WHITE PAPER

EHRs: What's Next?

An emids+encore Point of View

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The healthcare industry is in the final throes of a massive electronic health record (EHR) implementation effort. Fueled by the $30 billion paid out under the EHR Incentive Program, commonly known as Meaningful Use (MU), at least 92% of hospitals and 78% of physician offices[1] have implemented an EHR. Increasingly, after high expectations of ease-of-use and improved access to patient information, the level of satisfaction with EHRs post-implementation drops.[2] The reasons for this dissatisfaction are numerous, but predominately stem from the perception that EHRs add to, rather than decrease, the amount of time it takes to care for patients without providing improvements in other areas – such as reporting.[3] [4] Further, decreases in provider productivity may impact both patient satisfaction and physician compensation directly.

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Physicians perceive that EHRs add to, rather than decrease, the amount of time it takes to care for patients without providing improvements in other areas – such as reporting, impacting both patient satisfaction and physician compensation.

Ease-of-use, though important, is not the only major driver of dissatisfaction. Information sharing isn't happening as expected. It's hard and clunky to gain access to the full picture of a patient when part of that picture happens outside of a particular provider's EHR. This issue is particularly vexing in the ambulatory setting where one provider is trying to understand what other providers may have done or what may have occurred in the hospital. Many providers are affiliated with acute care facilities but not necessarily on the same EHR, yet they are responsible for the same patients. Despite standards and certified EHR technology (CEHRT) requirements, data liquidity just isn't happening. In a March 2017 interview, Jonathan Bush, founder and CEO of athenahealth, bemoaned the lack of incentives to drive effective interoperability.[5] It's not just technically hard (which is true); there's no compelling reason for either vendors or health systems to make it easier. Yet, the premise of value-based care relies on longitudinal data about a patient – including self-reported data – to be available seamlessly to all providers involved in that patient's care as well as to the patient.

Another area of EHR dissatisfaction is support for the specific needs of sub-specialties, for state requirements for Medicaid Health Homes, for payer requirements for a particular contract or…it can be a rather lengthy list. While EHR vendors have continued to expand functionality to cover the breadth of healthcare delivery activities, it is impossible for a single platform to meet 100% of the needs of 100% of the users.

So there are "bolt-on" applications – which add additional clunkiness to the overall user experience (including the requirement to log into a completely separate application). While meeting 80% of a user's needs is a good objective for the initial launch of an EHR, over time, these same users expect to have all their activities supported.

Finally, the combination of an explicit set of EHR requirements, as defined by MU and reinforced in the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA), and the growing acceptance of cloud-based technology in healthcare paints a future scenario where new EHRs will be available that cost less to license and maintain, are more streamlined to implement, and offer greater levels of interoperability.[6] In other words, the monolithic EHRs with their roots in 20th century technology may just become the white elephants of healthcare information technology (HIT) in the 21st century, unless steps are taken to address the very real concerns of providers, particularly in the ambulatory space.

So a less than ideal user experience combined with difficult interoperability and somewhat sub-optimized functionality paints an unsettling picture.

EHR disruption may take place through technology such as APIs, the cloud, or open-source EHRs.

This paper explores how disruption in the EHR market might occur and what this means for healthcare providers. Some questions we explore are[7]:

This paper can help you develop a framework to plot the best way forward for your organization. This path can help maximize your current investment while both improving the level of satisfaction among your user community and better positioning your organization for the growing penetration of value-based care.

WHAT EHR DISRUPTION COULD LOOK LIKE

There are three primary technology capabilities likely to cause disruption in the EHR market place (in order of near-term disruptability):

- Application programming interfaces (APIs)
- The cloud
- Open source EHRs

We'll look at each one of these – describe it, opine on how it will likely be used, and suggest how your organization might leverage and benefit from it.

APIs

While new to healthcare, APIs have been an integral enabler of ecommerce and the "app" explosion we all see on our Smart Phones.

> *"In general terms, it [an API] is a set of clearly defined methods of communication between various software components. A good API makes it easier to develop a computer program by providing all the building blocks, which are then put together by the programmer."*[8]

APIs can enable a different end user experience than found in the underlying technology and have the potential to improve physician productivity.

APIs are published by software companies to enable developers to create a "handshake" between applications for data integration and offer a single transaction to the end user, who is "shielded" from the mechanics of the data exchange. They also allow for a different user experience than the underlying technology may provide.

Travel websites such as Kayak and Expedia make use of APIs to bring together information (i.e., integration) from many different reservation systems and present them in a way that enables all of us to compare options and self-book airline, hotel, and other reservations.[9] Instagram relies on APIs such as Facebook Places (for location tagging) and in turn provides APIs so other apps can leverage Instagram (e.g., Worldcam). Uber uses a host of APIs, such as the one for Google Maps to support its on-demand ride share business.[10] These are all examples of how APIs both facilitate data sharing and improve the overall user experience.

This is exactly how APIs are starting to be used in healthcare – to improve the user experience, securely integrate data from disparate systems, and provide new capabilities not currently supplied by the underlying application. Integral to the use of APIs is the Fast Healthcare Interoperability Resources (FHIR) set of standards that describes data elements and formats for web-based API technology. FHIR is designed to provide more granular data-sharing than the document-sharing approach EHRs currently use to exchange patient data.[11]

One example of how an organization is leveraging APIs is a pilot project to replace keyboards and mice with touchscreen entry. This isn't changing the EHR at all but layering on a new user interface to provide a different user experience that has the promise to improve overall user satisfaction. Addressing the concerns and frustrations related to EHR use in ambulatory settings is a significant opportunity for leveraging APIs. No one is suggesting this is a trivial activity, but the prospect of layering on capabilities that meet the needs of physicians is far more palatable and cost effective than re-implementing an EHR.

The web site Programmableweb.com[12] lists 105 different applications that leverage existing EHR APIs. Many of these apps provide the means to search for additional information – such as available psychologists to treat new mothers – that is in the EHR workflow of the clinician. Others provide access to available clinical trials or dictionaries of clinical terminology. The common thread is seamlessly providing additional information to clinicians.

There are concerns regarding security, but a report released in 2016 by the API Task Force, while describing the vulnerabilities and steps to mediate them, determined the benefits outweighed the risks.[13]

Using the cloud for the EHR requires adopting standardization to benefit from less costly implementations, upgrades, and maintenance.

Just as contemporary travel websites completely shield the end user from the underlying complexity of the multiple source reservation systems, the EHRs of today might, in the future, become background transaction systems with an insulating layer of apps that integrate the data needed to care for a patient and provide a superior user experience. And while there are currently an array of "bolt on" applications that providers use to add functionality (e.g., provider look up, insurance verification), APIs are better than a "bolt-on" as they provide a seamless experience.

THE CLOUD

In the March interview previously mentioned[5], Jonathan Bush described why the cloud is where healthcare IT should be headed. He states that internet-enabling HIT supports a more nimble approach to implementation and change as well as interoperability. Two cloud-based applications need only build one data pipe connection to enable interoperability for all clients of both platforms.

Of course, Mr. Bush is the CEO of a vendor that offers a cloud-based solution, but there are examples in other industries where cloud provides a level of standardization and data accessibility and nimbleness in terms of adapting to a changing market.[14] For example, upgrading a cloud-based software platform is a one-time event rather than the instance-by-instance upgrades traditional software requires. Yes, there is the issue of coordinating and planning for the upgrade – but this also gets to the heart of the standardization issue. It is important to keep in mind the architectural difference of applications designed for the web and remote-hosted client server applications. In the former, a single instance of the software supports multiple, segregated customers through a recurring subscription (i.e., structurally one customer cannot access the data of another customer). In the latter, a separate instance is hosted for each customer with varying maintenance options.

Since the introduction of MU and its CEHRT requirements, implementation options for EHRs have been reduced, in large part to support the various MU requirements for how clinicians use the EHR and report on that use. EHR implementations have become much more standardized – but on platforms that were conceived to support the prior market demand for infinite configurability. More contemporary, cloud-based EHRs might offer a standardized platform that complies with all requirements and provides for more streamlined implementations and upgrades. True, there would be less flexibility but the available capabilities would be driven by market demand.

As value-based care continues to put downward pressure on reimbursement, organizations are looking for ways to reduce overall operating costs, and cloud-based EHRs could be part of that solution.

Cloud-based platforms also lower the total cost of ownership for organizations; they enable a smaller IT footprint.[15] While many organizations have shifted to a hosted approach for many if not all their major applications, there is still the need to retain staff to support these applications. While they don't need, for example, a database administrator or other technical skills, they do still need staff to coordinate the management of the application; they still have a team responsible for upgrades and builds. As value-based care continues to put downward pressure on reimbursement, organizations are looking for ways to reduce overall operating costs, and cloud-based EHRs could be part of that solution. In particular, a cloud-based EHR could be well-suited for physician practices, which often do not have the resources to invest in information technology.

In summary, cloud-based EHRs have the potential to be less costly, more interoperable, and easier to implement and support.

OPEN SOURCE

The use of open source software, while prevalent in other industries, has not yet been embraced for mission-critical applications in healthcare. Open source software is defined as:

> *"…software with source code that anyone can inspect, modify, and enhance."* [16]

While anyone who wishes to use open source software must sign a license that describes the terms of use (e.g., all modifications must be shared), that user is free to make modifications. So organizations that have the in-house development capacity could mold an open source EHR to their own needs – without any initial licensing or ongoing maintenance fees. Of course, there is the need to retain staff with the appropriate development skills, and this could prove costly over time, but there is some allure to being completely untethered from the development roadmap of a commercial EHR vendor. Crowd-sourced innovation could promise swifter turnaround on needed enhancements. And, open source options would likely also provide APIs so multiple sets of open source software could be used as foundational building blocks on which an organization could tailor its own solution.

A recent study catalogued over 50 open source EHRs, though at the time only 4 had been certified by the Office of the National Coordinator for Health Information Technology (ONC).[17] As CEHRT is a baseline requirement for hoping to achieve full reimbursement from federal healthcare funded options (e.g., Medicare) current adoption of open source EHRs is low. The VistA EHR[18] is probably the most well-known open source EHR, yet despite high ratings from physicians it has not seen significant traction.

At the very least, open source EHRs may put increasing pressure on the current leading vendors to be more nimble and innovative.

Hadoop is an example of open source technology that has been adopted by vendors such as IBM and Teradata to provide data lake[19] capabilities for structured and unstructured data in their respective analytics stack. This technology is increasingly deployed in healthcare settings. These data lakes certainly accept data from EHRs, but the technology is one step removed from the front-line applications that support patient care.

The promise of lower costs and more nimble innovation is attractive to some users, though, and as the current EHR options from the traditional vendors continue to encounter a growing level of dissatisfaction with clinicians[20], this option may prove increasingly viable. And at the very least it may put increasing pressure on the current leading vendors to be more nimble and innovative.

WHAT THIS COULD MEAN

APIs, the cloud, open source EHRs – given that most organizations already have an EHR in place (and may even be in the midst of implementing a new one) what do these disrupters mean to you? Let's take each of the situations posed at the start of this paper in turn.

Just finished implementing an EHR

There is no rational reason why an organization that has just completed the costly and disruptive process of implementing a new EHR should consider making a change. But, there is the evolving option to employ the APIs your EHR vendor provides to fill some gaps, integrate needed data, and improve the user experience. Over time, as you understand more about where your new EHR may not completely meet the needs of your users, you have the option to meet those needs with commercially available apps or by self-developing them. Some of these apps may even be open source-based. The key will be establishing the appropriate governance and evaluation processes to research recommendations, determine appropriateness, and oversee implementation and adoption.

Current EHR reaching end-of-life

Some organizations are facing a forced decision to change EHRs, as their current product has a sunset date. While an open source or cloud-based EHR might sound enticing, you have a justifiable concern that they aren't yet mature enough to support your complex organization. This is probably the most difficult of the 4 situations, and your response will somewhat rest on your level of risk tolerance. You essentially have 3 options (though, given the conservative nature of healthcare, only the first option will be palatable to most organizations):

Healthcare providers needing to replace their EHR can:

1. Implement from one of the leading vendors

2. Retain your existing EHR, even past the sunset date

3. Select a cloud-based or open source EHR

1. Go through a selection process and implement an EHR from one of the current leading vendors. This essentially puts you in the same category as described above – which means that you will be able to leverage the power of APIs to address future needs. The downside of this approach is the options currently available on the market are costly and time-consuming to implement.
2. Retain your current EHR until a cloud-based or open source EHR is more mature; then change. With this option you, of course, run the risk of operating an unsupported product once you pass the sunset date, and because of increasing regulatory demands that require software changes, this is a daunting option, and not for the faint of heart.
3. Select a cloud-based or open source EHR. This is the riskiest option but there are a few options that you should at least consider; when you weigh your requirements against what is available, you may be surprised. At the very least, consider some of the more mature cloud-based vendor products if you are pursuing the first option above. It can be instructive to compare the benefits and risks of a cloud-based solution to the more traditional choices.

Clinician demand to "keep up with the Joneses"

There are many organizations that have a perfectly serviceable (certified) EHR in place but are facing pressure from their clinicians to implement the EHR that "everyone else has". While there can be a lot of emotion involved in this debate (who wants to be seen by their peers as being behind the times!) there is no return on investment when viewed dispassionately. Despite vendor claims, the functional differences between products is largely "at the margin".

Instead, you have the luxury of time to see how the EHR vendor market evolves with new cloud-based solutions – or even determine if an open source approach is appropriate. Further, you can leverage the APIs supported by your current EHR to address gaps in functionality, improve the user experience, and integrate needed data. You, frankly, are in the best position of all; your EHR investment is in the past and you have been reaping its benefits. At some point in the future, you may want to implement something new – an EHR that isn't even on the market now – or you may continue to layer on capabilities via the APIs until your current EHR is just "in the background", like the green screen reservation systems are for Kayak.

Value-based care, population health management and your EHR

Unfortunately, the EHRs available today were designed prior to the growing demands of value-based care. A recent paper in the Journal of the American Medical Informatics Association outlines how current HIT capabilities are not positioned to support the demands of value-based care.[21] One recommendation from this paper is to improve patient access to clinical data in a manner that "preserves 'computability'". In addition, broader data sets should be accommodated that incorporate patient self-reported data from various fitness devices (e.g., Apple Watch).

Value-based care demands increasingly sophisticated, EHR-agnostic HIT capabilities.

Since value-based care is focused on outcomes rather than process, organizations need data to measure and understand outcomes, provide feedback to clinicians in the course of patient care, and-in general-have better knowledge about the health status of the populations they serve. Yet this should not impose added documentation burdens on providers to obtain this data. Further, care management activities (e.g., patient-centered medical homes) should be tightly coupled to EHRs in a way that is EHR-agnostic. Not every physician a patient sees will be on the same EHR, yet data about the patient needs to be readily accessible to care coordinators. Further, the lines of communication between caregivers and care coordinators should be frictionless and supported by EHRs.

Patient portals are becoming an increasingly important means for patients and providers to stay connected. Yet, if a patient sees more than one physician, the patient might have to access multiple portals - one for each physician's office. Today, patient portals are tightly coupled to the underlying EHRs; it is quite cumbersome and difficult to integrate non-native EHR data into a patient's record. And scheduling and bill payment from one portal across multiple underlying EHRs is virtually impossible. To be effective as a means of engaging patients, the portal offered to patients should be EHR-agnostic. The portal should be able to support scheduling, prescription refill requests, access to results, bill payment, etc., as a single point of contact regardless of how many EHRs might be represented by the various physicians (and hospitals) involved in the patient's care.

These are not easy technical challenges to overcome to better support value-based care. But if we are going to meet the promise of improved outcomes at a decelerating rate of cost, solutions must be found to more fully IT-enable value-based care.

CLOSING

Nothing stays the same. Change is constant. Technology moves fast! EHRs will evolve. Some current vendors will disappear, and new ones will rise. There are clear signals of dissatisfaction by clinicians with the existing EHRs; some of these surveys and articles have been referenced throughout this paper. The administrative demands on physicians is growing and, frankly, exacerbated by EHRs.[22] The Annals of Family Medicine published a 10-year vision for how to redesign IT to better enable care delivery.[23] This is a seismic shift in healthcare since 2009. The opportunity now is to embrace the available options to improve usability, interoperability, and specialized requirements. It doesn't have to involve "rip and replace". Organizations can gracefully evolve their EHR investment to meet the needs of their clinicians and patients as well as the requirements of value-based care.

REFERENCES

1. ONC, Health IT Dashboard, Quick Stats (Captured June 1, 2017)
2. ACP Newsroom, Survey of Physicians Shows Declining Satisfaction with Electronic Health Records (Captured May 9, 2017)
3. Healthcare IT News, We asked people how to fix EHRs, and boy did they have answers, Updated, May 15, 2017
4. Healthcare IT News, Doctors demand extreme EHR makeover ... right now, April 10, 2017
5. HealthcareDIVE, Why Jonathan Bush thinks big vendors like Epic, Cerner will 'collapse', March 4, 2017
6. Cloud Standards Customer Council, Impact of Cloud Computing on Healthcare Version 2.0, February 2017
7. HIT Infrastructure, Top 5 Health IT Infrastructure Trends Heading into 2017, December 22, 2016
8. Wikipedia, Application programming interface (captured April 28, 2017)
9. HIT Infrastructure, Why Application Programming Interfaces are Key For Healthcare (captured on April 26, 2017)
10. Nordic APIs, 4 Apps that Rely on APIs for Survival, January 26, 2017
11. Wikipedia, Fast Healthcare Interoperability Resources (captured May 17, 2017); HL7.org, Introducing HL7 FHIR (captured May 17, 2017)
12. ProgrammableWeb, Category: Healthcare, APIs (captured May 10, 2017)
13. HIT Policy and Standards Committees, Application Programming Interface (API) Task Force Recommendations, May 12, 2016
14. Computer Economics: Research Byte, Cloud Users Enjoy Significant Savings, April 2016; reference to full study: The Economic and Strategic Benefits of Cloud Computing, April 2016
15. HIT Infrastructure, Top 5 Health IT Infrastructure Trends Heading into 2017, December 22, 2016
16. Opensource.com, What is open source? (captured May 10, 2017)
17. JMIR Medical Informatics, The State of Open Source Electronic Health Record Projects: A Software Anthropology Study, February 24, 2017

18. WorldVistA (captured May 17, 2017)

19. "A data lake is a method of storing data within a system or repository, in its natural format,[1] that facilitates the collocation of data in various schemata and structural forms, usually object blobs or files. The idea of data lake is to have a single store of all data in the enterprise ranging from raw data (which implies exact copy of source system data) to transformed data which is used for various tasks including reporting, visualization, analytics and machine learning. The data lake includes structured data from relational databases (rows and columns), semi-structured data (CSV, logs, XML, JSON), unstructured data (emails, documents, PDFs) and even binary data (images, audio, video) thus creating a centralized data store accommodating all forms of data.[2 " Wikipedia, Data lake (captured June 1, 2017)

20. Healthcare IT News, We asked people how to fix EHRs, and boy did they have answers Updated, May 15, 2017

21. Journal of the American Medical Informatics Association, Crossing the health IT chasm: considerations and policy recommendations to overcome current challenges and enable value-based care, April 5, 2017

22. Annals of Internal Medicine, Putting Patients First by Reducing Administrative Tasks in Health Care: A Position Paper of the American College of Physicians, May 2, 2017

23. Annals of Family Medicine, Vision for a Principled Redesign of Health Information Technology, May-June 2017