

Essentials of the U.S. Hospital IT Market Fifth Edition

EMR Adoption Model TrendsSM (2008–2009)

Stage	Cumulative Capabilities	2008 Final	2009 Final
Stage 7	Complete EMR; CCD transactions to share data; data warehousing; data continuity with ED, ambulatory, OP	0.3%	0.7%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full RPACS	0.5%	1.6%
Stage 5	Closed-loop medication administration	2.5%	3.8%
Stage 4	CPOE, CDSS (clinical protocols)	2.5%	7.4%
Stage 3	Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside radiology	35.7%	50.9%
Stage 2	Clinical data repository, controlled medical vocabulary, CDSS, may have document imaging, HIE capable	31.4%	16.9%
Stage 1	Ancillaries—laboratory, radiology, pharmacy—all installed	11.5%	7.2%
Stage 0	All three ancillaries not installed	15.6%	11.5%

Data from HIMSS Analytics™ Database © 2010

N = 5,166

N = 5,235

The EMR Adoption Model: An EMR Market Transformation Assessment Tool

The EMR Adoption Model

Understanding the level of electronic medical record (EMR) capabilities in hospitals has been a challenge in the U.S. healthcare information technology (IT) market. HIMSS complete has created an EMR Adoption Model that identifies the levels of EMR capabilities ranging from the initial clinical data repository (CDR) environment through an EMR environment where paper charts are no longer used to deliver patient care—all care processes are supported with electronic documentation.

HIMSS Analytics has developed a methodology and algorithms to automatically score the more than 5,000 U.S. hospitals and approximately 700 Canadian hospitals in our database (where we have captured the relevant clinical information to be able to score the facilities) relative to their progress in implementing the components of an EMR. From this data, we also provide peer comparisons for care delivery organizations as they strategize their paths to a complete EMR. The EMR Adoption Model (EMRAM) is a tool that we will use to evaluate the impact on EMR adoption of American Recovery and Reinvestment Act of 2009/Health Information Technology for Economic and Clinical Health (ARRA/HITECH) funding over the next five years.

The EMR Adoption Model is a tool that we will use to evaluate the impact of federal stimulus funding on EMR adoption.

The stages of the model are as follows:

- **Stage 0:** Some clinical automation may be present, but all three of the major ancillary department systems for laboratory, pharmacy, and radiology are not implemented. Systems that are in place are departmentally focused, not patient-centered via a common patient record.
- **Stage 1:** All three of the major ancillary clinical systems (pharmacy, laboratory, radiology) are live and operational. Again, these are departmentally focused, not patient-centered via a common patient record.
- **Stage 2:** Major ancillary clinical systems feed data to a clinical data repository that provides physician access for retrieving and reviewing results in a patient-centric record. The CDR contains a controlled medical vocabulary and the clinical decision support/rules engine for rudimentary conflict checking. Information from document imaging

systems may be linked to the CDR at this stage, and initial linkages to health information exchanges (HIEs) may be accomplished at this stage for sharing diagnostic patient information. The first level of clinical decision support is implemented to conduct error checking with order entry from ancillary systems (i.e., drug/drug, drug/food, drug/lab conflict checking normally found in the pharmacy, or duplicate laboratory order checking found in the lab) by this stage.

- **Stage 3:** Clinical documentation (e.g., vital signs, flow sheets) is required; nursing notes, care-plan charting, and/or the electronic medication administration record (eMAR) system are scored with extra points, and are implemented and integrated with the CDR for at least one service or one unit in the hospital. Some level of medical image access from radiology picture archiving and communication systems (RPACS) is available for access by physicians via the organization's intranet or other secure networks outside of the radiology department confines.
- **Stage 4:** Computerized practitioner order entry (CPOE) for use by any physician is added to the nursing and CDR environment along with the second level of clinical decision support capabilities related to evidence-based medicine protocols. If one inpatient service area has implemented CPOE and completed the previous stages, then this stage has been achieved.
- **Stage 5:** The closed-loop medication administration environment is fully implemented in at least one patient care service area. The data flows of the CPOE, pharmacy, and eMAR applications are tightly coupled and integrated with bar coding technology (or RFID technology) for the nurse (nurses may be identified via their login information to bar-code scanning equipment), patient, and medication to support the five rights of medication administration, thereby maximizing medication administration point-of-care patient safety processes.
- **Stage 6:** Full physician documentation/charting (using structured templates) is implemented that generates discrete data for at least one patient care service area. Level three of clinical decision support provides guidance for clinician activities related to protocols, and outcomes are present in the form of variance and compliance alerts. A full complement of radiology PACS systems provides medical images to physicians via an intranet and displaces all film-based images for radiology services.

- **Stage 7:** The hospital no longer uses paper charts to deliver and manage patient care and has a mixture of discrete data, document images, and medical images within its EMR environment. Clinical data warehouses are being used to analyze patterns of clinical data to improve quality of care and patient safety. Clinical information can be readily shared via standardized electronic transactions (i.e., Continuity of Care Record—CCR—and Continuity of Care Document—CCD), with all entities within an integrated delivery system, or a health information exchange (i.e., other non-associated hospitals, ambulatory clinics, sub-acute environments, employers, payers, and patients in a data-sharing environment). There is continuity of data flows for patients between inpatient, emergency department, and outpatient service modalities.

Scoring Format

An EMR score is represented by the following format—*S.nnnn*, where *S* equals the current stage achieved for the model and the *.nnnn* is the weighted score representing the implementation of higher-stage clinical applications that have been implemented before the complete higher stage has been achieved. In this model, all applications in previous stages and the current stage must be achieved before a current stage is considered to have been fully achieved.

For example, if CPOE is implemented before clinical documentation in Stage 3 and the organization has a CDR, its EMR Adoption Model score would be *2.nnnn*, where the *.nnnn* would represent the weighted score for CPOE and any other implemented upper-stage applications. Once the clinical documentation applications have been implemented in a service, the hospital would automatically become a Stage 4 facility, because it has accomplished what is required for that stage as well as Stage 3. In 2009, we added cardiology PACS (CPACS) modalities as “extra credit” items for the EMRAM scores.

EMRAM Comparison, 2008–2009

An overall evaluation of the U.S. hospital market trend for EMRAM scores by individual stage from 2008 to 2009 is shown in Figure EMR1. This figure clearly shows that more than half of U.S. hospitals are at Stage 3—providing the foundation for automating CPOE, closed-loop medication administration, and physician documentation. We have observed over the last 24 months that the percentage of hospitals in Stages 0–2 is decreasing and the percentage of hospitals in Stages 3–7 is increasing. This demonstrates that U.S. hospitals are advancing their EMR capabilities

to meet new market demands and requirements, such as receiving funding related to ARRA/HITECH meaningful use requirements. Now, 50 percent of U.S. hospitals have achieved Stage 3, clinical documentation, which shows tremendous growth since 2007—when just 25 percent of U.S. hospitals achieved Stage 3.

Stage 5 of the EMR Adoption Model is the most difficult to achieve because of the integration/interoperability requirements, technology integration requirements, and re-engineering efforts required to implement point-of-care closed-loop medication administration and management. This stage requires significant investments in capital, executive commitment, and cultural adoption.

Stages 4–6 have the greatest impact on physician and clinician work flows, and therefore require the highest levels of communication and implementation execution to ensure that the disruption to patient-care routines is minimized. Our observations since 2006 lead us to believe that EMR return on investment (ROI) and benefits are not achieved until Stage 5 has been achieved. From what we have seen in these organizations, Stages 6 and 7 dramatically improve EMR ROI and benefit realization.

EMR Adoption Model Trends SM (2008–2009)			
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* CCD = continuity of care document; CDSS = clinical decision support system; CPOE = computerized practitioner order entry; ED = emergency department; EMR = electronic medical record; HIE = health information exchange; OP = outpatient; PACS = picture archiving and communications system; RPACS = radiology picture archiving and communications system

Figure EMR1

National Review of EMR Scores

The majority of U.S. hospitals are in the early stages of EMR transformation. An evaluation of U.S. hospitals' current EMR capabilities using different market segments provides a more complete analysis of what types of hospitals are advancing in their pursuit of a complete EMR environment (see Table EMR1). In 2009, hospitals began to make a significant advancement in Stage 3 achievements. The hospitals that achieved a **mean average** EMR Adoption Model score of greater than 3.0000 in 2009 are academic/teaching facilities, general medical/surgical, urban, integrated delivery system (IDS) hospitals, and hospitals with more than 100 beds.

The hospital type segments that achieved a **median** EMRAM score of 3.0000 or greater are academic/teaching facilities, non-academic facilities, general medical/surgical hospitals, "other" non-general medical/surgical facilities, urban, hospitals that are part of an IDS, and independent hospitals. Hospitals with 101 or more beds have now achieved median EMRAM scores higher than 3.0000, and all regions in the U.S. have now achieved this level of EMRAM scores. This is significant growth at all market segment levels from 2008 to 2009. The highest median EMRAM scores are still achieved by academic/teaching facilities.

4th Quarter, 2009: EMR/SEHR* Adoption Model Scores— Based on 5,235 U.S. hospitals with a minimum score of 0.000 and maximum score of 7.0710					
Segment	Mean	Min.	Max.	Median	Number
Hospital Type Segment					
Academic/Teaching	3.7836	0.1650	7.0710	3.3770	296
Non-academic	2.6903	0.0000	7.0630	3.1470	4,939
General Medical/Surgical	3.0282	0.0000	7.0630	3.2150	3,156
Others	2.3332	0.0000	7.0710	3.0550	2,079
Rural	1.8593	0.0000	6.0080	2.0710	1,171
Urban	3.0094	0.0000	7.0710	3.2150	4,064
IDS	3.0017	0.0000	7.0710	3.2160	3,134
Independent Hospital	2.3800	0.0000	7.0310	3.0640	2,101
Critical Access	1.8494	0.0000	6.0080	2.0630	1,291
Bed Segment					
0–100 Beds	2.1999	0.0000	7.0310	2.2070	2,675
101–200 Beds	3.0949	0.0050	7.0630	3.2170	986
201–300 Beds	3.3780	0.0400	7.0630	3.3070	624
301–400 Beds	3.4009	0.0330	7.0710	3.3040	397
401–500 Beds	3.5128	0.1750	7.0470	3.3320	227
501–600 Beds	3.6051	3.6051	7.0310	3.3480	141
600+ Beds	3.8236	2.0550	7.0310	3.3630	185

* shared electronic health record

Table EMR1

4th Quarter, 2009: EMR/SEHR Adoption Model Scores— Based on 5,235 U.S. hospitals with a minimum score of 0.000 and maximum score of 7.0710					
Segment	Mean	Min.	Max.	Median	Number
Regions (U.S. Census Defined)					
East North Central	2.9981	0.0050	7.0710	3.2135	816
East South Central	2.5713	0.0000	6.0710	3.0960	448
Middle Atlantic	3.0805	0.0050	7.0390	3.2080	493
Mountain	2.3731	0.0000	6.0230	3.0880	417
New England	3.4212	0.1110	6.0710	3.2920	203
Pacific	2.9186	0.0000	7.0630	3.1400	583
South Atlantic	3.0769	0.0000	7.0310	3.3040	781
West North Central	2.3753	0.0000	7.0310	3.0615	698
West South Central	2.3163	0.0000	6.0560	3.0150	796
All Hospitals					
Total	2.7522	0.0000	7.0710	3.1560	5,235

Table EMR1

Stage key for regions:

New England: MA, ME, VT, RI, CT, NH

Middle Atlantic: NY, NJ, PA

South Atlantic: MD, DE, DC, WV, VA, NC, SC, GA, FL

East North Central: MI, OH, IN, IL, WI

East South Central: KY, TN, MS, AL

West North Central: MN, IA, MO, KS, ND, SD, NE

West South Central: TX, LA, AR, OK

Mountain: ID, CO, WY, MT, NV, UT, AZ, NM

Pacific: WA, CA, OR, AK, HI

An evaluation of the **median** scores by state for the EMR model (see Table EMR2) in order of rank from highest to lowest score suggests that the top 10 states tend to have large urban populations and smaller numbers of hospitals. The exceptions are Florida and Virginia, which each have more than 100 hospitals. States with large rural populations tend to have lower scores.

4th Quarter, 2009: EMR/SEHR Adoption Model Scores— By state, based on 5,235 U.S. hospitals with a minimum score of 0.000 and a maximum score of 7.0710					
United States					
Segment	Mean	Min.	Max.	Median	Number
Connecticut	3.8377	1.0390	6.0630	3.4150	33
Delaware	3.4942	2.1550	5.1120	3.3390	9
Virginia	3.5291	0.0650	7.0310	3.3350	85
Florida	3.0890	0.0050	6.0560	3.3240	234
Rhode Island	3.7207	0.1650	6.0550	3.3210	11
North Carolina	3.1242	0.0050	5.1350	3.3210	120
South Carolina	3.0945	0.0450	5.1490	3.3200	67
Maryland	3.5229	0.0100	6.0630	3.3190	49
Maine	3.4549	0.2030	6.0390	3.3175	38
New Jersey	3.1583	0.0100	5.1490	3.2715	86
Massachusetts	3.3802	0.2100	6.0710	3.2670	81
Indiana	3.0953	0.0050	6.0550	3.2390	129
Ohio	2.9304	0.0150	5.1490	3.2270	195
Wisconsin	2.9036	0.0050	7.0310	3.2250	136
Pennsylvania	3.0314	0.0050	7.0390	3.2190	198
Georgia	2.7965	0.0000	6.0630	3.2070	155
Washington	2.8151	0.0000	6.0390	3.2030	93
New Hampshire	3.0317	0.1110	5.0790	3.1910	26
Colorado	2.6307	0.0050	5.1490	3.1855	84
Illinois	3.1618	0.0100	7.0710	3.1840	197
Michigan	2.8805	0.0050	6.0710	3.1840	159
Missouri	2.8590	0.0050	7.0310	3.1800	127
Vermont	3.0729	1.0710	5.1490	3.1755	14
Oregon	3.0582	0.0290	6.0560	3.1720	62
District of Columbia	2.1558	0.0000	4.2770	3.1640	11
New York	3.0951	0.0050	6.0710	3.1570	209
Arizona	2.7355	0.0050	5.1650	3.1560	80
Nevada	2.4574	0.0000	4.2670	3.1560	40
Tennessee	2.8440	0.0000	6.0710	3.1560	142
Wyoming	2.5865	0.0150	5.0850	3.1400	27
Minnesota	2.7241	0.0000	6.0630	3.1390	133
California	3.0028	0.0000	7.0630	3.1320	386
West Virginia	2.6827	0.0050	5.0640	3.1310	51
Alaska	2.4579	0.0050	4.1390	3.1240	17
Iowa	2.7058	0.0000	5.1490	3.1115	118
Kentucky	2.6456	0.0350	5.1490	3.0815	106

Table EMR2

4th Quarter, 2009: EMR/SEHR Adoption Model Scores— By state, based on 5,235 U.S. hospitals with a minimum score of 0.000 and a maximum score of 7.0710					
United States					
Segment	Mean	Min.	Max.	Median	Number
Alabama	2.6135	0.0000	5.0960	3.0800	103
Texas	2.4180	0.0000	6.0550	3.0750	453
South Dakota	2.1805	0.0000	5.0950	3.0000	53
Utah	2.3375	0.0000	3.4230	2.2900	47
Idaho	2.2698	0.0000	5.0480	2.1790	43
Louisiana	2.2656	0.0000	6.0560	2.1620	139
New Mexico	2.5575	0.0000	6.0230	2.1280	40
Oklahoma	2.0420	0.0000	6.0470	2.1150	119
Hawaii	1.9702	0.0050	6.0470	2.0940	25
Arkansas	2.2418	0.0050	6.0550	2.0870	85
Mississippi	2.0463	0.0000	6.0710	2.0860	97
Nebraska	1.9567	0.0000	5.1350	2.0860	87
Kansas	1.8145	0.0000	6.0310	2.0850	137
North Dakota	1.8347	0.0000	5.1490	2.0150	43
Montana	1.2831	0.0000	3.3270	1.0040	56

Table EMR2

ARRA/HITECH funding for EMR adoption will drive the EMRAM scores to increase dramatically over the next five years. From this increased rate of EMR adoption, the U.S. should realize improved quality outcomes and patient safety. Hospitals will be reporting more clinical results to the government, and from this data the government should be able to derive effective evidence-based medicine protocols that will improve outcomes and drive down costs.

HIMSS Analytics updates EMRAM scores for all of these market segments quarterly, and these updates can be found on our Web site from the following link: http://www.himssanalytics.org/hc_providers/emr_adoption.asp.



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