Impact of the Electronic Health Record on Health Care Institutions

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Abstract

The Electronic Health Record (EHR) is a digitalized longitudinal collection data that will allow health care providers to share data across different organizations and improve quality care. Currently, the implementation of the EHR is obligatory and has been promoted through different rulings, policies, and economic stimulus. This article discusses the impact of the implementation of EHR on health care institutions on regulations/policies, doctor-patient relationship and infrastructure. Furthermore, it evaluates how vendors, policy makers, and other organizations have been equally impacted by the implementation of the EHR; and, the interactions between them and the stakeholders. In summary, this article portraits the complexity, benefits, and areas of opportunity that arises from the development and implementation of EHR systems in health care institutions.

Keywords: electronic health record, health care systems

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# Background

The Electronic Health Record (EHR) is a digitalized longitudinal collection of data generated over time and represents the clinical history of a patient, as well as, other interactions of the patient with a health providers and institutions. The EHR contains the demographics, progress notes, problems, medications, vital signs, among other data relevant to the patient care. The Institute of Medicine (IOM) has defined eight essential components for the EHR: (1) health information and data, (2) results management, (3) order entry management, (4) decision support, (5) electronic communication and connectivity, (6) patient support, (7) administrative processes, and (8) reporting and population health management. (Barey, Mastrian, & McGonigle, 2018) These eight components delineate the difference between EHR and EMR. Strictly speaking, the EMR is an electronic collection of data related to the patient medical history, whereas, the EHR is a system integrated by the eight essential components with the purpose of improving health care quality. (Garret & Seidman, 2011)

The mentioned eight elements align with the key objective of the EHR, which is according to the Department of Health & Human Services (2018), that:

… health information can be created and managed by authorized providers in digital format capable of being shared with other providers across more than one health care organization.

The former supports the notion that the electronic health record will constantly be managed and updated by health care professionals, health care institutions and, in times, by patients. Moreover, we can say that the main paradigm of the EHR can be stated as the design and implementation of a multidisciplinary, cross-institutional, national, and institution model for storing data that is readily accessible and can improve the health care quality of an individual and populations. (Gunter & Terry, 2005)

In the United States, different administrations have been promoting the adoption and “meaningful use” of the EHR. (Hoffman, 2010) As it was stated by Bush, the digitalization of health data will render as a benefit less medical errors, cost reduction and improvement in health care. (Barey, Mastrian, & McGonigle, 2018) Therefore, different administrations have created different economic stimuli for the adoption and “meaningful use” of the EHR. (Hoffman, 2010) One of this economic stimulus was created as a result of the American Recover and Reinvestment Act of 2009, this stimulus authorized incentive payments to eligible professionals, hospitals, and other organizations that attested the adoption and “meaningful use” of the EHR. (Centers for Medicare & Medicaid Services, 2015)

This “meaningful use” of the EHR can be defined as a set of requirements outlined by ARRA that are organized into 3 incremental stages of implementation. (McGonigle, Garver-Mastrian, & Hammel-Jones, 2018) The first two stages of the “meaningful use” have both required and optional EHR functionalities that are relevant to capturing data, reporting quality measurement, and information exchange. All of these functionalities have an impact on individual and public health. The third stage builds on its predecessors and features support for the improvement of quality care by promoting patient exchange data ownership and improvement of population health. (Ambinder, 2005) (Griskewicz, 2015)

The technical part that arose from the implementation of EHR systems was taken over by the Health Information Technology for Economic and Clinical Health (HITECH) Act. This act addresses the development, adoption, and implementation of policies and regulations for transmission, exchange and storage of data. (Adler-Milstein & RS, 2013) Furthermore, the HITECH Act addresses the concerns that have risen around the privacy and security of transmission of health information over electronic means by strengthening the enforcement civil and criminal provisions by the Health Insurance Portability and Accountability Act(HIPAA). (Office for Civil Rights, 2017) (Office for Civil Rights, 2013)

The different stages of the “meaningful use” provide the proper foundation for the capturing and exchange of health care data of individuals on EHR systems. The EHR will act as a centralized repository of data that will keep track of the patient along his/her medical history. The health care data may be accessed, modified, and enriched by other information systems. At the end, the EHR system will provide the health care provider with a powerful decision-making tool. The main objective of this tool is to lower the incidence of medical errors and increase the health care quality. On the epidemiology side, the availability of a vast repository of data can assist in the development of machine learning algorithms intended for improvement of general population. Therefore, it is very important to understand the impact of the implementation of EHR on healthcare systems, in order to, highlight the areas of opportunity and strengthen the areas that are beneficial to them.

# Literature Review

The implementation of an EHR can impact different areas of the health care systems and can be disruptive to the health care work flow. These areas can be grouped in the following categories: regulations/policies, doctor-patient relationship and infrastructure.

## **Regulations/Polices**

The legal scope of the implementation of the EHR systems can be related to policies, rulings and incentives that have been created in order to regulate and promote the implementation and use of EHR systems. The literature demonstrates that, incentives for health care institutions who are demonstrating attestation of “meaningful use” have promoted the adoption of EHR systems for healthcare providers and hospitals. (Ambinder, 2005) As a means to promote the adoption of EHR, the Centers of Medicare & Medicaid Services (2018) has extended the deadline for Stage 2 and Stage 3 due to the difficulty expressed by health care providers to attest the requirement for this stages.

Additionally, taking in account the issues reported by health care providers and vendors, this organization has modified the criteria in order to simplify the process of attestation. Nonetheless, even with these actions taken in place, the adoption of Stage 2 has been slower than with Stage 1. (Gold & McLaughlin, 2016) The adoption of Stage 3 is still on its early process, some early adopters had begun reporting from 2017. Nevertheless, 2018 is the year on which all health care institutions will have to proof attestation for Stage 3, therefore, there is small data on the adoption of this stage.

## **Doctor Patient Relationship**

The implementation of an EHR can be disruptive to the health care work flow. In specific, the doctor-patient relationship is one of the areas of biggest concern. Some health care providers and patients had expressed their fear of a decrease on face-to-face time as a result of having to interact with the EHR system. (Sines & Griffin, 2017) Adding to the former, the time spent on implementation on EHR systems can have a negative effect on the health care institutions due to the reduction in the flow of patients. Furthermore, in small practices, the disruption that brings the implementation of EHR systems into their workflows can be detrimental to productivity. (Degen, Li, & Angerer, 2015) On the contrary, big practices that implement EHR have reported an increase of productivity and health care quality, as a consequence of, the correct delegation of activities. (Adler-Milstein & RS, 2013)

There has been some resistance emerging from health care providers to the adoption of the EHR systems. This resistance has been linked to lack of economical, logistics and technical readiness of physicians to adopt them. Furthermore, physicians fear that their lack of computer skills may have an impact on the time of adoption and use of the EHR systems. Even more, some physicians have even expressed that they may retire early or join larger organizations in order to avoid legal and financial problems. (Ajami & Bagheri-Tadi, 2013)

## **Infrastructure**

Part of the infrastructure pertaining to the EHR relies on the data interoperability. The data interoperability, which can be described as the capability of interpreting data through different platforms with the same results, has been point to the EHR. On this area, health care systems can be noticeably benefited by the increased delivery of guideline-based care; inter operational accessibility; accuracy on patient documentation; patient surveillance and monitoring; and, reduced medication errors. (Alvandi, 2015) As a result of this, there is an increase in quality care, patient satisfaction, shortened hospitalizations, and less readmissions. (Hessels, Flynn, Cimiotti, Bakken, & Gershon, 2015)

The simplification and delegation repetitive tasks are some of the objectives of EHR system. For this purpose, there are a number of EHR systems that allow the health care provider to copy-paste information from one patient to another patient. In addition, the EHR systems allow the use of template to fill out the information as a means of task simplification. As it was stated by Bowman (2013), data being copy-pasted from one patient into another enhances the loss of traceability of information. This author also discusses how the use of templates affects the quality of the data provided by the health care providers. Furthermore, the author talks about how data discrepancies may arise from the interchangeable employment of structured and unstructured data within EHR systems. This disjointed form of introducing data can have as a result data being lost, and, incorrectly entered, displayed or transmitted. Moreover, these errors can provoke the accumulation of great amount useless data that can result in medical errors.

# Discussion

Some articles have shown that the implementation of the EHR systems have increased quality care, patient satisfaction, shortened hospitalizations, and less readmissions. (Hessels, Flynn, Cimiotti, Bakken, & Gershon, 2015) On the contrary, Bowman (2013) have found that these EHR systems have failed to show benefits due to the shortcomings on their implementation. The author discusses that the hazards are mostly related to the loss of information integrity. Furthermore, these errors can have a great impact on patient safety resulting in fraud and even iatrogenesis. All of these errors can be related with the lack of understanding of the vendor in relation to the health care use cases and the poor system usability of EHR systems. (Bowman, 2013)

Likewise, it has been shown that the exchange of data still represents a major challenge due to the EHR systems limitations to exchange data, high subscription rates for data exchange and lack of harmonization. (Gold & McLaughlin, 2016) Adding to the challenge in exchanging data, the vendor lack of knowledge of the business rules of the health care systems and lack of anticipation for Stage 3 has increased the reluctance to adopt EHR systems. It has been argued that the design and development of EHR systems require a more comprehensive involvement from the vendors and stakeholders. (Ratwani, Faibanks, Hettinger, & Benda, 2015)

Moreover, there are still a number of unresolved issues around how to implement the data exchange of health care information. Some of these issues are related to patient ownership of information; the standard for data exchange; and, security and privacy concerns. (Gunter & Terry, 2005) There are still many technical difficulties to overcome, mostly arising from the complexity of harmonizing data over different types of practices and the difficulty on the implementation of the EHR into a clinical setting.

The creation of a number of monetary stimulus and the modification of the requirements for Stage 1 and 2 had improved the speed of adoption. Nonetheless, health care institutions are still facing some problems for successfully going through the attestation process of the “meaningful use”. (Adler-Milstein & RS, 2013) As a result, the Centers of Medicare & Medicaid Services has made modifications to requirements and has extended the deadline for “meaningful use” attestation process. (Centers for Medicare & Medicaid Services, 2015) The changes on the requirements and deadlines are indicators that this process requires the constant collaboration of health care providers, organizations, and stakeholders in order to have more suitable requirements and a more realistic timeline.

Currently, it is difficult to review the impact of the EHR systems on the Health Care systems due to the disparity of adoption and the lack of data exchange. The lack of a broader implementation of Stage 2 and 3 prevent us from making an assessment of the key feature of the EHR. It is important to make more research on the prevalence of risks on the implementation of EHR systems and associated impact that is related to loss of data integrity, patient safety and quality of care. (Bowman, 2013)

# Conclusion

The Electronic Health Record (EHR) is a digitalized collection of data generated with the main purpose of exchanging data and improving quality care. The improvement of health care has been the triggering cause for a number of rulings and policies, such as HIPAA. As a result, different administrations have been promoting a number of economic stimulus with the main purpose of reaching the “meaningful use” status of the EHR for all health care systems.

Nevertheless, this implementation has faced a number of challenges that include regulations/policies, doctor-patient relationship and infrastructure challenges. As a result, there has been modification to the requirements and timelines for “meaningful use” attestation. The modification in the requirements had helped to increase the speed to adopt and implement the EHR, except, that some small practices and clinical specialties still face the challenge to adapt the EHR to their specialized workflow scenarios. (Friedman, & others, 2013)

Due to the slow adoption of the EHR and the lack of interoperability, health care systems have been struggling to reach the *advanced clinical processes and health information exchange* which is merely the second stage of the “meaningful use” definition. In other words, the key feature of interoperability between different health care systems has not been achieved yet.

There had been numerous reports demonstrating that EHR has already incremented the quality of care. (Jarvis, & others, 2013) (Shekelle, Morton, & Keeler, 2006) Even more, some health care systems have found an improvement on their workflows thanks to the adoption of the EHR. We can say that at institution level EHR systems have had a positive impact but on the population level the impact is not known due to the lack of data interoperability. On the other hand, there is still need to review the impact of the risks and associated issues that the implementation and use of the EHR brings to the health care systems.

In summary, we are still not certain on how the EHR will finally impact health care at individual, health institutions and population levels due to the fact that health care systems have not even reached the Stage 2 “meaningful use” status. Even more, there is need to research more systematically the impact on the rise of iatrogenic events that are related to the use of EHR systems.

# References

Adler-Milstein, J., & RS, H. (2013, November 25). The Impact of Electronic Health Record Use on Physician Productivity. *Am J Managed Car*. Retrieved from <http://www.ajmc.com/journals/issue/2013/2013-11-vol19-sp/the-impact-of-electronic-health-record-use-on-physician-productivity?p=3>

This article talks about the efforts involved during the adoption of the EHR and the requirements needed to meet stage 2 of “meaningful use” criteria. It makes an analysis of the impact of the EHR adoption in big and small practices, and, gives a review on the progress and challenges that EHR adoption inputs on them. Furthermore, it discusses the areas for opportunity for the EHR systems, vendors, and health care systems. The authors give a comprehensive view on how the implementation of the EHR systems had been transforming the health care systems and acknowledge the issues reported by them.

Ajami, S., & Bagheri-Tadi, T. (2013). Barriers for Adopting Electronic Health Records (EHRs) by Physicians. *Acta Informatica Medica, 21*(1), 129–134. doi:10.5455/aim.2013.21.129-134

This article reviews the barriers into the adoption of the Electronic Health Records. Furthermore, it discusses that, even though there are some substantial benefits of adoption an EHR system, there are still resistance from health care providers to adopt these systems. This review assists to have a broader look into the impact of the EHR systems.

Alvandi, M. (2015). Optimizing the Effect of Eletronic Health Records for Healthcare Professionals and Consumers. *Am J Accountable Care*. Retrieved from <http://www.ajmc.com/journals/ajac/2015/2015-vol3-n3/optimizing-the-effect-of-electronic-health-records-for-healthcare-professionals-and-consumers>

The author talks about the benefits of data exchange and how the inter operational approach will benefit the health care delivery quality. He discusses how data exchange has supplied the necessary bases for guideline-based care and how this promotes a better patient surveillance, monitoring, better health care delivery, and reducing medication errors. This article relates the advantages that the implementation of the EHR bring to the health care systems which help us understand one of the many positive ways on which the EHR is transforming the health care systems.

Ambinder, E. (2005, Jul). Electronic Health Records. *J Oncol Pract, 1*(2), 57-63. doi:10.1200/jop.2005.1.2.57

This article helps to provide the basic features and elements that define an Electronic Health Record. Even more, this article gives detail on the different stages of the “meaningful use” criteria and the requirements that are included on these stages. This article assists to understand the complexity in the implementation of the EHR systems.

Barey, E., Mastrian, K., & McGonigle, D. (2018). The Electronic Health Record and Clinical Informatics. In D. McGonigle, & K. Mastrian, *Nursing Informatics and the Foundation of Knowledge* (pp. 267-287). Burlington: Jones & Bartlett.

These authors discuss the different elements that compose the EHR. The elements described as being included on the EHR are the key elements that determines the difference between this system and the Electronic Medical History. Moreover, these components represent the groundwork of the main goal mentioned by the U. S. Department of Health & Human Services on HIPAA act and, further on, are reinforced by the “meaningful use” requirements. It is relevant for this article to provide a clear picture of what the elements encompass the EHR consequently we can establish the elements that play a role on the EHR implementation.

Bowman, S. (2013, Fall). Impact of Electronic Health Record Systems on Information Integrity: Quality and Safety Implications. *Perspect Health Inf Manag, 10*(Fall), 1c.

This article reviews how the Electronic Health Record Systems has changed the way on which health care providers interact with data. Furthermore, it reviews the shortcomings of EHR systems, the increase of iatrogenic related issues and the problems related to data misuse. The article helps us understand the risks associated with data inconsistencies and how information systems are affected by them.

Centers for Medicare & Medicaid Services. (2015, October 16). *Medicare and Medicaid Programs; Electronic Health Record Incentive Program-State 3 and Modifications to Meaningful Use in 2015 Through 2017.* Retrieved from Federal Register: <https://www.federalregister.gov/documents/2015/10/16/2015-25595/medicare-and-medicaid-programs-electronic-health-record-incentive-program-stage-3-and-modifications#p-146>

Final Rule published by the Center for Medicare & Medicaid Services. This document is the main source of information for the understanding the legal implications of the implementation and adoption of EHR systems. The comments on this final rule provides a view on how the regulations has been adapted and changed in order to help organizations to comply with it.

Degen, C., Li, J., & Angerer, P. (2015). Physicians intention to leave direct patient care: an integrative review. *Hum Resour Health, 13*, 74. doi:http://doi.org/10.1186/s12960-015-0068-5

These authors address the many challenges that arises from adopting the EHR systems on small practices. Additionally, they cover in detail the impact related to the disruption of the clinical workflow. Likewise, they cover the issues that can give rise to the resistance of physicians to adopt the EHR systems. This article gives us a good view of how all type of health care systems are affected by the adoption of the EHR systems, besides, it helps us understand the impact of the implementation on all levels of the EHR systems.

Friedman, A., Crosson, J. C., Howard, J., Clark, E. C., Pellerano, M., Karsh, B., . . . Cohen, D. J. (2013). A Typology of Electronic Health Record Workarounds in Small-to-Medium Size Primary Care Practices. *J Am Med Inform Assoc, 21*(e1), e78-e83. doi:http://doi.org/10.1136/amiajnl-2013-001686

This article reviews how the implementation of the EHR systems has affected small practices. The way on which, some of them, had modified them in order to customize the EHR systems functionality to their needs. This article provides a view from the standpoint of the small practices which help us understand better the impact of the EHR systems.

Garret, P., & Seidman, J. (2011, January 4). *EMR vs EHR - What is the Difference'*. Retrieved from HealthITBuzz: <https://www.healthit.gov/buzz-blog/electronic-health-and-medical-records/emr-vs-ehr-difference/>

These authors discuss the difference between Electronic Health Record (EHR) and Electronic Medical Record (EMR). Furthermore, it discusses how some people may use the two terms interchangeably without having an idea on the many differences that these two systems possess. It is important to know and have clarity on the contrast among these two terms since the use of them has caused confusion.

Gold, M., & McLaughlin, C. (2016). Assessing HITECH Implementation and Lessons: 5 Years Later. *Milbank Q, 94*(3), 654-687. doi:10.1111/1468-0009.12214

These two authors review and discuss in detail how the health care systems had approached the adoption of EHR systems to attest the requirements for criteria of stage 1 and stage 2. The authors make a contrast between the speed of adoption for stage 1 and stage 2 criteria. At last, the conclude that stage 2 is presenting a slow velocity in adoption than with stage 1; and, they detail how deadlines had been adapted in response to this. The review of the velocity of adoption on different stages of “meaningful use” provide the time frame that is relevant to determine whether there is a greater challenge for the adoption of the EHR in correlation of the requirements for attestation.

Griskewicz, M. (2015, February 10). *Overview of Meaningful Use Requirements - HIMSS.* Retrieved from HIMSS: <https://www.himss.org/sites/himssorg/files/FileDownloads/KS%20HIMSS%20MU%20Presentation%20Griskewicz%20Mat%20Kendall.pdf>

This document gives a summarized view of the requirements needed for attestation of “meaningful use” for Stage 1, 2 and 3. This document helps to demonstrate the complexities in the attestation of the “meaningful use” and how the process has changed.

Gunter, T., & Terry, N. (2005, Jan-Mar). The Emergence of National Electronic Health Record Architectures in the United States and Australia: Models, Costs, and Questions. *J Med Internet Res, 7*(1), e3. doi:10.2196/jmir.7.1.e3

The authors give an overview of how the implementation of the EHR needs to have a design approach that allows the exchange of data. Correspondingly, they discuss the challenges that arises from data exchange. Conversely, they give an overview of the remaining challenges that arises from data exchange in health care systems. The former gives light of one the challenges that arises with the implementation of the EHR.

Hessels, A., Flynn, L., Cimiotti, J. P., Bakken, S., & Gershon, R. (2015). Impact of Heath Information Technology on the Quality of Patient Care. *Online J Nurs Inform, 19*. Retrieved from <http://www.himss.org/impact–heath–information–technology–quality–patient–care>

The authors discuss how the data exchange that comes during the use of EHR systems are benefiting different areas of the Health Care Systems. They discuss how the nursing environments are positively affected by the implementation EHR systems and data exchange. Likewise, they point out the areas on which the integration of EHR systems will benefit Health care systems. The article supports the positive outcome of the implementation of the EHR systems, besides providing the positive scope.

Hoffman, S. (2010). *Employing E-Health: The Impact of Electronic Health Records on the Workplace.* Retrieved from <http://scholarlycommons.law.case.edu/faculty_publications/10>

The author describes the impact of the implementation of the EHR systems in relation to the working environment. It discusses the background and history of the different policies and economic stimulus that had arisen from the promotion of the implementation of the EHR. It is crucial to know the legal background of the implementation of the EHR systems considering how this determines the complications or transparency arising from the legal scope of the EHR systems and related policies.

Jarvis, B., Johnson, T., Butler, P., O'Shaughnessy, K., Fullam, L., & Gupta, R. (2013). Assessing the Impact of Electronic Health Records as an Enabler of Hospital Quality and Patient Satisfaction. *Acad Med*, 88;1471-7. doi:10.1097/ACM.0b013e3182a36cab .

This article portrays the benefits of implementing EHR systems on health care facilities. Furthermore, it discusses how EHR systems promotes health care quality and improve health outcomes.

McGonigle, D., Garver-Mastrian, K., & Hammel-Jones, D. (2018). Workflow and Beyond Meaningful Use. In D. McGonigle, & K. Garver-Mastrian, *Nursing Informatics and the Foundation of Knowledge* (pp. 245-248). Burlington: Jones & Bartlett Learning.

The authors discuss the concept of “meaningful use” of the EHR systems, which comprises a number of requirements that are outlined by different laws and regulations. The description of the “meaningful use” stages facilitates the understanding of the complexities in relation to the implementation of the requirement for different stages. Withal, it assists in the understanding of the causes of the complexity that health care systems face in order to meet attestation for these stages.

Office for Civil Rights. (2013, July 26). *Summary of the HIPAA Security Rule*. Retrieved from HHS: <https://www.hhs.gov/hipaa/for-professionals/security/laws-regulations/index.html>

The office of civil rights outlines the laws and regulations that are involved in the implementation of EHR systems. On this summary, provides the relevant context of the rules that are outlining the EHR systems in the US.

Office for Civil Rights. (2017, June 16). *HITECH Act Enforcement Interim Final Rule*. Retrieved from HHS: <https://www.hhs.gov/hipaa/for-professionals/special-topics/hitech-act-enforcement-interim-final-rule/index.html>

The final rule gives details around the data of adoption rate of the EHR by Health Care systems. It further explains how the rulings had been adjusted to accommodate the current need of the Health Care Systems. With this in view, we can have an idea of the shared responsibility necessary to build a policy that meets its objective yet is within reach of their actors.

Ratwani, R., Faibanks, R., Hettinger, A., & Benda, N. (2015). Electronic Health Record Usability: Analysis of the User-Centered Design Processes of Eleven Electronic Health Record Vendors. *J Am Med Infomr Assoc*, 2015;22:1179–82. doi:10.1093/jamia/ocv050.

The authors discuss comprehensively the different types of EHR systems available on the market. They review the systems usability and business rules and point out the different areas of opportunity for them. Besides, they provide a brief set of recommendations for vendors and stakeholders. Part of the problem of implementing the EHR systems is related to the complexity that arises from the user interfaces. Therefore, understanding how physicians view these systems and how effective they are, give us an idea of how challenging it can be for a Health Care System to adopt them.

Shekelle, P., Morton, S., & Keeler, E. (2006, April). Costs and Benefits of Health Information Technology. *Evid Rep Technol Assess, 132*, 1-71.

This article portrays evidence on the costs and benefits that arise from the implementation and use of EHR systems. This assist in the understanding of the beneficial areas of EHR systems.

Sines, C., & Griffin, G. (2017). Potential Effect of the Electronic Health Record on the Small Physician Practice: A Delphy Study. *Perspect Health Inf Manag*, Spring;14(Spring):1f.

The authors review how the implementation of the EHR systems are impacting small practices and detail all of the issues that are related to the maintenance, cost, security, and training. It is essential to know how EHR systems implementation is impacting small practices to have a full scope of the problem.