Health Information Technology

An Assessment of Maryland Acute Care Hospitals

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MARYLAND HEALTH CARE COMMISSION

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Table of Contents

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Introduction

Over the last decade, hospitals have evolved to keep pace with the transition towards quality-based care. Improving quality requires widespread diffusion of health information technology (health IT). The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 is considered a unique federal policy for driving change among hospitals through financial incentives for their adoption and Meaningful Use (MU) of certified electronic health record (EHR) technology.[1, 2, 3] Maryland hospitals have received over $300 million dollars of the nearly $27 billion dollars in MU incentives allocated by the federal government. Prior to HITECH (2008), less than a quarter (16 percent) of Maryland hospitals had adopted a basic EHR[4] as compared to nine percent of hospitals nationally.[5] Today, all hospitals in Maryland and about 96 percent nationally have adopted a certified EHR; all have demonstrated MU.[6, 7]

About the Assessment

The Maryland Health Care Commission (MHCC) conducts an annual assessment of health IT adoption among all acute care hospitals ("hospitals") in the State.[8] This report highlights findings from the assessment, which includes dashboards illustrating hospital implementation of telehealth, data analytics, health information exchange (HIE), and patient portals with some available national comparisons. Included is information about hospitals' strategic initiatives where there is investment in health IT to support quality care goals. Hospitals' perceptions of vulnerabilities in data security (e.g., e-mail, mobile devices, people, etc.) and efforts to enhance cybersecurity is also noted.

Limitations

Data used in the assessment was self-reported by hospitals. The MHCC collected data through an online survey that was not audited for accuracy. Hospitals' interpretation of survey questions may vary, which could influence assessment findings. National benchmark data is not inclusive of the entire population and uses different survey methodologies; certain national comparisons are not available.

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[1] A certified EHR meets the technological capability, functionality, and security requirements adopted by the Department of Health and Human Services. The Office of the National Coordinator for Health Information Technology (ONC) Health IT Certification Program is a voluntary program for the certification of health IT standards, implementation specifications, and certification criteria. This program supports the availability of certified EHRs that is required to participate in MU and most alternative payment models under the purview of federal, state and private entities. For more information, visit: www.healthit.gov/policy-researchers-implementers/about-onc-health-it-certification-program.

[2] HITECH introduced the MU program that requires use of certified EHR technology and outlines objectives hospitals must achieve to earn financial incentives. For more information, visit: www.healthit.gov/providers-professionals/meaningful-use-definition-objectives.

[3] Health Affairs, *HITECH Act Drove Large Gains In Hospital Electronic Health Record Adoption*, August 2017. Available at: www.healthaffairs.org/doi/pdf/10.1377/hlthaff.2016.1651.

[4] A basic EHR is classified as minimum use of at least 10 core functions: recording patient demographic information; physician notes; nursing assessments; problem lists; medication lists; discharge summaries; ordering medications; and viewing laboratory reports; radiology reports; and diagnostic test results.

[5] ONC Data Brief 35, *Adoption of Electronic Health Record Systems among U.S. Non-Federal Acute Care Hospitals: 2008-2015*, May 2016. Available at: www.healthit.gov/sites/default/files/briefs/2015_hospital_adoption_db_v17.pdf.

[6] Hospitals demonstrate MU by successfully attesting through either the CMS Medicare Attestation System or through the State's Medicaid Attestation System.

[7] See n. 6, *Supra*.

[8] N=46 (2012); N=46 (2013); N=47 (2014); N=48 (2015); N=48 (2016).

Health Care Costs

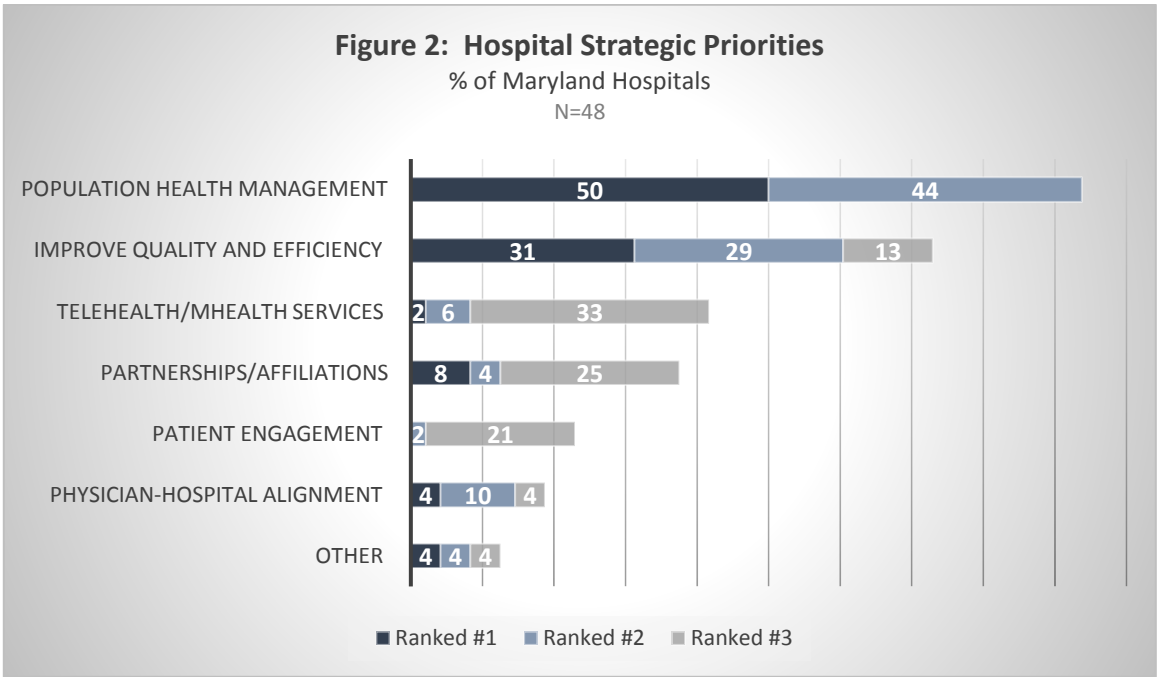
Health care policy remains adamantly focused on exploring innovative ways to improve quality and reduce costs. U.S. health care spending grew by 4.3 percent in 2016, amounting to $3.3 trillion or $10,348 per capita.[9] Spending is projected to grow an average of 5.6 percent annually over the next decade (2016-2025).[10] This spend is more than other high-income nations, yet life expectancy and health outcomes in the U.S. tend to be worse.[11] Generally, health care accounts for up to one-third of state budgets.[12] In Maryland (as of 2014), health care spending has grown about 6 percent on average[13] ranking 16th in the nation at $51.3 million; per capita cost was $8,602 ranking 19th among states.[14] Hospital care represents about 38 percent of total spending, or $19.6 million.[15]

Exploring Strategy

Rising health care costs coupled with a patient-centric approach to health care reform are driving hospitals to transform the way care is delivered. The top three strategic initiatives reported by Maryland hospitals (in ranking order) where there is investment in health IT include: (1) enhancing population health management activities; (2) implementing new processes to improve quality and efficiency; and (3) offering telehealth/mobile health (mHealth) services to manage high risk patients (Figure 1). Other areas of focus prioritized by about half of hospitals include developing partnerships/affiliations (i.e., with other hospitals, ambulatory practices, public health departments, payers, etc.) followed by deploying programs to promote patient engagement (Figure 2).

FIGURE 1: TOP 3 STRATEGIC PRIORITIES

[9] CMS data available at: www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html.
[10] CMS, *2016-2025 Projections of National Health Expenditures Data Released*, February 2017. Available at: www.cms.gov/Newsroom/MediaReleaseDatabase/Press-releases/2017-Press-releases-items/2017-02-15-2.html.
[11] The Common Wealth Fund, *U.S. Spends More on Health Care Than Other High-Income Nations But Has Lower Life Expectancy, Worse Health*, October 2015. Available at: www.commonwealthfund.org/publications/press-releases/2015/oct/us-spends-more-on-health-care-than-other-nations.
[12] Ballotpedia, *Healthcare policy in Maryland*. Available at: ballotpedia.org/Healthcare_policy_in_Maryland.
[13] Timeframe: 1991-2014.
[14] Kaiser Family Foundation. Available at: www.kff.org/state-category/health-costs-budgets/?state=MD.
[15] Ibid.

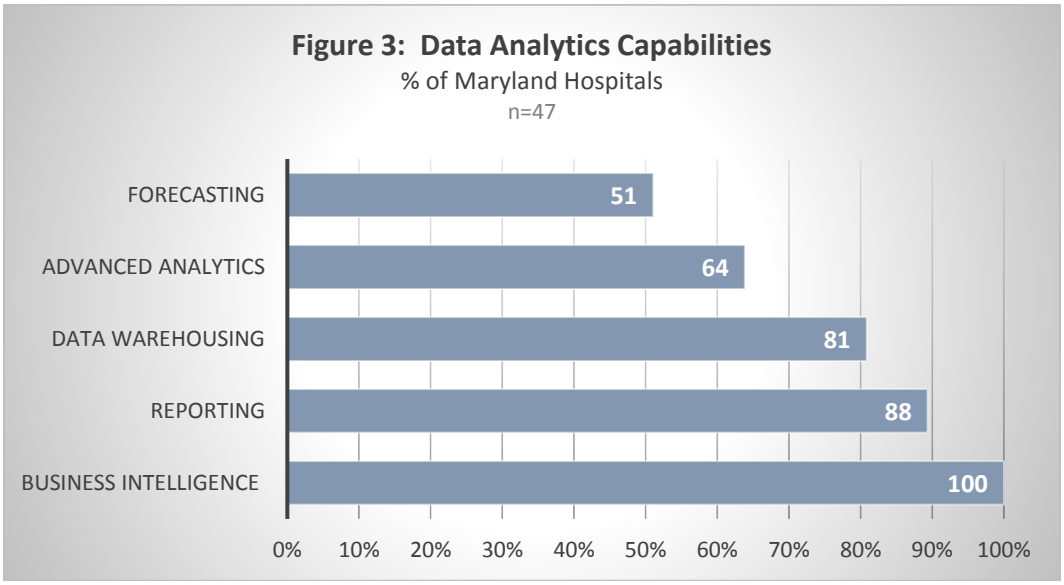


Note: Other includes expanding ambulatory services, maximizing ambulatory EHR workflows and clinical pathways, and selecting an enterprise business/clinical analytics platform.

Data Analytics

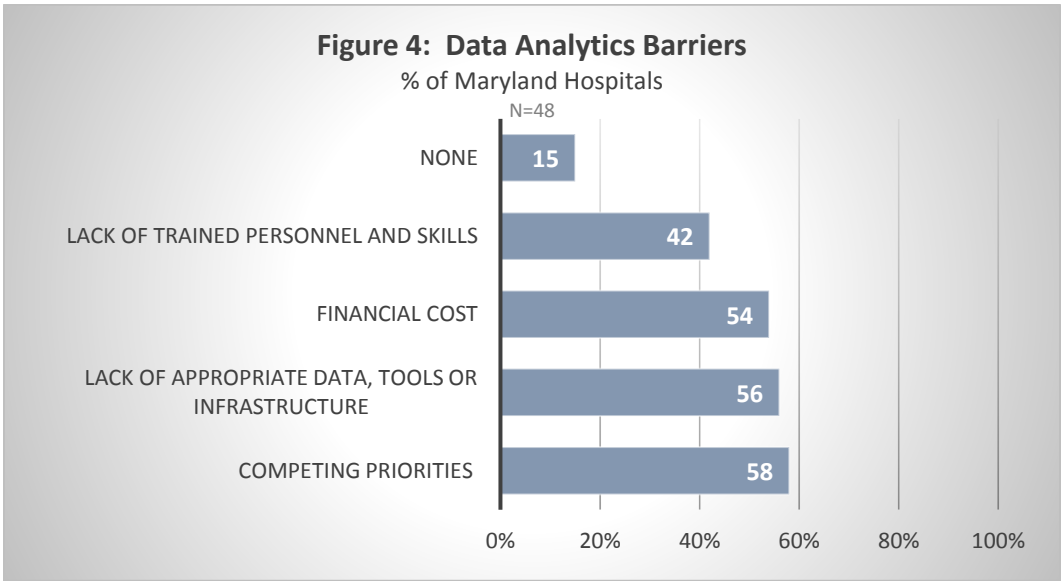
Almost all hospitals[16] have data analytics capabilities, an increase of about 20 percent from the prior year.[17] Business intelligence is key to informing process improvement initiatives. Often built on the foundation of a data warehouse[18], business intelligence is a critical tool for hospitals in pursuing care delivery transformation as a way to improve quality and cost performance.[19, 20] Data warehousing utilizes a centralized repository for information bringing together disparate data sources, cleaning data and preparing it for more advanced analyses.[21] More than half of hospitals conduct advanced analytics and forecasting (e.g., data mining, self-service analytics, statistical analyses, and predictive modeling). Use of advanced data analytics is expected to increase as hospitals augment activities to improve population health and expand patient engagement, key requirements under the All-Payer Model (Figure 3).[22]

[16] Garrett Regional Medical Center reports it does not have capabilities for data analytics.
[17] MHCC, *Health Information Technology: An Assessment of Maryland Acute Care Hospitals*, January 2017. Available at: mhcc.maryland.gov/mhcc/pages/hit/hit/documents/HIT_2015_Hosp_HealthIT_Assess_MD_Rpt_20170208.pdf.
[18] A data warehouse is designed for analytical processing and layers over other databases in order to collect data from them.
[19] Health Catalyst, *Healthcare Business Intelligence: What Your Strategy Needs*. Available at: www.healthcatalyst.com/healthcare-business-intelligence-data-warehouse.
[20] Hospitals invest in information systems and data warehouses first to achieve data-driven outcomes. Business intelligence collects, analyzes, and connects data that can be aggregated, organized, catalogued, and structured to facilitate research, analysis, dashboards and ad hoc queries, among other things.
[21] HIT Infrastructure, *Defining the Basics of the Healthcare Big Data Warehouse*, January 2016. Available at: hitinfrastructure.com/news/defining-the-basics-of-the-healthcare-big-data-warehouse.
[22] In January 2014, implementation of the All-Payer Model Contract began in Maryland when the State entered into a five-year demonstration with CMS. The current Model is focused on hospital spending, the next phase, known as Total Cost of Care (TCOC), encompasses all health care services delivered in both hospital and non-hospital settings. TCOC is anticipated to begin in 2020. For more information, visit: hscrc.maryland.gov/Pages/progression.aspx.



Note: Percentages represent hospitals with data analytics capabilities.

Hospitals require robust tools to integrate, analyze, and leverage data in ways that can improve the consumer experience and identify inefficiencies to reduce costs. More than half of Maryland hospitals report the existence of barriers including: competing priorities; lack of appropriate data; limited analytical tools or computing infrastructure; and insufficient financial resources. Staffing limitations also present challenges for some hospitals (Figure 4). Access to skilled personnel and adequate funding are barriers identified by about half of hospitals nationally.[23]

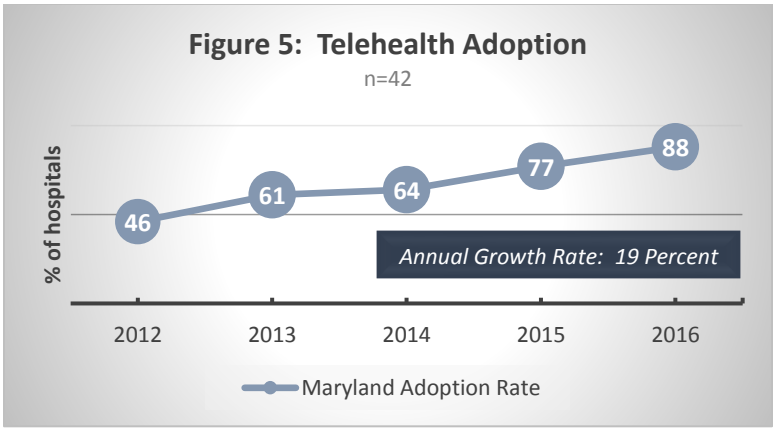


Note: Percentages represent barriers reported by all hospitals.

[23] Deloitte, *Health System Analytics: The Missing Key to Unlock Value-based Care*, 2015. Available at: www2.deloitte.com/content/dam/Deloitte/us/Documents/life-sciences-health-care/us-dchs-provider-analytics-report.pdf.

Telehealth

Since 2012, telehealth adoption among hospitals has experienced a compound annual growth rate of about 19 percent (Figure 5).[24, 25] Though implementation of telehealth has mostly been in specific departments, diffusion is occurring across service lines and care settings.[26, 27] Approximately 88 percent of Maryland hospitals have implemented one or more telehealth projects, which exceeds the nation by nearly 17 percent.[28] Telehealth technology has evolved to support video, audio, and text using modern-day wireless devices including smartphones and tablets.[29] These devices enable real-time communication between providers and patients through virtual consults and remote monitoring in various settings.



Among hospitals in Maryland that have adopted telehealth, 86 percent report use of interactive audio/video technology, 45 percent remote monitoring devices, and 24 percent mobile devices. Examples of ways this technology is used particularly for purposes of remote patient monitoring include post-hospital discharge care, post-surgical follow-ups, medication management, and support for chronic conditions.[30] Hospitals report that improving quality of care and reducing hospital readmissions are the two most important factors driving telehealth adoption. Increasing efficiencies and expanding access to care ranks third and fourth, aligning with top organizational goals reported by hospitals nationally (Figure 6).[31]

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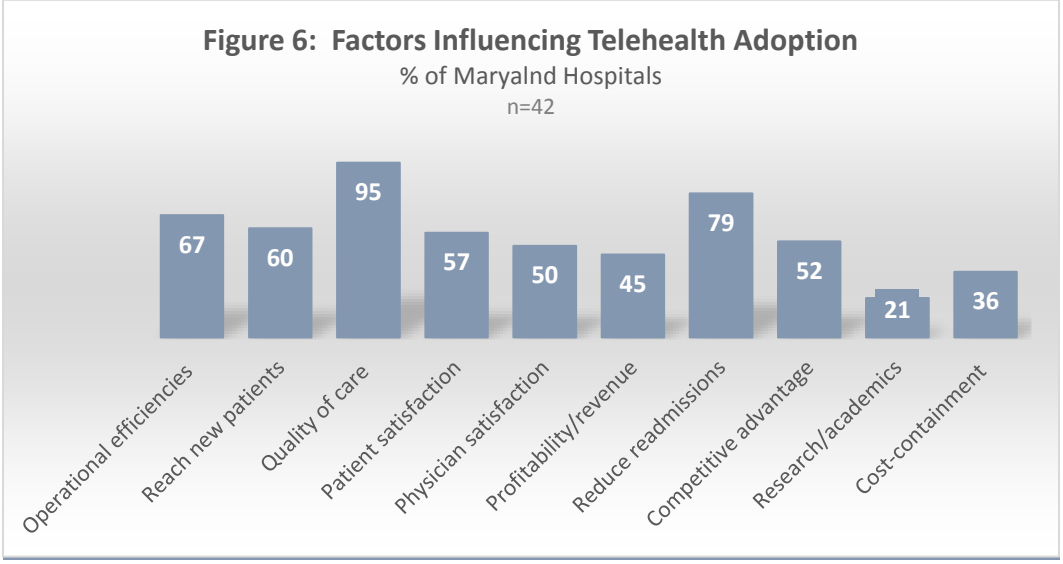
[24] Compound annual growth rate determined using a beginning value of 21 (number of adopters in 2012) and an ending value of 42 (number of adopters in 2016) over 4 periods.
[25] Four of six non-adopters are considering telehealth; two are undecided.
[26] Telehealth is initially implemented and managed by individual departments before scaling a telehealth program to an enterprise-wide approach that centrally manages and coordinates all telehealth services.
[27] Telehealth platforms were typically developed to target specific use-cases (e.g., telestroke) that could meet the needs of departmental telehealth initiatives. Technology has evolved to offer solutions that are tailored to accommodate enterprise-wide initiatives. For more information, visit: www.signifyresearch.net/digital-health/rise-enterprise-scale-platform-centric-telehealth/.
[28] HIMSS Analytics, *Enabling Better Health through Information Technology*, 2017.
[29] As early as 1955, the Nebraska Psychiatric Institute began using closed-circuit TV to monitor patients remotely. Telehealth has since evolved to address issues with access to care for a wide range of specialties including dermatology and neurology. For more information, visit: healthit.ahrq.gov/key-topics/telehealth.
[30] Teledoc and Becker's Hospital Review, *The State of Consumer Telehealth*, 2016. Available at: communications.teladoc.com/resources/Ebook-State-of-Consumer-Telehealth.pdf.
[31] Ibid.



While technology has advanced and quality improvement measures are driving more interest in telehealth, hospitals must still overcome challenges to establish a successful telehealth program. The top three challenges reported by Maryland hospitals include: cost to acquire, implement, and maintain telehealth services; lack of reimbursement; and limitations in technical infrastructure to support telehealth. Hospitals across the nation experience these same challenges in addition to others involving physician engagement, licensing requirements, workflow integrations, and sustainability (Table 1).[32, 33] Accomplishments and lessons learned by early adopters of telehealth have informed program development. Scaling telehealth can be challenging and requires collaboration with physicians, patients, community health organizations, and long-term care facilities to identify ways to sustain telehealth programs beyond the initial funding period.

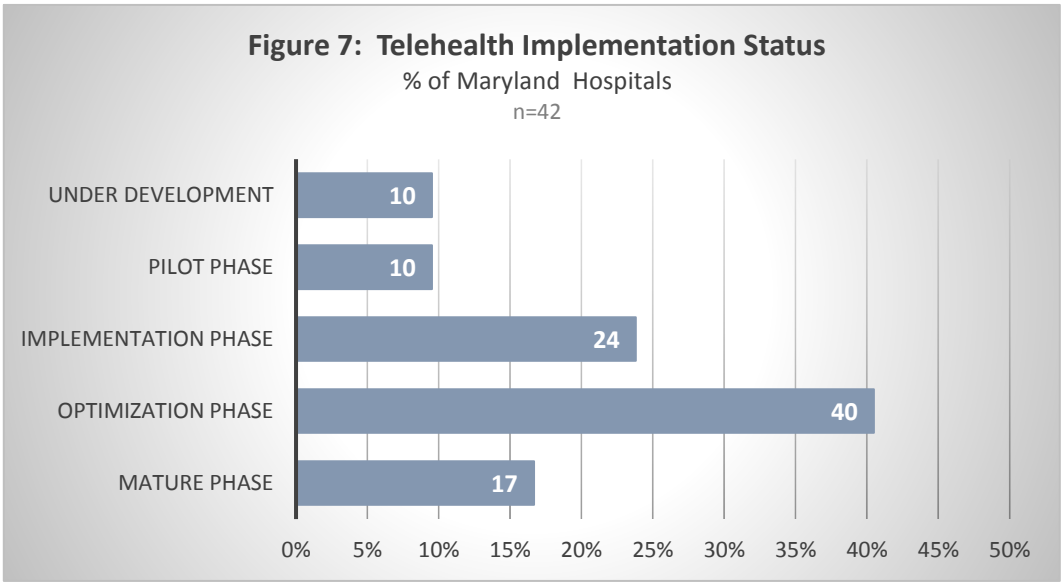
Table 1: Telehealth Barriers
% of Maryland Hospitals
N=48

Acquisition, implementation, and maintenance costs	69
Lack of reimbursement	63
Limitations in technical infrastructure	48
Administrative and physician buy-in	44
Multi-state licensing requirements	44
Integration into existing clinical workflows	40
Sustainability	35
Credentialing	33
Security/HIPAA-compliance	15
Monitoring quality of care	8
Medical malpractice policy restrictions/exclusions	4
Premium increase for medical malpractice policy	2

[32] Becker's Hospital Review, *Overcoming 4 Challenges in Implementing Telemedicine, Healthcare's Next Frontier*, February 2012. Available at: www.beckershospitalreview.com/healthcare-information-technology/overcoming-4-challenges-in-implementing-telemedicine-healthcares-next-frontier.html.

[33] REACH Health, *2017 U.S. Telemedicine Industry Benchmark Survey*, April 2017. Available at: reachhealth.com/wp-content/uploads/2017-US-Telemedicine-Industry-Benchmark-Survey-REACH-Health.pdf.

Hospitals are generally at the forefront of telehealth as compared to other provider types.[34] Adopters are however at various stages of implementation with multiple telehealth projects in different phases. About half of adopters statewide are in preliminary stages of setting up a telehealth program (i.e., under development, pilot phase, and implementation phase – Figure 7). Forty percent of telehealth adopters are in an optimization phase where telehealth technology is fully functional; this is an increase of about 20 percent since the prior year.[35] Less than a quarter of Maryland hospitals have a mature telehealth program (Figure 7). Achieving program sustainability[36] can be affected by communication and technology costs, physician and patient acceptance, and return on investment, among other things.[37, 38] Key elements in assessing financial sustainability are understanding how telehealth affects cash flow--patients being targeted, operational capabilities, and how services will be reimbursed.[39]



Note: Telehealth implementation status has the following meanings: under development n=4 (assessing telehealth technologies, workflows, etc. with definitive plans to implement telehealth services); pilot phase n=4 (conducting limited telehealth tests/trials for a limited period of time); implementation phase n=10 (incorporating telehealth technology into clinical workflows and educating staff within the hospital); optimization phase n=17 (telehealth technology fully functional and telehealth services actively being rendered by hospital); mature (sustain) phase n=7 (secured funding and general cultural acceptance to support telehealth).

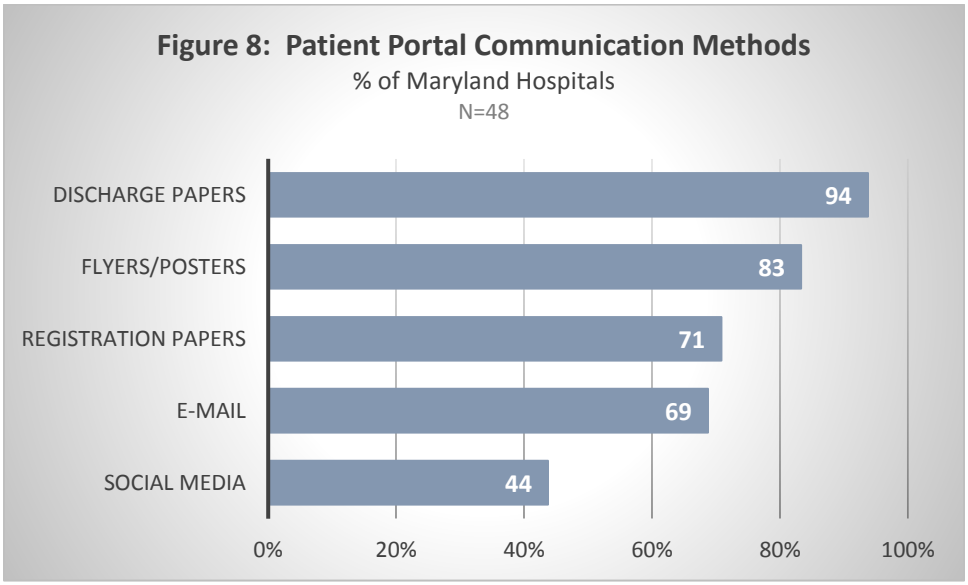
Patient Portals

Emerging care delivery models require hospitals to find new ways to engage patients, families, and caregivers. MU provided the framework for empowering patients to become more active participants in their care using technology. A patient portal is a secure website that provides consumers with access to their health care information (e.g., discharge summaries, medications, test results, etc.) and offers

[34] American Hospital Association, *Telehealth: Delivering the Right Care, at the Right Place, at the Right Time*, July 2017. Available at: www.aha.org/system/files/content/17/telehealth-case-examples.pdf.
[35] See n. 18, *Supra*.
[36] Sustainability can be viewed as the long-term ability of a hospital to respond to external pressures and adapt to external constraints without detriment to its functioning.
[37] Costs for hospital telehealth programs come from operational budgets and/or grants when payers are not billed.
[38] Singh, Rajendra et al. "Sustainable Rural Telehealth Innovation: A Public Health Case Study." Health Services Research 45.4 (2010): 985–1004. PMC. Web. 26 Feb. 2018.
[39] Healthcare Financial Management Association, *Building a Sustainable Telehealth Program*, October 2015. Available at: www.hfma.org/Content.aspx?id=42573.

functionalities such as secure messaging, request prescription refills, view education materials, and pay bills, among other things.[40] Uptake in patient portals has remained less than optimal.[41, 42] A study conducted by the U.S. Government Accountability Office found that of the almost 90 percent of hospitals that have a patient portal, only 15 percent of patients have used that technology to electronically view, download, or transmit their health information.[43] In Maryland, all hospitals have implemented a patient portal and report less than 10 percent of patients use the technology.[44]

Lack of momentum in consumers' use of patient portals is likely attributed to portal overload. Managing different passwords and becoming familiar with navigating portals can negatively impact use particularly when patients seek care from multiple physicians. Other factors that contribute to low adoption include patient socioeconomic demographics and health status.[45] All Maryland hospitals report using several methods to communicate information to patients about their portal. Discharge papers are the primary communication tool used by the majority of hospitals, exceeding flyers by about 10 percent and registration papers and e-mail by more than 20 percent (Figure 8). About 88 percent of hospitals offer a consumer-facing mobile application to access patient portals and 83 percent assist patients with logging in to the portal before discharge. The two most common portal functionalities offered by all hospitals, which align with MU criteria are: access visit summary and check test results.[46]



[40] While MU does not specify the means by which hospitals are to provide patients with electronic access to their health information, patient portals are most commonly used to achieve this measure.
[41] Computer Task Group, *Patient Portals: If You Build It, Will They Come?* Available at: www.ctg.com/white-paper/patient-portals-if-you-build-it-will-they-come.
[42] MU Stage 1 required hospitals to provide patients with access to their patient portal. MU Stage 2 changed this by requiring hospitals to report the number of patients who electronically view, download, or transmit their health information. The MU Stage 2 metric was initially set at 10 percent and then later reduced to five percent. A subsequent ruling by CMS required hospitals get at least a single patient to access the portal. MU Stage 3 changed the metric again by requiring 25 percent of patients' access their records online; 35 percent engage in secure messaging with a clinical team; and 15 percent contribute patient-generated data to the portal.
[43] U.S. GAO, *Health Information Technology: HHS Should Assess the Effectiveness of Its Efforts to Enhance Patient Access to and Use of Electronic Health Information*, March 2017. Available at: www.gao.gov/products/GAO-17-305.
[44] Based on hospital submitted MU data for the view, download, and transmit measure.
[45] See n. 44, Supra.
[46] See Appendix A for all patient portal functionalities offered by hospitals.

MU Stage 3 beginning in 2018 (optional in 2017) attempts to increase consumer access to their health information by encouraging use of application programming interfaces (API) as a way to consolidate patient information from multiple providers.[47] This requirement encourages vendors to develop a cloud-based personal health record[48] that allows consumers to obtain from one website their health information from multiple providers involved in their care. Approximately 31 percent of Maryland hospitals have implemented an API; the remaining majority (67 percent) indicated future plans to make available a vendor facing API within the next two years.

Health Information Exchange

Electronic health information is fundamental to fulfilling the promise of health IT to improve quality. Hospitals have become increasingly dependent on HIE to make advances in care delivery and inform population health activities. Over the last decade, the State has made a considerable investment in the Chesapeake Regional Information System for our Patients (CRISP) to establish the infrastructure to support a statewide HIE. The MHCC and the Health Services Cost Review Commission reviewed competing applications and designated CRISP in 2009 to build and maintain the technical infrastructure to support a statewide HIE. In 2011, all hospitals were sending data to CRISP making it the first HIE in the nation to connect all acute care hospitals in a state.[49]

CRISP has continued to expand HIE service offerings beyond query-based exchange to in-context alerts[50] and analytical services. As CRISP services continue to expand to community-based providers, some HIEs that were established by hospitals have ceased to exist. Enabling different systems to send and receive information in the workflow remains a barrier for exchanging health information in general. This can be attributed to variation in the way standards are implemented, and that many EHR vendors have placed an emphasis on increasing market share without equal emphasis on exchange.[51, 52] HIEs are moving in a direction where exchange occurs between EHR solutions and HIEs provide record locater services, provider messaging, and serve as a data repository, among other things.

Cybersecurity

Hospitals continue to expand use of networked technology, which includes Internet-enabled medical devices and electronic databases for clinical, financial, and administrative operations. With greater reliance on electronic systems to improve care delivery comes greater need for hospitals to secure their IT systems, medical devices, and patient data. Hospitals face increasing susceptibility to hacking incidents and data breaches from threats that can originate from e-mails, cloud sharing, and portable mobile devices. To address these vulnerabilities, hospitals are investing more in cybersecurity and risk

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[47] An API is a set of routines, protocols, and tools for building software applications to specify how software should interact. For more information, visit: www.webopedia.com/TERM/A/API.html.

[48] A personal health record is an electronic application used by patients to maintain and manage their health information in a private, secure, and confidential environment. For more information, visit: www.healthit.gov/providers-professionals/faqs/what-personal-health-record.

[49] Healthcare IT News, *Maryland Lauded by State Officials*, March 2013. Available at: www.healthcareitnews.com/news/maryland-hie-lauded-state-officials.

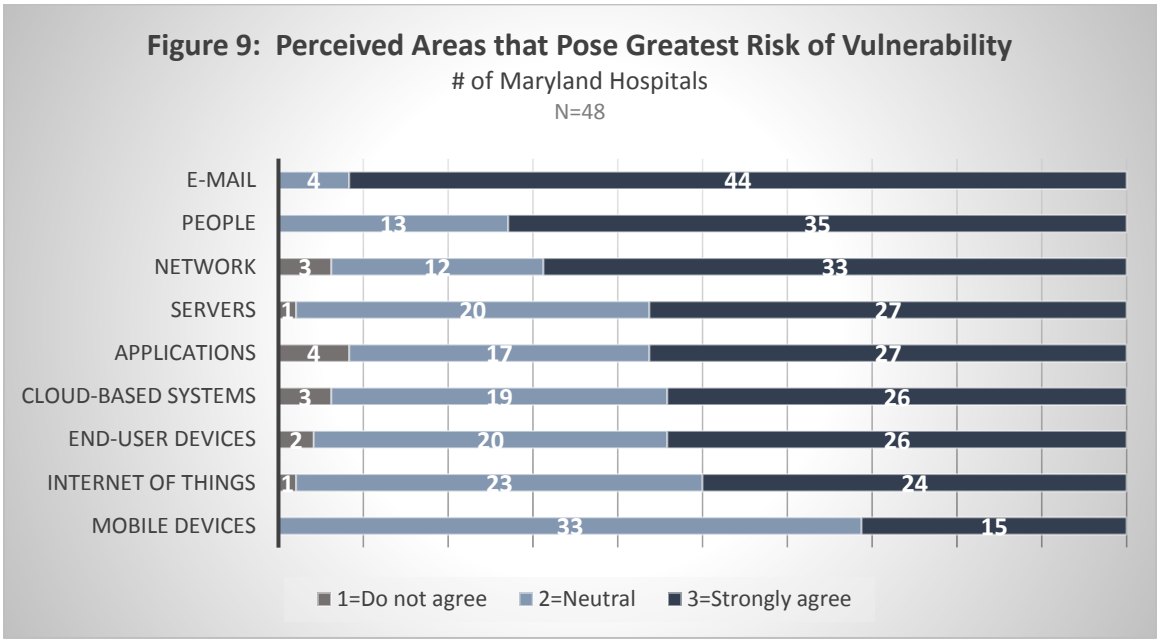
[50] An in-context alert delivers high-level, key information about a patient to support physician decisions. Hospital EHR systems can receive alerts within their EHR workflow without needing to query CRISP and find the information.

[51] Modern Medicine Network, *The disconnect between EHRs and health information exchange*, August 2012. Available at: medicaleconomics.modernmedicine.com/medical-economics/news/modernmedicine/modern-medicine-feature-articles/disconnect-between-ehrs-and-h?page=full.

[52] Outdated or incompatible transmission standards for the exchange of health care data in addition to hundreds of EHR vendors resulting in resource intensive efforts to enable connectivity.

management making it a part of their existing governance, risk management, and business continuity framework.

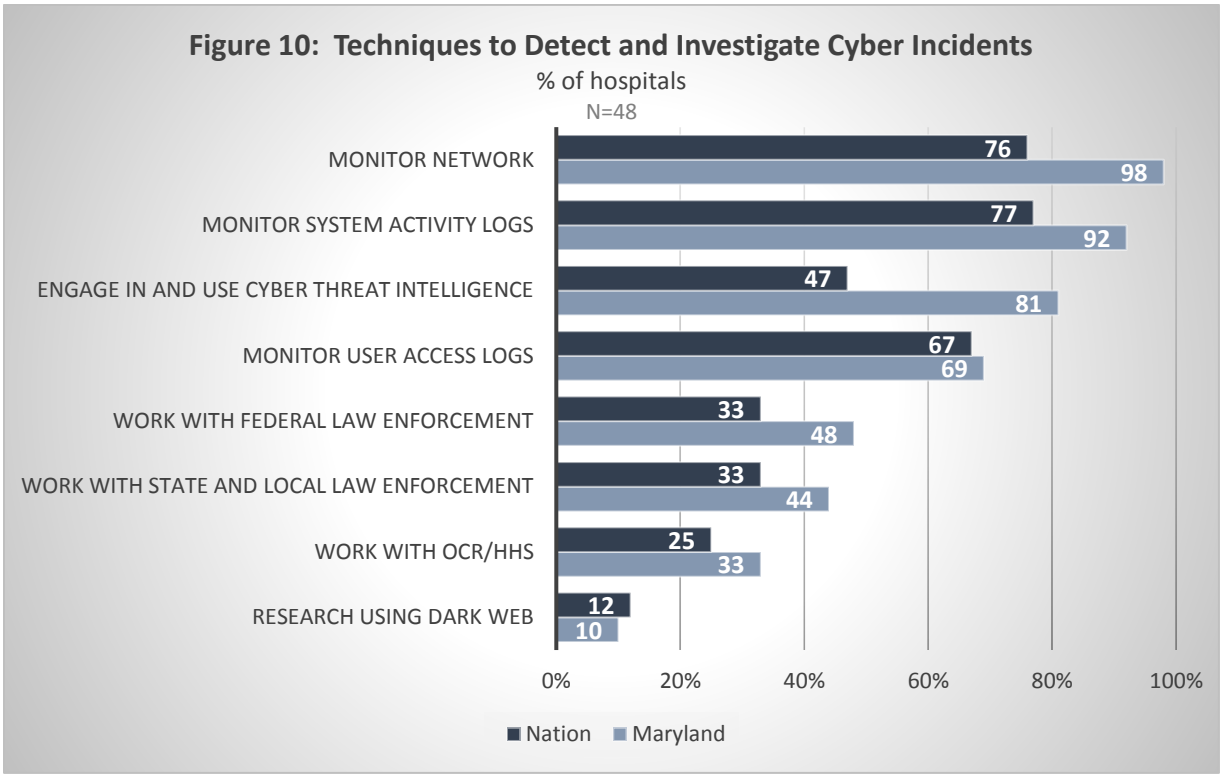
Hospitals largely agree that e-mail and people using technology increase their vulnerability most. Hospitals nationally identify e-mail as a high vulnerability.[53] This can be attributed to increased threats from phishing scams that attempt to exploit vulnerabilities of system end-users. It is estimated that 91 percent of cyber-attacks begin with a successful phish.[54] Other areas of IT, such as networks, servers, and applications are viewed by hospitals as slightly less vulnerable. Perceived risk of mobile devices ranks lower among hospitals locally when compared to the nation where mobile devices are reported as the second greatest vulnerability after e-mail (Figure 9).[55] Mobile devices have the potential to help hospitals communicate more efficiently than traditional call systems. Inadequate password protection, lack of cybersecurity software, unsecure text messaging, and reliance on public Wi-Fi and cellular networks make hospitals more vulnerable.[56]

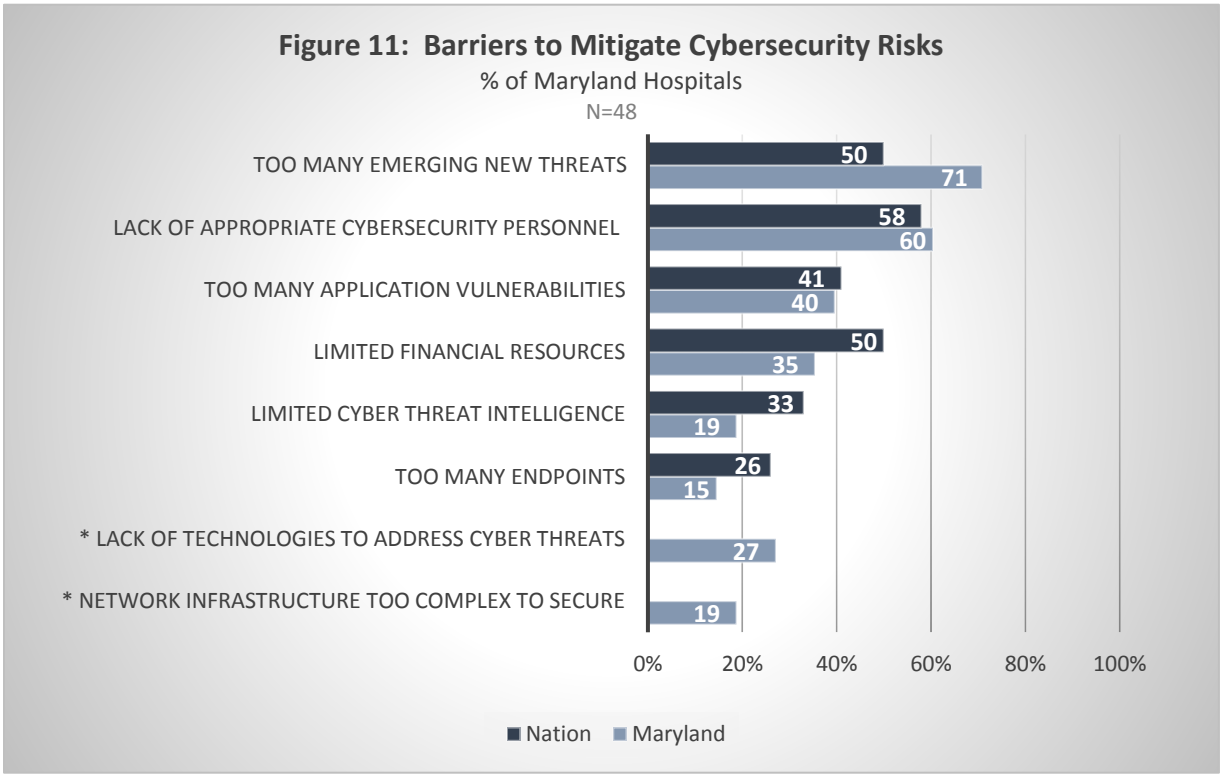


Hospitals deploy a variety of techniques to detect and investigate cyber incidents. The large majority of hospitals monitor networks and system activity logs, consistent with hospitals nationally.[57] Notably, use of these top two techniques in Maryland exceeds the nation by about 22 and 15 percent respectively. Hospitals locally also leverage cyber threat intelligence almost twofold as compared to hospitals across the nation. Use of other techniques is limited, which may be attributed, in part, to resources, such as access to trained personnel (Figure 10).[58] Hospitals in Maryland and the nation report a lack of cybersecurity personnel as a top barrier in mitigating cybersecurity risks. The proliferation of emerging threats ranks foremost in Maryland and second in the nation (Figure 11). This coupled with new medical

[53] HIMSS, *Cybersecurity Survey*, 2016. Available at: www.himss.org/sites/himssorg/files/2016-cybersecurity-report.pdf.
[54] HIPAA Journal, *Phishing Emails Used in 91% of Cyberattacks*, December 2016. Available at: www.hipaajournal.com/phishing-emails-used-in-91pc-of-cyberattacks-8610/.
[55] See n. 54, Supra.
[56] Medical Device and Diagnostic Industry, *For Hospitals, Mobile Devices Are a Blessing and a Curse*, August 2016. Available at: www.mddionline.com/hospitals-mobile-devices-are-blessing-and-curse.
[57] See n. 54, Supra.
[58] See n. 54, Supra.

devices that may run on legacy IT systems increases the magnitude of security vulnerabilities for hospitals.





Notes: National data unavailable for barriers with an asterisk (*). National data from HIMSS 2016 Cybersecurity Survey.

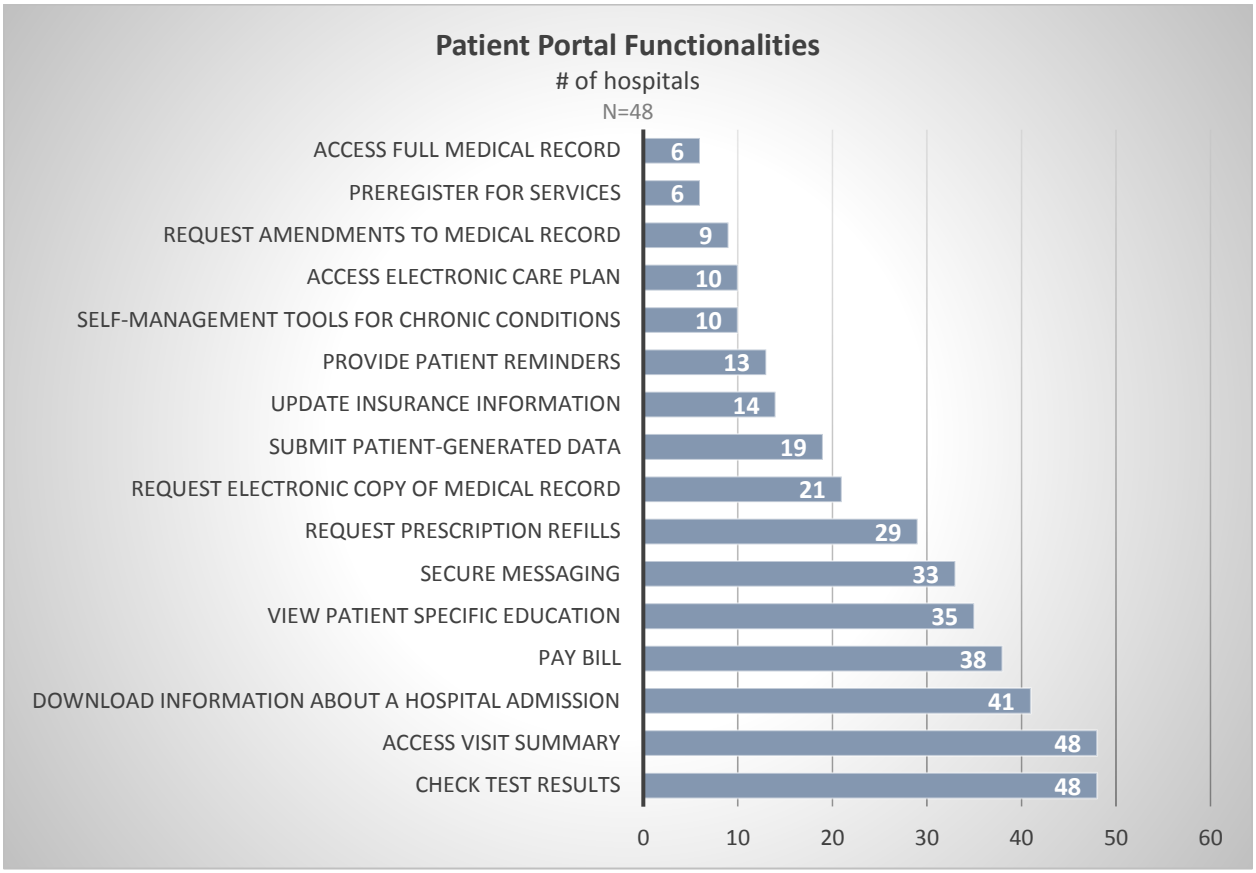
Conclusion

Maryland hospitals continue to make noteworthy progress with their implementation and use of health IT. A robust health IT infrastructure is essential to achieve the goals established by the Centers for Medicare & Medicaid Services under the All-Payer Model. Health IT is a key enabler to predictive analytics, which is growing in importance and will have significant impact on the way hospitals deliver care. Forecasting will position hospitals to benefit from cost containment and support care transformation. Over the next year, hospitals need to continue optimizing use of patient data to keep pace with a rapidly changing environment in care delivery.

Acknowledgements

The Maryland Health Care Commission thanks Maryland hospital Chief Information Officers and Chief Information Security Officers for their contributions to this report.

Appendix A


Patient Portal Functionalities
# of hospitals
N=48
ACCESS FULL MEDICAL RECORD
6
PREREGISTER FOR SERVICES
6
REQUEST AMENDMENTS TO MEDICAL RECORD
9
ACCESS ELECTRONIC CARE PLAN
10
SELF-MANAGEMENT TOOLS FOR CHRONIC CONDITIONS
10
PROVIDE PATIENT REMINDERS
13
UPDATE INSURANCE INFORMATION
14
SUBMIT PATIENT-GENERATED DATA
19
REQUEST ELECTRONIC COPY OF MEDICAL RECORD
21
REQUEST PRESCRIPTION REFILLS
29
SECURE MESSAGING
33
VIEW PATIENT SPECIFIC EDUCATION
35
PAY BILL
38
DOWNLOAD INFORMATION ABOUT A HOSPITAL ADMISSION
41
ACCESS VISIT SUMMARY
48
CHECK TEST RESULTS
48
0
10
20
30
40
50
60

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