idaho	NR	24(39)	19%	24(39)	80%	18(38)
Illinois	9%	130(185)	35%	131(180)	87%	129(177)
Indiana	11%	70(106)	19%	66(107)	88%	61(105)
Iowa	2%	79(117)	35%	83(117)	82%	95(117)
Kansas	0%	76(122)	19%	102(123)	73%	99(125)
Kentucky	6%	67(97)	24%	58(98)	82%	46(94)
Louisiana	8%	58(108)	14%	48(101)	70%	58(99)
Maine	3%	29(36)	20%	24(36)	87%	22(34)
Maryland	16%	37(46)	28%	39(46)	95%	34(45)
Massachusetts	9%	35(71)	37%	39(67)	93%	32(60)
Michigan	14%	103(133)	31%	87(133)	85%	76(128)
Minnesota	17%	80(128)	44%	127(131)	88%	124(128)
Mississippi	8%	39(90)	17%	37(88)	86%	27(88)
Missouri	9%	69(113)	35%	113(113)	87%	109(110)
Montana	6%	33(54)	15%	31(54)	83%	36(53)
Nebraska	6%	50(83)	19%	52(84)	75%	52(85)
Nevada	0%	11(29)	36%	13(30)	94%	12(29)
New Hampshire	4%	23(26)	29%	14(26)	79%	18(26)
New Jersey	16%	40(66)	11%	41(63)	75%	42(62)
New Mexico	22%	16(31)	23%	16(29)	90%	20(32)
New York	11%	120(190)	26%	118(177)	82%	119(167)
North Carolina	11%	79(109)	24%	76(111)	86%	73(105)
North Dakota	NR	20(42)	NR	15(42)	89%	20(41)
Ohio	4%	115(157)	20%	96(158)	85%	111(152)
Oklahoma	15%	56(103)	14%	39(102)	87%	42(104)
Oregon	17%	30(57)	42%	25(58)	85%	42(59)
Pennsylvania	8%	111(163)	30%	109(158)	78%	101(153)
Rhode Island	NR	6(11)	55%	9(11)	70%	7(10)
South Carolina	7%	39(59)	27%	24(57)	71%	32(60)
South Dakota	11%	47(51)	17%	27(51)	80%	27(49)
Tennessee	6%	61(114)	21%	49(116)	87%	51(109)
Texas	9%	215(346)	20%	175(349)	81%	203(331)
Utah	NR	20(41)	NR	8(41)	93%	25(44)
Vermont	15%	13(14)	45%	7(14)	65%	6(14)
Virginia	15%	52(80)	53%	40(79)	93%	53(80)
Washington	7%	46(85)	38%	51(85)	94%	50(90)
West Virginia	7%	38(50)	23%	27(50)	74%	30(48)
Wisconsin	10%	85(122)	47%	73(121)	83%	95(123)
Wyoming	10%	20(24)	21%	15(24)	94%	14(23)

NOTES: Basic EHR adoption requires the EHR system to have a set of EHR functions defined in Table A1.
n = survey respondents; N = Non-Federal acute care hospitals surveyed. NR = estimate does not meet standards for reliability.
SOURCE: ONC/AHA, AHA Annual Survey Information Technology Supplement