Health Information Technology

An Assessment of Maryland Hospitals

July 2011

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Executive Summary

The Maryland Health Care Commission (MHCC) developed the annual *Hospital Health Information Technology Survey* (survey) to assess the adoption, utilization and planning activities of health information technology (health IT) among the 46 acute care hospitals in Maryland. Widespread adoption of health IT has the potential to improve the efficiency, quality and effectiveness of health care.[1, 2] The survey is designed to benchmark progress of hospitals in Maryland compared to hospitals nationwide. Overall, Maryland hospital health IT adoption exceeds the national adoption rate. The survey includes questions regarding the adoption of six technologies: computerized physician order entry (CPOE), electronic health records (EHRs), electronic medication administration records (eMARs), infection surveillance software (ISS), electronic prescribing (e-prescribing), and electronic data exchange.

This year, the survey included questions related to connectivity to the state designated health information exchange (HIE), ability to meet meaningful use criteria,[3] and the hospital's plans to participate in the Centers for Medicare and Medicaid services (CMS) EHR incentive programs.[4], [5] Hospitals that report they have not adopted a technology were asked to indicate their plans to adopt the technology by choosing one of the following: implementing the technology over the next 12 months; assessing the technology over the next 12 months; or undecided at this time about the plan to adopt the technology. Since 2008, hospitals have reported an increase in the health IT adoption in six of seven categories; CPOE, EHRs, eMARs, BCMA, ISS, and electronic data exchange. Overall, BCMA adoption increased the most, at about 31 percent.

The survey also assessed health IT adoption by hospital size, geographic location, and hospital affiliation. Health IT adoption was assessed by hospital size; large hospitals reported adopting more technologies than smaller hospitals. When health IT adoption was assessed by geographic location, it was determined hospitals located in urban and rural areas had higher adoption rates than hospitals located in suburban areas. Health IT adoption was also evaluated by hospital affiliation; hospitals that are part of larger in-state health systems and standalone hospitals had higher rates of health IT adoption than hospitals that are associated with out-of-state health systems.

In 2010 hospitals reported on their plans to participate in the CMS EHR incentive programs, connectivity to the state designated HIE, and ability to meet meaningful use criteria that is required to qualify for an EHR adoption incentive under Medicaid and Medicare. Approximately 76 percent of hospitals expect to participate in the Medicaid EHR adoption incentive program and about 89 percent in the Medicare EHR adoption incentive program. Approximately 11 percent of hospitals reported connectivity to the statewide HIE. All hospitals reported the ability to meet at least one of the 14 meaningful use core objectives,[6] and one hospital reported the ability to meet all of the core objectives.

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[1] The New England Journal of Medicine, *Use of Electronic Health Records in U.S. Hospitals*, 360(16), April 2009.
[2] Annals of Internal Medicine, *Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care*, 144(10), May 2006. Available at: http://www.annals.org/content/144/10/742.full.
[3] 42 CFR Parts 412, 413, 422 et al. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf.
[4] For a complete listing of survey questions see *Survey Questions* in Appendix A.
[5] 42 CFR Parts 412,413, 422 et al. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf.
[6] To meet the meaningful use requirements, hospitals must meet core objectives unless an exception applies [see *Survey Glossary* in Appendix B].

About the Survey

Background

The Maryland Health Care Commission (MHCC) developed the annual *Hospital Health Information Technology Survey* (survey) to assess the adoption, utilization, and planning activities of health information technology (health IT) among the 46 acute care hospitals in Maryland. Health IT is considered critical to transforming the health care industry.[7] Widespread adoption of health IT has the potential to improve the efficiency, quality, and effectiveness of health care.[8, 9] Among other things, health IT adoption results in improved quality of care by increasing adherence to clinical care guidelines, enhancing disease surveillance, and decreasing medication errors.[10]

Purpose

The survey is designed to benchmark progress of hospitals in Maryland compared to hospitals nationwide. The ability to evaluate the state's progress to national activity provides valuable insight as to how well Maryland compares with the nation. The results of the survey are also used to compare health IT adoption among Maryland hospitals and identify opportunities for increasing health IT adoption.

Survey

This is the third year that all the acute care hospitals have responded to the survey. Included in the survey are questions regarding the adoption of six technologies: computerized physician order entry (CPOE), electronic health records (EHRs), electronic medication administration records (eMARs), infection surveillance software (ISS), electronic prescribing (e-prescribing), and electronic data exchange. Hospitals that report they have not adopted a technology were asked to indicate their plans to adopt the technology by choosing one of the following: implementing the technology over the next 12 months; assessing the technology over the next 12 months; or undecided at this time about their planning to adopt the technology. The survey assessed health IT adoption among primary care units (PCUs)[11] to determine if the technologies were fully or partially implemented. Unique to the survey this year are questions related to connectivity to the state designated health information exchange (HIE), ability to meet meaningful use criteria, and plans to participate in the Centers for Medicare and Medicaid services (CMS) EHR incentive programs.[12]

Report Limitations

The survey provides an overview of health IT adoption and planning activities in the state. The information presented in this report is based upon a self-assessment conducted by hospitals. Responses were likely influenced by the respondents' perception of the question. Findings from the survey have not been audited.

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[7] Department of Health and Human Services, *The Decade of Health Information Technology: Delivering Consumer-Centric and Information-Rich Health Care*, July 2004. Available at: http://www.providersedge.com/ehdocs/ehr_articles/The_Decade_of_HIT-Delivering_Customer-centric_and_Info-rich_HC.pdf.

[8] The New England Journal of Medicine, *Use of Electronic Health Records in U.S. Hospitals*, 360(16), April 2009.

[9] Annals of Internal Medicine, *Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care*, 144(10), May 2006. Available at: http://www.annals.org/content/144/10/742.full.

[10] Ibid.

[11] PCUs are the hospital departments that provide direct patient care [see *Survey Glossary* in Appendix B].

[12] For a complete listing of survey questions see *Survey Questions* in Appendix A.

Hospital Health IT Adoption

Evidence has shown that the adoption and effective use of health IT can reduce medical errors and adverse events and enable better documentation.[13] The survey focuses on health IT that has a direct impact on patient care and has the potential to improve the quality, safety, and efficiency of health care. The adoption and planning efforts for the following technologies were included in the survey: CPOE, EHRs, eMARs, BCMA, ISS, e-prescribing, and electronic data exchange with community providers. Findings are presented by hospital size, geographic location and hospital affiliation.[14] According to a 2006 national survey, Maryland is a leading state in health IT adoption with the fourth highest health IT adoption per hospital.[15] Hospitals reported a health IT adoption rate of about 60 percent.[16] Hospitals reported an increase in adoption in six of the seven technologies assessed; this finding suggests hospitals have invested a noteworthy amount of resources to implement health IT since 2008. The table below summarizes Maryland hospital health IT implementation and survey findings from 2008 through 2010.

Comparison of Hospital Health IT Implementation 2008 through 2010

	2008 *(n=44)* #/(%)	**2009** *(n=47)* #/(%)	**2010** *(n=46)* #/(%)	**2008 – 2010 Change** *(% change)*
Computerized Physician Order Entry	24 (55)	32 (68)	36 (78)	23
Electronic Health Record	34 (77)	38 (81)	41 (89)	12
Electronic Medication Administration Record	24 (55)	37 (79)	37 (80)	25
Barcode Medication Administration	14 (32)	38 (81)	29 (63)	31
Infection Surveillance Software	19 (43)	20 (43)	18 (39)	(-4)
Electronic Prescribing	4 (9)	13 (28)	9 (20)	11
Electronic Data Exchange	17 (39)	21 (45)	23 (50)	11
HIE Connectivity	*N/A*	*N/A*	5 (11)	*N/A*
Plan to Participate in the Medicaid EHR Incentive Program	*N/A*	*N/A*	35 (76)	*N/A*
Plan to Participate in the Medicare EHR Incentive Program	*N/A*	*N/A*	41 (89)	*N/A*
Health IT adoption rate	44	57	60	16

Computerized Physician Order Entry

CPOE[17] is an application that assists providers in generating and accessing orders for medical services and can prevent medication errors.[18,19] Orders are integrated with patient information and automatically checked for potential errors or problems.[20] Nationally, fewer than two percent of hospitals have implemented CPOE systems in all PCUs; and about 17 percent have CPOE in at least

[13] Agency for Healthcare Research and Quality, *National Healthcare Quality Report*, 2010. Available at: http://www.ahrq.gov/qual/nhqr10/nhqr10.pdf.
[14] See *Hospital Characteristics* in Appendix C.
[15] Health Affairs, *Adoption Of Health Information Technology For Medication Safety In U.S. Hospitals, 2006*, May, 2008 27(3)
[16] The hospital health IT adoption rate was calculated using the hospitals that responded yes to adopting each of the following technologies: CPOE, EHRs, eMARs, BCMA, ISS, eRX and electronic exchange with providers.
[17] CPOE enables providers to enter orders directly into the information system [see *Survey Glossary* in Appendix B].
[18] Health Affairs, *Overcoming Barriers to Adopting and Implementing Computerized Physician Order Entry Systems in U.S. Hospitals*, 23 (4), 2004.
[19] Health Affairs, *The Effect Of Health Information Technology on Quality In U.S. Hospitals*, April 2010, 29(4).
[20] The Leapfrog Group, *Computerized Physician Order Entry: Fact Sheet*, March 29, 2011. Available at: http://www.leapfroggroup.org/media/file/FactSheet_CPOE.pdf.

one PCU.[21] Comparatively, approximately 78 percent of Maryland hospitals reported they have implemented CPOE in at least one PCU, an increase of almost 23 percent since 2008 when the survey began. Since 2008, 10 fewer hospitals reported they are in the planning stages of CPOE implementation, as they have moved from the planning phase to the implementation phase.

Comparison of Hospital CPOE Implementation 2008 through 2010

Adoption Status	2008 *(n=44)* #/(%)	2009 *(n=47)* #/(%)	2010 *(n=46)* #/(%)	2008 – 2010 Change *(% change)*
Implemented	24 (55)	32 (68)	36 (78)	23
Fully	*17 (39)*	*15 (32)*	*16 (35)*	*(-4)*
Partially	*7 (16)*	*17 (36)*	*20 (43)*	*27*
Planning	20 (45)	15 (32)	10 (22)	(-23)
Implementing	*9 (45)*	*8 (53)*	*3 (30)*	*(-15)*
Assessing	*9 (45)*	*3 (20)*	*5 (50)*	*5*
Undecided	*2 (10)*	*4 (27)*	*2 (20)*	*10*

Clinical Decision Support

Clinical decision support (CDS)[22] is used to help physicians make medication decisions and provides treatment recommendations based on patient specific clinical information and treatment guidelines.[23] CDS can be integrated with CPOE to create prompts for standards of care (SOC) guidelines and medication alerts. The American Hospital Association (AHA) administers a supplement to its annual survey of hospitals to assess hospital health IT adoption. The AHA reported that CDS adoption in hospitals nationally is approximately 36 percent for SOC and about 51 percent for medication alerts.[24] The Maryland survey asked hospitals that reported they adopted CPOE applications to report if the CPOE application offers decision support software for medication prescribing and decision support software for diagnosis, SOCs and chronic conditions. Statewide, around 92 percent of hospitals that adopted CPOE report having CDS for medication prescribing and roughly 58 percent of hospitals that adopted CPOE report that their CPOE technology has CDS capabilities for diagnosis, SOCs, and chronic conditions. Since 2008, reported CDS adoption has increased about 21 percent; this finding suggests hospitals are increasingly investing in CDS technology to assist with decision making during the provider order entry process.

Comparison of Hospital CDS Integration 2008 through 2010 Among Hospitals that Reported Implementing CPOE

Adoption Status	2008 *(n=24)* #/(%)	2009 *(n=32)* #/(%)	2010 *(n=36)* #/(%)	2008 – 2010 Change *(% change)*
Medication CDS	17 (71)	28 (88)	33 (92)	21
Diagnosis/SOC-CDS	10 (42)	19 (59)	21 (58)	16

[21] Ibid.
[22] CDS is a computer application to assist in clinical decisions by providing evidence-based knowledge in the context of patient-specific data [see *Survey Glossary* in Appendix B].
[23] Health Affairs, *The Effect Of Health Information Technology on Quality In U.S. Hospitals*, April 2010, 29(4).
[24] American Hospital Association, *Continued Progress: Hospital Use of Health Information Technology*, 2007. Available at: http://www.aha.org/aha/content/2007/pdf/070227-continuedprogress.pdf.

Electronic Health Records

EHRs[25] can improve quality of care, productivity, and reduce cost.[26, 27] The 2009 AHA survey found that approximately 9 percent of hospitals nationwide have a basic EHR and almost three percent reported having a comprehensive EHR.[28, 29] Since 2008, EHR adoption in Maryland hospitals has increased almost 12 percent. In Maryland, hospital EHR adoption was reported notably higher than national EHR adoption at around 89 percent. The variation between the state and national activity is largely attributed to efforts by Maryland hospitals to implement technology. Around 59 percent of hospitals report having fully implemented EHRs in all PCUs and approximately 30 percent reported partially implemented EHRs. As hospitals migrate from the planning to the implementation phase, the number of hospitals in the planning phase has decreased by approximately 12 percent.

Comparison of Hospital EHR Implementation 2008 through 2010

Adoption Status	**2008** *(n=44)* #/(%)	**2009** *(n=47)* #/(%)	**2010** *(n=46)* #/(%)	**2008 – 2010 Change** *(% change)*
Implemented	34 (77)	38 (81)	41 (89)	12
Fully	*23 (52)*	*26 (55)*	*27 (59)*	*7*
Partially	*11 (25)*	*12 (26)*	*14 (30)*	*5*
Planning	10 (23)	9 (19)	5 (11)	(-12)
Implementing	*1 (10)*	*2 (22)*	*1 (20)*	*10*
Assessing	*4 (40)*	*3 (33)*	*4 (80)*	*40*
Undecided	*5 (50)*	*4 (45)*	-	*(-50)*

[25] An EHR the technology used to store clinical information. [see *Survey Glossary* in Appendix B].
[26] The Center for Health Information Technology at the American Academy of Family Physicians, *Potential Benefits of an EHR*, 2011. Available at: http://www.centerforhit.org/online/chit/home/cme-learn/tutorials/ehrcourses/ehr101/benefits.html.
[27] S. S. Jones, J. L. Adams, E. C. Schneider, J. S. Ringel, and E. A. McGlynn, *Electronic Health Record Adoption and Quality Improvement in US Hospitals*, American Journal of Managed Care December 22, 2010. Available at: http://www.ajmc.com/supplement/managed-care/2010/AJMC_10dec_HIT/AJMC_10decHIT_Jones_SP64to71.
[28] Health Affairs, *A Progress Report on Electronic Health Records in U.S. Hospitals*, October 2010, 29(10).
[29] The AHA annual survey defines a basic EHR as an EHR having a set of ten clinical functions deployed in at least one hospital unit and a comprehensive electronic health record is defined as a set of twenty-four clinical functions deployed in all hospital units.

Electronic Medication Administration Records

eMARs[30] are designed to replace traditional paper medication administration records and provide hospital staff with an electronic record of the medications ordered and administered. eMARs increase medication management efficiency and improve patient safety by minimizing transcription errors and eliminating illegible handwriting.[31] Nationally, almost 26 percent of hospitals have adopted eMAR.[32] Hospitals in Maryland reported a considerably higher rate of eMAR adoption in 2010 at about 80 percent.[33]

Comparison of Hospital eMAR Implementation 2008 through 2010

Adoption Status	2008 *(n=44)* #/(%)	2009 *(n=47)* #/(%)	2010 *(n=46)* #/(%)	2008 – 2010 Change *(% change)*
Implemented	24 (55)	37 (79)	37 (80)	25
Fully	*10 (23)*	*15 (32)*	*14 (30)*	*7*
Partially	*14 (32)*	*22 (47)*	*23 (50)*	*18*
Planning	20 (45)	10 (21)	9 (20)	(-25)
Implementing	*13 (65)*	*2 (20)*	*3 (33)*	*(-32)*
Assessing	*5 (25)*	*5 (50)*	*5 (56)*	*31*
Undecided	*2 (10)*	*3 (30)*	*1 (11)*	*1*

Barcode Medication Administration

BCMA[34] improves medication safety utilizing barcode technology to ensure that the correct medication is administered in the correct dose at the correct time to the correct patient.[35] In the traditional manual drug administration process, the medication quantity and patient's identity are manually verified before the medication is given.[36] The *New England Journal of Medicine* reports BCMA is associated with a 41 percent reduction in medication administration errors not related to timing and about 51 percent reduction in potential adverse drug events.[37] Nationally, BCMA about 27 percent of hospitals reported they adopted BCMA.[38] Statewide, BCMA adoption was reported notably higher; around 63 percent of hospitals have implemented BCMA in at least one PCU. The higher than national estimates Maryland hospital BCMA adoption rate may be largely attributed to hospitals placing a high priority on medication safety and information technology.

[30] An eMAR is an electronic record of medications administered to a patient during their hospital stay [see *Survey Glossary* in Appendix B].
[31] Netsmart Technologies. Avatar eMAR, 2011. Available at: http://www.ntst.com/products/products_Avatar_eMar.asp.
[32] Health Affairs, *Adoption Of Health Information Technology For Medication Safety In U.S. Hospitals*, 27 (3), 2008.
[33] Variation between state and national reporting of eMAR adoption rates may be largely attributed to the high IT adoption rate among Maryland hospitals.
[34] BCMA is technology that uses an infrared scan of the barcodes on the patient's bracelet and medication package at the bedside [see *Survey Glossary* in Appendix B].
[35] New England Journal of Medicine, *Effect of Bar-Code Technology on the Safety of Medication Administration*, 362, May 2010.
[36] Ibid.
[37] Ibid.
[38] Health Affairs, *Adoption Of Health Information Technology For Medication Safety In U.S. Hospitals*, 27 (3), 2008.

Comparison of Hospital BCMA Implementation 2008 through 2010				
Adoption Status	**2008** *(n=44)* #/(%)	**2009** *(n=47)* #/(%)	**2010** *(n=46)* #/(%)	**2008 – 2010 Change** *(% change)*
Implemented	14 (32)	28 (60)	29 (63)	31
Fully	*1 (2)*	*6 (13)*	*5 (11)*	*(9)*
Partially	*13 (30)*	*22 (47)*	*24 (52)*	*(22)*
Planning	30 (68)	19 (40)	17 (37)	(-31)
Implementing	*18 (60)*	*6 (32)*	*8 (47)*	*(-13)*
Assessing	*4 (13)*	*6 (32)*	*5 (29)*	*16*
Undecided	*8 (27)*	*7 (36)*	*4 (24)*	*(-3)*

Infection Surveillance Software

ISS[39] helps hospitals identify, reduce, prevent and monitor health care related infections and has the potential to decrease time spent on conducting manual surveillance.[40, 41] Emerging evidence demonstrates that ISS may improve efficiency of data collection and potentially improve patient outcomes; however, ISS use remains low.[42] The *2008 Most Wired Survey and Benchmarking* study reported about 58 percent of hospitals nationwide have a partially implemented electronic infection surveillance system and about 24 percent of hospitals nationwide have a fully implemented electronic infection surveillance system.[43, 44] Hospital ISS adoption in Maryland was reported at around 39 percent. Since 2008, an increasing number of hospitals reported they are assessing ISS systems and undecided about their planning initiatives for implementing ISS.[45]

Comparison of Hospital Infection Surveillance Software 2008 through 2010				
Adoption Status	**2008** *(n=44)* #/(%)	**2009** *(n=47)* #/(%)	**2010** *(n=46)* #/(%)	**2008 – 2010 Change** *(% change)*
Implemented	19 (43)	20 (43)	18 (39)	(-4)
Planning	25 (57)	27 (57)	28 (61)	4
Implementing	*8 (32)*	*2 (7)*	*2 (7)*	*(-25)*
Assessing	*7 (28)*	*11 (41)*	*11 (39)*	*11*
Undecided	*10 (40)*	*14 (52)*	*15 (54)*	*14*

[39] ISS is technology that electronically tracks the rates of infection outbreaks [see *Survey Glossary* in Appendix B].
[40] Hospitals and Health Networks, *Infection Surveillance: A Better Way to Beat Bugs*, January 2009. Available at: http://www.hhnmag.com/hhnmag_app/jsp/articledisplay.jsp?dcrpath=HHNMAG/Article/data/01JAN2009/0901HHN_FEA_Technology_SB1&domain=HHNMAG.
[41] American Journal of Infection Control, *Electronic surveillance systems in infection prevention: Organizational support, program characteristics, and user satisfaction*, 2010. Available at: http://www.cumc.columbia.edu/studies/pnice/chaipi/documents/ESS%20paper%20in%20press.pdf.
[42] Ibid.
[43] Hospitals and Health Networks, *Infection Surveillance: A Better Way to Beat Bugs*, January 2009. Available at: http://www.hhnmag.com/hhnmag_app/jsp/articledisplay.jsp?dcrpath=HHNMAG/Article/data/01JAN2009/0901HHN_FEA_Technology_SB1&domain=HHNMAG.
[44] A partially electronic ISS indicates there is a combination of paper and electronic infection surveillance processes.
[45] The decrease in ISS implementation may be explained by variance in hospital interpretation of the survey question.

Electronic Prescribing

e-Prescribing[46] facilitates the electronic transmission of a prescription directly to a pharmacy from the point-of-care and can improve the quality and safety of care.[47, 48] Nationally, in 2009 about 18 percent of eligible prescriptions were sent electronically.[49] Statewide, approximately 20 percent of hospitals reported e-prescribing with community pharmacies during this reporting period. The percent of hospitals that are undecided about their planning initiatives for e-prescribing has decreased almost 40 percent since 2008.

Comparison of Hospital e-Prescribing with Community Pharmacies 2008 through 2010

Adoption Status	**2008** *(n=44)* #/(%)	**2009** *(n=47)* #/(%)	**2010** *(n=46)* #/(%)	**2008 – 2010 Change** *(% change)*
Implemented	4 (9)	13 (28)	9 (20)	11
Planning	40 (91)	34 (72)	37 (80)	(-11)
Implementing	*4 (10)*	*7 (21)*	*10 (27)*	*17*
Assessing	*8 (20)*	*17 (50)*	*16 (43)*	*23*
Undecided	*28 (70)*	*10 (29)*	*11 (30)*	*(-40)*

Electronic Data Exchange with Providers

The ability to share health information electronically has the potential to improve patient safety and quality of care by delivering patient information at the time of care and to reduce care inefficiencies through better availability of information.[50, 51] The AHA reported that nationally approximately 67 percent of hospitals electronically exchange some patient information with physician offices.[52] During this reporting period, about 50 percent of hospitals reported exchanging some patient information electronically with community providers, an increase of about 5 percent over the last year.

[46] e-Prescribing is the electronic transmission of a prescription to a community pharmacy [see *Survey Glossary* in Appendix B].
[47] U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, *E-Prescribing Overview*. Available at: http://www.cms.gov/ERxIncentive/.
[48] Journal of the American Medical Informatics Association, *The Impact of e-Prescribing on Prescriber and Staff Time in Ambulatory Care Clinics: A Time-Motion Study*. Vol. 14, 2007.
[49] Surescripts, *Advancing Healthcare in America: 2009 National Progress Report on E-Prescribing, Plus What's Ahead in 2010 and Beyond*, 2009/2010. Available at: http://www.surescripts.com/downloads/NPR/national-progress-report.pdf.
[50] Agency for Healthcare Research and Quality, *Evolution of State Health Information Exchange: A Study of Vision, Strategy, and Progress*, January 2006. Available at: http://www.avalerehealth.net/research/docs/State_based_Health_Information_Exchange_Final_Report.pdf.
[51] Healthcare Information and Management Systems Society, *Health Information Exchanges: Similarities and Differences*, March 2009. Available at: http://www.himss.org/content/files/RHIO/HIE_CommonPracticesWhitePaper20090330.pdf.
[52] American Hospital Association, *Continued Progress: Hospital Use of Health Information Technology*, 2007. Available at: http://www.aha.org/aha/content/2007/pdf/070227-continuedprogress.pdf.

Comparison of Hospital Electronic Data Exchange with Community Providers 2008 through 2010				
Adoption Status	**2008** *(n=44)* #/(%)	**2009** *(n=47)* #/(%)	**2010** *(n=46)* #/(%)	**2008 – 2010 Change** *(% change)*
Implemented	17 (39)	21 (45)	23 (50)	11
Planning	27 (61)	26 (55)	23 (50)	(-11)
Implementing	*3 (11)*	*2 (8)*	*9 (39)*	*28*
Assessing	*6 (22)*	*17 (65)*	*8 (35)*	*13*
Undecided	*18 (67)*	*7 (27)*	*6 (26)*	*(-41)*

Comparison of Hospital Health IT Adoption 2008 through 2010

This year, the report includes information specific to individual hospitals. The table below identifies health IT adoption of the following technologies by hospital and year: CPOE, EHRs, eMAR, BCMA, ISS, e-prescribing, and exchange with providers. As previously noted, responses are provided by the hospitals and are not audited for accuracy.

Comparison of Hospital Health IT Adoption 2008 through 2010

Hospital	CPOE			EHRs			eMAR			BCMA			ISS			e-prescribing			Exchange with Providers		
	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
Anne Arundel Medical Center			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓		✓	✓
Atlantic General Hospital		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓							✓	✓	✓
Baltimore Washington Medical Center	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓						✓
Bon Secours Hospital	✓	✓	✓														✓	✓			
Calvert Memorial Hospital			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
Carroll Hospital Center		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓				✓			✓	✓	
Chester River Hospital		✓	✓	✓	✓	✓															✓
Civista Medical Center	✓		✓	✓	✓	✓	✓		✓	✓		✓	✓								
Doctors Community Hospital	✓	✓	✓	✓	✓	✓			✓			✓									
Dorchester General Hospital			✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓				✓	✓	✓
Edward McCready Memorial Hospital			✓			✓												✓			✓
Fort Washington Hospital																					
Franklin Square Hospital Center		✓		✓	✓	✓		✓	✓		✓	✓									
Frederick Memorial Hospital	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓		✓	✓			✓	✓		
Garrett County Memorial Hospital	✓			✓		✓							✓							✓	✓
Good Samaritan Hospital					✓	✓		✓	✓		✓	✓		✓							
Greater Baltimore Medical Center	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓					✓	✓	
Harbor Hospital		✓		✓	✓	✓		✓	✓		✓	✓	✓	✓	✓						
Harford Memorial Hospital		✓	✓		✓	✓		✓	✓		✓	✓							✓	✓	✓
Holy Cross Hospital	✓	✓	✓		✓	✓	✓	✓	✓						✓					✓	
Howard County General Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓						✓
James Lawrence Kernan Hospital		✓	✓		✓	✓		✓	✓				✓	✓	✓		✓	✓			✓
Johns Hopkins Bayview Medical Center	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓				✓	✓	
Johns Hopkins Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓				✓		✓		
Laurel Regional Hospital	✓							✓					✓				✓				
Maryland General Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				✓		✓
Memorial Hospital at Easton			✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓					✓	✓
Mercy Medical Center		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓						✓	
Montgomery General Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
Meritus Medical Center*		✓	✓	✓	✓	✓			✓			✓							✓	✓	
Northwest Hospital Center	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓	✓		✓
Peninsula Regional Medical Center	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓						
Prince George's Hospital Center			✓					✓													✓
Shady Grove Adventist Hospital		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓								✓	✓
Sinai Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓			✓	✓	✓	✓
Southern Maryland Hospital Center	✓	✓	✓										✓	✓	✓						
St. Agnes Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
St. Joseph Medical Center					✓	✓	✓	✓	✓											✓	
St. Mary's Hospital	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓				
Suburban Hospital	✓	✓	✓		✓	✓													✓	✓	✓
Union Hospital of Cecil County	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓
Union Memorial Hospital				✓	✓	✓		✓	✓		✓	✓						✓			
University of Maryland Medical Center	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓		✓
Upper Chesapeake Medical Center	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓						✓	✓	✓
Washington Adventist Hospital		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓								✓	✓
Western Maryland Regional Medical Center						✓			✓			✓			✓						✓
Total**	24	32	36	34	38	41	24	37	37	14	28	29	19	20	18	4	13	9	17	21	23
Percent	55	68	78	77	81	89	55	79	80	32	60	63	43	43	40	9	28	20	39	45	50

* Meritus Medical Center is formally Washington County Hospital
**Braddock and Memorial Hospital at Cumberland merged between 2009 and 2010 to form Western Maryland Regional Medical Center

Connectivity to the State Designated HIE

The electronic exchange of clinical information has the ability to create cost savings by enabling access to a consumers' information at the point of care. Improved access to information reduces redundant tests and costs associated with paper-based ordering and results delivery.[53] A recent study found net savings from national implementation of HIE between providers and five other types of organizations could result in a saving of around $77.8 billion annually.[54] The eHealth Initiative reported in 2010 approximately 73 operational electronic data sharing initiatives nationwide.[55] The Chesapeake Regional Information System for our Patients, or CRISP, is Maryland's state designated HIE. During this reporting period, five hospitals indicated they are connected to the state designated HIE. In the fall of 2010, all hospitals signed a letter of intent to connect to the exchange over the 24 months.

Hospital Connectivity to the State Designated HIE

Adoption Status	**2010** *(n=46)* #/(%)
Connected	5 (11)
Planning	41 (89)
Implementing	*18 (44)*
Assessing	*13 (32)*
Undecided	*10 (24)*

Medicare and Medicaid EHR Incentive Payments

The *American Recovery and Reinvestment Act of 2009* (ARRA) established programs under Medicare and Medicaid to provide incentive payments for the meaningful use of certified EHRs.[56] To qualify for a Medicare or Medicaid incentive, hospitals must adopt, implement, or upgrade to certified EHRs in year one of the Medicaid EHR incentive program and meet the requirements for meaningful use of an EHR in years two and beyond. Adopting a certified technology essentially means the product has met more than about 100 requirements regarding functionality, security, and interoperability by an Authorized Testing and Certification Body recognized by the Office of the National Coordinator for Health Information Technology.

The Medicare and Medicaid EHR incentive programs aim to increase EHR adoption, while balancing the urgency of adopting EHRs and recognizing the challenges that adoption will pose.[57] Meaningful use refers to a set of criteria that consists of core and menu objectives and clinical quality measures that medical providers must meet to demonstrate they are using their EHR as an effective tool in their practice.[58] The quality measures established as part of meaningful use are expected to expand over time and are staged in three steps over five years; stage one focuses on electronically

[53] Health Affairs, *The Value Of Health Care Information Exchange And Interoperability*, 2005.
[54] Health Affairs, *The Value Of Health Care Information Exchange And Interoperability*, 2005.
[55] eHealth Initiative, *The State of Health Information Exchange in 2010: Connecting the Nation to Achieve Meaningful Use*, 2010.
[56] 42 CFR Parts 412,413, 422 et al. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf.
[57] The New England Journal of Medicine, *The "Meaningful Use" Regulation for Electronic Health Records*, August 5, 2010. Available at: http://www.ncdhhs.gov/healthit/NEJMMUREG.pdf.
[58] See *Survey Glossary* in Appendix B

capturing health information in a standardized format and stage two and stage three will expand upon the reporting requirements of stage one.[59] Hospitals that participate in the Medicare and Medicaid EHR incentives report calculated clinical quality measure directly from their certified EHR technology. Hospitals that participate in the incentive programs attest that they have met the requirements for meaningful use in the CMS web-based Medicare and Medicaid EHR incentive program registration and attestation system. Hospitals fill in numerators and denominators for the meaningful use objectives, indicate if they qualify for exclusions to specific objectives, report on clinical quality measures, and legally attest that they have successfully demonstrated meaningful use. During this reporting period, hospitals were asked if they plan to participate in the Medicare and Medicaid EHR incentive programs and to indicate when they anticipate beginning participation in the programs.

Medicare

The Medicare EHR incentive program is administered by the Centers for Medicare and Medicaid Services (CMS). Eligible hospitals may receive Medicare incentive payments for the meaningful use of certified EHRs from years 2011 through 2016. Incentive payments for eligible hospitals are based on meeting a number of requirements identified by CMS in the regulations.[60] Incentive payments are calculated beginning with a $2 million base payment. Medicare eligible hospitals that do not demonstrate meaningful use will have a payment adjustment in their Medicare reimbursement beginning in 2015. Approximately 89 percent of hospitals in Maryland reported they plan to apply for Medicare EHR incentive payments. The survey did not ask hospitals to identify when they would be able to attest to meeting the meaningful use requirements; however the survey asked hospitals when they plan to begin participation in the Medicare EHR incentive program. Approximately 43 percent of hospitals plan to begin participation in the Medicare EHR incentive program in 2011, about 33 percent in 2012, roughly 9 percent in 2013 and about two percent are undecided about when they plan to begin participation.

Plan to Apply for Hospital Medicare EHR Incentive Payments

Participation	**2010** *(n=46)* #/(%)
Yes	41 (89)
No	1 (2)
Undecided	3 (7)

Medicaid

The Medicaid EHR incentive program is voluntarily offered by individual states. The ARRA establishes 100 percent federal funding to states for Medicaid incentive payments made to EPs and EHs.[61] The Medicaid EHR incentive program provides incentive payments to EPs and EHs as they adopt, implement, upgrade, or demonstrate meaningful use of certified EHR technology in their first year of participation and meet the meaningful use requirements for up to five remaining participation years.[62] Incentive payments for eligible hospitals are available in 2011; Maryland

[59] 42 CFR Parts 412,413, 422 et al. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf.
[60] 42 CFR Parts 412,413, 422 et al. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf.
[61] Centers for Medicare & Medicaid Services, *Medicare and Medicaid Incentives and Administrative Funding*. Available at: http://www.hhs.gov/recovery/reports/plans/pdf20100610/CMS_HIT%20Implementation%20Plan%20508%20compliant.pdf.
[62] 42 CFR Parts 412,413, 422 et al. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf.

Medicaid anticipates accepting hospital incentive applications in October of this year. The last year a Medicaid eligible hospitals may begin the program is 2016. Eligible hospitals with at least 10 percent Medicaid patient volume are eligible for Medicaid EHR incentive payments and payments are based on a number of factors, beginning with a $2 million base payment.[63] Approximately 17 percent of hospitals reported that they are not planning to participate in the Medicaid EHR incentive program and most frequently cited the reason they are not applying for the Medicaid EHR incentive payments is because they do not meet the minimum Medicaid patient eligibility criteria.

Plan to Apply for Hospital Medicaid EHR Incentive Payments	
Participation	**2010** *(n=46)* #/(%)
Yes	35 (76)
No	8 (17)
Undecided	3 (7)

Meaningful Use

To meet the meaningful use requirements, hospitals must demonstrate they meet all 14 core objectives and 5 of 10 menu objectives to be eligible for EHR incentive payments from CMS.[64] The AHA supplement survey data from 2009 were analyzed to estimate how many hospitals nationally met specific core and menu meaningful use objectives. The survey included select questions related to the meaningful use core objectives. Hospitals were asked to provide information related to roughly 9 of the 14 core objectives and 3 of the 10 menu objectives.[65, 66, 67] Nationwide, about two percent of hospitals met the nine core objectives analyzed required to meet stage one meaningful use. Compared with the AHA study, in Maryland about 7 percent, or three hospitals, reported they were able to meet the nine core objectives analyzed in the AHA study. Around 53 percent of hospitals nationally were likely to meet 5 of the 9 core meaningful use criteria.[68] The survey asked hospitals to indicate which core and menu meaningful use objectives the hospital currently is able to meet. In general, hospitals are making progress in meeting the meaningful use requirements. Many hospitals indicated challenges meeting criteria related to engaging in HIE, some of the requirements around drug monitoring and ordering, and reporting quality measures to CMS.[69] The following table represents the meaningful use core and menu objectives that hospitals reported they are currently able to meet.

[63] Ibid.
[64] 42 CFR Parts 412,413, 422 et al. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-17207.pdf.
[65] Health Affairs, *A Progress Report on Electronic Health Records in U.S. Hospitals*, 29(10), October 2010.
[66] The nine core meaningful use measures that were analyzed by Health Affairs were: record key demographics, maintain current problem list, maintain active medication list, ability to give patients an electronic copy of their health information, CPOE, drug-drug and drug-allergy checks, ability to exchange clinical information, implements at least one of four clinical decision rules, report hospital quality measures.
[67] The three menu meaningful use measures that were analyzed were: incorporate clinical lab-test results into EHR, perform medication reconciliation, record advanced directives.
[68] Health Affairs, *A Progress Report on Electronic Health Records in U.S. Hospitals*, 29(10), October 2010.
[69] Ibid.

Meaningful Use Criteria – Core Objectives	2010 *(n=46)* #/(%)
CPOE for medication orders	23 (50)
Implement drug–drug and drug–allergy interaction checks	41 (89)
Record patient demographics (sex, race, ethnicity, date of birth, preferred language, and in the case of hospitals, date and preliminary cause of death in the event of mortality)	36 (78)
Maintain up-to-date problem list of current and active diagnoses	20 (43)
Maintain active medication list	38 (83)
Maintain active medication allergy list	41 (89)
Record vital signs and chart changes (height, weight, blood pressure, body-mass index, growth charts for children)	33 (72)
Record smoking status for patients 13 years of age or older	36 (78)
Implement one clinical decision support rule and ability to track compliance with the rule	25 (54)
Report clinical quality measures to CMS or states	21 (46)
On request, provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies, and for hospitals, discharge summary and procedures)	16 (35)
Provide patients with an electronic copy of their discharge instructions at time of discharge, upon request	22 (48)
Implement capability to electronically exchange key clinical information among providers and patient-authorized entities	16 (35)
Implement systems to protect privacy and security of patient data in the EHR	37 (80)
Meaningful Use Criteria – Menu Objectives	**2010** *(n=46)* #/(%)
Implement drug-formulary checks	36 (78)
Record advance directives for patients 65 years of age or older	39 (85)
Incorporate clinical laboratory test results into EHRs as structured data	34 (74)
Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach	31 (67)
Use certified EHR technology to identify patient-specific education resources and provide those to the patient as appropriate	12 (26)
Perform medication reconciliation between care settings	29 (63)
Provide summary of care record for patients referred or transitioned to another provider or setting	18 (39)
Submit electronic immunization data to immunization registries or immunization information systems	9 (20)
Submit of electronic data on reportable laboratory results to public health agencies	23 (50)
Submit electronic syndromic surveillance data to public health agencies	19 (41)

Health IT Adoption by Hospital Characteristics

Hospital health IT adoption rates were analyzed by hospital size, geographic location, and affiliation. The following technologies were used to determine the overall health IT adoption rate among Maryland hospitals: CPOE, EHRs, BCMA, ISS, e-prescribing, and electronic data exchange with community providers. Hospitals that reported having adopted these technologies were used to calculate an overall health IT adoption rate. The hospital health IT adoption rate was assessed among hospital size, geographic location, and affiliation. Nationally, large hospitals, teaching hospitals, hospitals apart of a hospital system and hospitals located in urban areas are more likely to have EHRs.[70, 71, 72] Nationwide large hospitals and hospitals in urban areas have higher rates of e-

[70] The New England Journal of Medicine, *Use of Electronic Health Records in U.S. Hospitals*, 360(16), April 2009.

prescribing.[73] For the most part, these finds are consistent in Maryland; larger hospitals have a higher health IT adoption rate and e-prescribing rate. In contrast to national findings, rural hospitals have the highest EHR adoption rate.

Hospital Size

Hospitals were evaluated on health IT adoption and the adoption of six technologies based on size as measured by the number of inpatient beds.[74] Academic hospitals were classified as those with more than 500 beds, large hospitals have 250-500 beds, medium hospitals with 100-249 beds, and small hospitals with less than 100 beds.[75] In general, hospital size can be a predictor of health IT adoption; nationally, large hospitals have been found to have noticeably higher rates of EHR adoption than small hospitals.[76, 77]

Key findings from the survey indicate that academic hospitals reported the highest rate of health IT adoption at about 69 percent. Large hospitals in Maryland had a health IT adoption rate of approximately 58 percent, followed by medium size hospitals at almost 54 percent and small hospitals at about 43 percent. EHR adoption among Maryland hospitals is comparable to national research findings that indicate larger hospitals are more likely to adopt EHRs. As previously reported both academic size hospitals have adopted EHRs, approximately 94 percent of large hospitals, almost 89 percent of medium size hospitals, and about 78 percent of small hospitals have adopted an EHR.

Geographic Location

Hospital geographic location was used to assess overall health IT adoption rates among urban, suburban, and rural hospitals.[78] Rural and urban hospitals had about the same health IT adoption rate, at approximately 57 and 58 percent. Suburban hospitals reported a health IT adoption rate of about 48 percent. Nationally, rural hospitals are least likely to have adopted at least a basic EHR.[79] In contrast, Maryland rural hospitals reported the highest EHR adoption rate at 100 percent, approximately 76 percent of suburban hospitals, and almost 92 percent of urban hospitals reported they adopted an EHR.

Hospital Affiliation

Health IT adoption was assessed by hospital affiliation; hospitals affiliated with another hospital in Maryland were considered in-state hospitals, hospitals affiliated with a hospital outside of Maryland were considered out of state, and hospitals with no affiliation were considered standalone hospitals. In-state and standalone hospitals reported about the same health IT adoption rate at approximately 53 and 51 percent. Consistent with previous year findings, out-of-state hospitals had the lowest hospital health IT adoption rate at about 38 percent. EHR adoption rates

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[71] Board of Governors of the Federal Reserve System, *Health Care Finance and the Early Adoption of Hospital Information Systems*. Available at: http://www.federalreserve.gov/pubs/feds/2002/200241/200241pap.pdf.
[72] Robert Wood Johnson Foundation, *Health Information Technology in the United States: On the Cusp of Change*, 2009. Available at: http://www.rwjf.org/files/research/hitfullreport.pdf.
[73] Agency for Healthcare Research and Quality, *National Healthcare Quality Report*, 2010. Available at: http://www.ahrq.gov/qual/nhqr10/nhqr10.pdf.
[74] See Appendix C, *Hospital Characteristics*.
[75] Maryland Health Care Commission, *Hospital Guide*, 2011. Available at: http://mhcc.maryland.gov/hospital_services/acute/acutecarehospital/annrptlicbedsfy11_20100714.pdf.
[76] RAND Corporation, *The State and Pattern of Health Information Technology Adoption*, 2005. Available at: http://www.rand.org/pubs/monographs/2005/RAND_MG409.pdf.
[77] Health Affairs, *Adoption Of Health Information Technology For Medication Safety In U.S. Hospitals*, 27 (3), 2008.
[78] See Appendix C, *Hospital Characteristics*.
[79] Health Affairs, *A Progress Report on Electronic Health Records in U.S. Hospitals*, 29(10), October 2010.

vary among hospital affiliation. A Rand study found that the single largest determinant of hospital EHR adoption was whether the hospital was part of a multi-hospital system.[80] This finding suggests that hospitals affiliated with health systems would have a higher EHR adoption rate than standalone hospitals. In comparison to standalone hospitals, hospitals affiliated with health systems are more likely to have higher health IT adoption rates.[81] In Maryland, in-state hospitals had an EHR adoption rate of about 92 percent, out-of-state hospitals had an EHR adoption rate of approximately 67 percent, and standalone hospitals had an EHR adoption rate of almost 90 percent.

[80] RAND Corporation, *The State and Pattern of Health Information Technology Adoption*, 2005. Available at: http://www.rand.org/pubs/monographs/2005/RAND_MG409.pdf.
[81] Health Affairs, *Adoption Of Health Information Technology For Medication Safety In U.S. Hospitals*, 27 (3), 2008.

2010 Hospital HIT Survey Results

The table below displays results in aggregate, and by hospital size, geographic location, and affiliation.

	Aggregate	Hospital Size				Geographic Location			Hospital Affiliation		
IT Components	**All Hospitals**	**Academic**	**Large**	**Medium**	**Small**	**Urban**	**Suburban**	**Rural**	**In State**	**Out of State**	**Standalone**
Number of Hospitals	46	2	17	18	9	12	17	17	25	3	18
Percentage of Hospitals	100	4	37	39	20	26	37	37	54	7	39
Order Entry											
Yes	36	2	13	15	6	10	12	14	9	2	15
Planning Projections											
Assessing	5	-	1	1	3	1	3	1	2	1	2
Implementing	3	-	1	2	0	-	1	2	2	-	1
Undecided	2	-	2	-	0	1	1	-	2	-	-
Clinical Decision Support											
Medications	33	2	13	12	6	8	11	14	18	1	14
Diagnosis	21	2	9	7	3	7	8	6	11	1	9
Electronic Health Records											
Yes	41	2	16	16	7	11	13	17	23	2	16
Planning Projections											
Assessing	4	-	1	1	2	-	4	-	2	-	2
Implementing	0	-	-	1	0	1	-	-	-	1	-
Undecided	1	-	-	-	0	-	-	-	-	-	-
Electronic Medication Administration Records											
Yes	37	2	16	15	4	11	12	14	22	2	13
Planning Projections											
Assessing	5	-	1	1	3	-	4	1	2	-	3
Implementing	3	-	-	1	2	-	1	2	1	-	2
Undecided	1	-	-	1	0	1	-	-	-	1	-
Barcode Medication Administration											
Yes	29	-	12	14	3	7	8	14	16	-	13
Planning Projections											
Assessing	5	-	2	1	2	-	4	1	1	1	3
Implementing	8	2	2	2	2	3	3	2	5	1	2
Undecided	4	-	1	1	2	2	2	-	3	1	-
Infection Surveillance Software											
Yes	18	2	7	6	3	7	5	6	12	1	5
Planning Projections											
Assessing	11	-	4	6	1	1	5	5	7	-	4
Implementing	2	-	1	1	0	-	2	-	1	-	1
Undecided	15	-	5	5	5	4	5	6	5	2	8
Electronic Prescribing											
Yes	9	1	4	2	2	5	2	2	5	1	3
Planning Projections											
Assessing	16	-	4	10	2	2	7	7	9	1	5
Implementing	10	1	4	3	2	3	1	6	5	-	5
Undecided	11	-	5	3	3	2	7	2	6	1	5
Electronic Data Exchange with Providers											
Yes	23	2	8	8	6	5	8	10	16	-	7
Planning Projections											
Assessing	8	-	3	4	1	3	3	2	4	-	4
Implementing	9	-	5	2	1	3	3	3	4	1	4
Undecided	6	-	1	4	1	1	3	2	1	2	3
Connectivity to State Designated Health Information Exchange											
Yes	5	-	3	2	-	-	5	0	3	1	1
Planning Projections											
Assessing	13	-	4	7	2	4	4	5	8	-	5
Implementing	18	2	7	6	3	5	4	9	9	-	9
Undecided	10	-	3	3	4	3	4	3	5	2	3
Participation in Medicare Electronic Health Record Incentive Program											
Yes	40	1	15	18	8	9	15	17	21	3	17
No	2	-	1	-	-	1	-	-	-	-	1
Undecided	4	1	1	-	1	2	2	-	4	-	-
Participation in Medicaid Electronic Health Record Incentive Program											
Yes	34	1	12	16	6	9	12	11	21	3	11
No	9	-	4	2	2	2	3	6	1	-	7
Undecided	3	1	1	-	1	1	2	-	3	-	-
Health IT Adoption Rate											
Percent (%)	60	79	64	60	49	67	50	65	59	38	57

Remarks

Maryland health IT adoption exceeded national health IT adoption rates in the following categories: CPOE, CDS, EHRs, eMARs, BCMA, and e-prescribing. Health IT has the potential to improve health care delivery while generating efficiencies throughout the system.[82, 83] The survey findings suggest that Maryland hospitals continue to make notable progress in health IT adoption. Since 2008 hospital health IT adoption increased for six of the seven technologies assessed. Approximately 89 percent of hospitals in Maryland reported they have adopted an EHR, with the highest adoption rate among rural hospitals at approximately 100 percent. E-Prescribing to pharmacies continues to trail the adoption rate of the technologies assessed in the survey.

Over the last couple of years, reporting to stakeholders on the progress of health IT adoption was essential in benchmarking the state's readiness to take advantage of the health IT adoption benefits. The results from this year's survey clearly indicate that Maryland is a leader in health IT adoption and is well situated to benefit from widespread adoption. Next year, in collaboration with the hospital Chief Information Officers, the MHCC plans to restructure the survey to measure the value of health IT adoption in care delivery and in generating efficiencies for hospitals. The survey questions will be aimed at assessing how the technology is used to improve the quality of care and its impact on health care outcomes.

[82] Health Affairs, *The Benefits of Health Information Technology: A Review of the Recent Literature Shows Predominantly Positive Results*, 30(3), March 2011.

[83] Agency for Healthcare Research and Quality, *National Healthcare Quality Report*, 2010. Available at: http://www.ahrq.gov/qual/nhqr10/nhqr10.pdf

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Peninsula Regional Medical Center
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Appendix A

Survey Questions

Below is an outline of the *2010 Hospital Health Information Technology Survey* (survey). The survey included seven sections. To facilitate analysis of HIT utilization, the first section inquired of the number of primary care units. The first section also asked hospitals to provide the total number of inpatient orders and inpatient medication orders for the previous month for paper and electronic. The remaining sections asked questions related to the following categories: Order Entry, Electronic Health Records, Medication Administration, Infection Management, Health Information Exchange, and Meaningful Use. Questions below with an asterisk required hospitals to answer the planning questions in the event the hospital answered with a "No" response.

Primary Care Units (PCUs) *(Indicate the number of departments for each specialty*

Critical Care	Outpatient (Ambulatory) Surgery
Emergency Department	Post Anesthesia Care Unit (PACU)
Labor and Delivery (L&D)	Short-Stay (23 hour observation)
Medical/Surgical	Telemetry
Mother/Baby	Pediatrics
Operating Room (OR)	Psychiatric

Patient Orders Overview

1. What was the total of all inpatient orders (both paper and electronic) for the primary care units last month *(enter value)*?
    a. How many were submitted electronically by providers? *(enter value)*
2. What was the total inpatient medication orders (both paper and electronic) for the primary care units last month *(enter value)*?
    a. How many were submitted electronically by providers? *(enter value)*
3. What is your most recent HIMSS EMR Adoption Model Ranking? *(enter value: 0-7)*

Order Entry

1. *Does your hospital have an order entry system that allows providers (MD, DO, NP, PA) to electronically enter all patient care orders for laboratory, radiology, pharmacy, nursing, respiratory, ultrasound, PT/OT, etc? *If no, go to Planning Questions.*
    a. Which orders can the provider enter electronically *(select all that apply)*: pharmacy, laboratory, radiology, nursing, respiratory, ultrasound, PT/OT, or dietary.
2. *Does your system allow providers (MD, DO, NP, PA) to electronically view the status and results of laboratory, radiology, pharmacy, nursing, respiratory, and PT/OT?
3. *Does your system have an order set feature where a group of orders can be selected based upon a problem or diagnosis?
4. Does this system offer decision support software for medication prescribing, including drug-drug; drug-food; contraindication/dose limit for diagnosis, allergies, age/weight, lab/radiology results?
    a. Is this feature implemented and operationalized?
    b. Does the software offer links to resources for reference?
    c. Is electronic documentation required for overriding an interception?
5. Does this system offer decision support software for diagnosis, chronic conditions, and standards of care, including heart failure, diabetes, or other appropriate treatments such as pneumonia vaccination, flu shot, etc.?
    a. Is this feature implemented and operationalized?
    b. Does the software offer links to resources for reference?
    c. Is electronic documentation required for overriding an interception?

6. Is information from pharmacy, laboratory, and admitting-discharge-transfer integrated into the order entry process?
7. Does the system have an active "read-back order" function for verbal/phone orders?

Electronic Health Record (EHR)

1. *Does your hospital have an EHR? *If no, go to Planning Questions*
    a. Which documentation can be entered electronically *(select all that apply)*: medication administration, physician progress notes, physician H&P/assessment, nursing assessment , nursing notes, vital signs, respiratory notes, PT/OT notes.
2. *Does your system allow review of previous admission data?
3. *Does your system provide patient assignment lists?

Medication Administration

1. *Does your hospital have an electronic medication administration record (eMAR)? *If no, go to Planning Questions.*
2. *Does your hospital have a Barcode Medication Administration (BCMA) system for medication administration? *If no, go to Planning Questions.*
3. Does your hospital have a medication reconciliation system in place for admission, discharge, and changes in level of care?

Infection Management

1. Does your hospital use infection surveillance software to manage your organization's infectious diseases? *If no, go to Planning Questions.*
2. Does your reporting to the NHSN exceed minimum reporting requirements?
3. Is your hospital linked to Centers for Disease Control – Alert System?

Health Information Exchange

1. Does your hospital have a system to electronically prescribe discharge medications directly to community pharmacies? *If no, go to Planning Questions.*
2. Does your hospital have a system capable of electronic data exchange for consultation or transfer of care with outpatient providers, such as physicians, long term care, etc.?

Meaningful Use

1. Is your hospital planning on participating in the Medicaid EHR Incentive Program?
    a. If yes, what year is your hospital planning on beginning participation in the Medicaid EHR Incentive Program?
2. Is your hospital planning on participating in the Medicare EHR Incentive Program?
    a. If yes, what month/year is your hospital planning on beginning participation in the Medicare EHR Incentive Program?

Core Objectives

1. Indicate which core objectives your hospital is able to meet today:
    a. Computer provider order entry (CPOE) for medication orders?
    b. Implement drug–drug and drug–allergy interaction checks?
    c. Record patient demographics (sex, race, ethnicity, date of birth, preferred language, and in the case of hospitals, date and preliminary cause of death in the event of mortality)?
    d. Maintain up-to-date problem list of current and active diagnoses?
    e. Maintain active medication list?
    f. Maintain active medication allergy list?
    g. Record vital signs and chart changes (height, weight, blood pressure, body-mass index, growth charts for children)?
    h. Record smoking status for patients 13 years of age or older?
    i. Implement one clinical decision support rule and ability to track compliance with the rule?

j. Report clinical quality measures to CMS or states?
k. On request, provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies, and for hospitals, discharge summary and procedures)?
l. Provide patients with an electronic copy of their discharge instructions at time of discharge, upon request?
m. Implement capability to electronically exchange key clinical information among providers and patient-authorized entities?
n. Implement systems to protect privacy and security of patient data in the EHR?

Menu Objectives

1. Indicate which menu objectives your hospital is able to meet today:
    a. Implement drug-formulary checks?
    b. Record advance directives for patients 65 years of age or older?
    c. Incorporate clinical laboratory test results into EHRs as structured data?
    d. Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach?
    e. Use certified EHR technology to identify patient-specific education resources and provide those to the patient as appropriate?
    f. Perform medication reconciliation between care settings?
    g. Provide summary of care record for patients referred or transitioned to another provider or setting?
    h. Submit electronic immunization data to immunization registries or immunization information systems?
    i. Submit of electronic data on reportable laboratory results to public health agencies?
    j. Submit electronic syndromic surveillance data to public health agencies?

Planning Questions

Planning questions were incorporated in all survey sections as appropriate.

1. If no, is your hospital:
    a. Assessing a _____ system within 12 months?
    b. Implementing a _____ system within 12 months?
    c. Undecided at this time?

Appendix B

Survey Glossary

Barcode Medication Administration (BCMA):

Technology that allows for the real-time confirmation of the "five rights" – right patient, right medication, right dose, right route, and right time – for medication administration.

Computerized Physician Order Entry (CPOE):

Computer based application system for providers (MD, DO, NP, PA) to enter patient care orders at the point of care.

Core Objectives:

To meet the meaningful use requirements, hospitals must meet core objectives unless an exception applies; several objectives do not allow exceptions. Core objectives include the following:

- CPOE for medication orders
- Implement drug–drug and drug–allergy interaction checks
- Record patient demographics (sex, race, ethnicity, date of birth, preferred language, and in the case of hospitals, date and preliminary cause of death in the event of mortality)
- Maintain up-to-date problem list of current and active diagnoses
- Maintain active medication list
- Maintain active medication allergy list
- Record vital signs and chart changes (height, weight, blood pressure, body-mass index, growth charts for children)
- Record smoking status for patients 13 years of age or older
- Implement one clinical decision support rule and ability to track compliance with the rule
- Report clinical quality measures to CMS or states
- On request, provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies, and for hospitals, discharge summary and procedures)
- Provide patients with an electronic copy of their discharge instructions at time of discharge, upon request
- Implement capability to electronically exchange key clinical information among providers and patient-authorized entities
- Implement systems to protect privacy and security of patient data in the EHR

Clinical Decision Support (CDS):

Computer application to assist in clinical decisions by providing evidence-based knowledge in the context of patient-specific data.

Clinical Quality Measures:

To demonstrate meaningful use successfully, eligible hospitals are required to report on 15 clinical quality measures.

Electronic Health Record (EHR):

A longitudinal collection of electronic health information that serves as a legal medical record, which includes documentation, vital signs, and assessments.

Electronic Medication Administration Record (eMAR):

An electronic format of the traditional paper medication administration record.

Electronic Prescribing (e-prescribing):

The electronic transmission of prescriptions directly to the dispensing pharmacy by the ordering provider.

Health Information Exchange (HIE):

Electronic movement of health-related information among organizations.

Health Information Technology (HIT):

Technology used to maintain health information into electronic format.

Infection surveillance:

An application that monitors the events of infectious disease.

Order Set:

A group of evidenced-based orders for specific diagnosis or problems.

Meaningful Use:

The criteria for meaningful use are based on a series of specific objectives, each of which is tied to a measure that allows EPs and hospitals to demonstrate that they are meaningful users of certified EHR technology.

Medicare and Medicaid EHR Incentive Programs:

The Health Information Technology for Economic and Clinical Health Act established programs under Medicare and Medicaid to provide incentive payments for the "meaningful use" of certified EHR technology. The Medicare and Medicaid EHR incentive programs will provide incentive payments to eligible professionals and eligible hospitals as they adopt, implement, upgrade or demonstrate meaningful use of certified EHR technology. The programs begin in 2011. These incentive programs are designed to support providers in this period of health IT transition and instill the use of EHRs in meaningful ways to help our nation to improve the quality, safety and efficiency of patient health care.

Menu Objectives:

To meet the meaningful use requirements, hospitals must meet five of ten menu objectives unless an exception applies. Menu objectives include the following and one of the five objectives chosen must be a population health-related objective indicated by an asterisk * below:

- Implement drug-formulary checks
- Record advance directives for patients 65 years of age or older
- Incorporate clinical laboratory test results into EHRs as structured data
- Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach
- Use certified EHR technology to identify patient-specific education resources and provide those to the patient as appropriate
- Perform medication reconciliation between care settings
- Provide summary of care record for patients referred or transitioned to another provider or setting
- *Submit electronic immunization data to immunization registries or immunization information systems
- *Submit of electronic data on reportable laboratory results to public health agencies
- *Submit electronic syndromic surveillance data to public health agencies

Primary Care Unit:

A culmination of hospital units that comprise the major patient care areas and are typical of any hospital despite the size of the facility.

Provider:

A licensed professional with prescribing privileges.

Appendix C

Hospital Characteristics

Hospital	Size	Geography	Affiliation
Anne Arundel Medical Center	Large	Suburban	Standalone
Atlantic General Hospital	Small	Rural	Standalone
Baltimore Washington Medical Center	Large	Suburban	In State
Bon Secours Hospital	Medium	Urban	Out of State
Calvert Memorial Hospital	Small	Rural	Standalone
Carroll Hospital Center	Medium	Rural	Standalone
Chester River Hospital	Small	Rural	In State
Civista Medical Center	Medium	Rural	Standalone
Doctors Community Hospital	Medium	Suburban	Standalone
Dorchester General Hospital	Small	Rural	In State
Edward McCready Memorial Hospital	Small	Rural	Standalone
Fort Washington Hospital	Small	Suburban	Standalone
Franklin Square Hospital Center	Large	Suburban	In State
Frederick Memorial Hospital	Large	Rural	Standalone
Garrett County Memorial Hospital	Small	Rural	Standalone
Good Samaritan Hospital	Medium	Suburban	In State
Greater Baltimore Medical Center	Large	Urban	Standalone
Harbor Hospital	Medium	Urban	In State
Harford Memorial Hospital	Medium	Rural	In State
Holy Cross Hospital	Large	Suburban	Out of State
Howard County General Hospital	Medium	Suburban	In State
James Lawrence Kernan Hospital	Small	Urban	In State
Johns Hopkins Bayview Medical Center	Academic	Urban	In State
Johns Hopkins Hospital	Large	Urban	In State
Laurel Regional Hospital	Small	Suburban	In State
Maryland General Hospital	Medium	Urban	In State
Memorial Hospital at Easton	Medium	Rural	In State
Mercy Medical Center	Medium	Urban	Standalone
Meritus Medical Center *(formally Washington County)*	Large	Rural	In State
Montgomery General Hospital	Medium	Suburban	In State
Northwest Hospital Center	Medium	Suburban	In State
Peninsula Regional Medical Center	Large	Rural	Standalone
Prince George's Hospital Center	Large	Suburban	In State
Shady Grove Adventist Hospital	Large	Suburban	In State
Sinai Hospital	Large	Urban	In State
Southern Maryland Hospital Center	Medium	Suburban	Standalone
St. Agnes Hospital	Large	Urban	Standalone
St. Joseph Medical Center	Large	Suburban	Out of State
St. Mary's Hospital	Medium	Rural	Standalone
Suburban Hospital	Medium	Suburban	Standalone
Union Hospital of Cecil County	Medium	Rural	Standalone
Union Memorial Hospital	Large	Urban	In State
University of Maryland Medical Center	Academic	Urban	In State
Upper Chesapeake Medical Center	Medium	Rural	In State
Washington Adventist Hospital	Large	Suburban	In State
Western Maryland Regional Medical Center	Large	Rural	In State

Size *(licensed beds)*	**Geography** *(Counties)*	**Affiliation**
Academic: > 500 Large: 251 - 500 Medium: 100 – 250 Small: <100	Urban: Baltimore City	Standalone: No affiliation
	Suburban: Anne Arundel, Baltimore, Howard, Montgomery, and Prince George's	In State: Affiliated with another hospital in Maryland
	Rural: Allegany, Calvert, Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Garrett, Harford, Kent, Queen Anne's, Somerset, St. Mary's, Talbot, Washington, Wicomico and Worchester	Out of State: Affiliated with a hospital outside of Maryland
		1 = Johns Hopkins Health System; 2 = MedStar Health; 3 = University of Maryland Medical System

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