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Population health management beyond the EHR: Part 2

Contents

Introduction

As population health management (PHM) becomes the new best practice of healthcare, a new information technology infrastructure is needed to facilitate this care delivery model. Within this infrastructure, as explained in Part 1 of this white paper series, electronic health records (EHRs) are necessary but not sufficient, and health information exchanges (HIEs) may soon be irrelevant as new data interchange methods emerge. Interoperability among health IT systems and with other data sources is crucial to PHM, but is still far from being achieved.

Interoperability advocates are promoting the development of the Fast Health Interoperability Resources (FHIR) standard and the use of open application programming interfaces (APIs). But the widespread adoption of FHIR and the simplified implementation of open APIs are likely still years away. Meanwhile, healthcare organizations need a way to integrate their enterprise data and interoperate now to manage population health. They also need a wide range of information on individual patients that is not available from EHRs, including data on claims, social determinants of health, behavioral health, physical environmental factors, and genetic factors.

The Office of the National Coordinator for Health IT (ONC) is already moving toward this new paradigm. In its 2015 interoperability roadmap, ONC envisions a future "where an individual's health information is not limited to what is stored in EHRs, but includes information from many different sources (including technologies that individuals use) and portrays a longitudinal picture of their health, not just episodes of care"[1].

Highlights

- EHRs and HIEs do not provide the infrastructure needed for PHM, and interoperability cannot wait for widespread adoption of FHIR and open APIs

- For PHM, an ideal approach would be a cloud-based platform that enables care collaboration across the enterprise

- Based on the aggregation and normalization of data in a data lake, this platform would include a central registry, a smart care plan, and a communication mechanism located in the care plan module

- Longitudinal, integrated data about the whole person and the psychosocial determinants of their health, coupled with cognitive technologies, provide insights that can scale care management and make it cost-effective

- Physicians would still regard their EHRs as the source of truth for documentation, billing, and legal purposes, but the care collaboration platform would provide a person-centered source of truth for population health and care management

The concept of a longitudinal record, while still in an experimental stage, is gaining wide currency in healthcare. Frequently, it is coupled with the idea of an integrated care plan that all care team members can view and contribute to. Taking that idea a step further, one can envision a "smart care plan" that would draw on all of the relevant data about an individual at any point in time.

This smart care plan could be the linchpin of interoperability if it were housed on a collaborative care platform that held the key data from a variety of sources in a central registry. All care team members would have online access to this registry and the care plan. As the patient's health situation changed and more knowledge was gained about his/her health problems and responses to treatments, the care team would confer and make informed decisions about the patient's ongoing care management.

This type of interoperability is not a stopgap solution to support PHM until FHIR arrives. When FHIR-based apps become a practical way to exchange health information, the care collaboration platform would still be a viable way to coordinate care, and FHIR would expand its functionality.

This paper explains how the right PHM infrastructure can support collaboration among care providers and patients, imagines how cognitive computing could enhance clinical decision support, and demonstrates how data beyond what is captured in clinical records can inform decision making for providers and care teams. This paper also discusses what an ideal platform and a smart care plan might look like.

Care collaboration platform

Because efficient, personalized care requires collaboration across the community, no smart care plan is possible unless the PHM infrastructure includes a centralized cloud platform that facilitates virtual collaboration among patients, healthcare providers, and other professionals. Except for the limited initiatives of a few EHR and HIE vendors, no such platform exists today. But according to Chilmark Research , IT vendors have begun offering their own data aggregation and normalization tools, thereby obviating the need for potential value-add HIE capabilities beyond simple messaging[2].

A care collaboration platform could be based on a data lake to which all care team members contribute. (For details, see Part 1 of this white paper series.) This data lake could produce a central registry linked to analytics and could support a smart care plan. The care plan could also include messaging functionality that would allow all team members to communicate asynchronously with one another. When a change in the care plan is made, for example, all care team members would be alerted and could comment; members could also use the platform to communicate directly with one other.

Here's how the platform might work in the area of referrals. Today, closed-loop referrals between primary care physicians and specialists are the exception rather than the rule. Some EHRs help providers track referrals by alerting them when they have not received a consultant report within a certain period of time. But, although a few HIEs have tried to implement closed-loop referrals, there are no automated, end-to-end systems for electronic referrals and the receipt of specialist notes across organizations using different EHRs.

With primary care doctors and specialists working together on a care collaboration platform, the situation would be very different. When a patient referral is placed, the specialist would see the reason for the referral and be able to pull up the

key data on the patient from the central registry within seconds. After the patient visits the specialist, the consultant's report, recommendations, and treatment plan would be shared with everyone on the care team. They could also see alerts to communicate urgent follow-up information, missed referral appointments, and more. The primary care physician could also download the report to his or her EHR to make it part of the patient's legal medical record.

The central registry would provide an up-to-date record of the relevant clinical data about a patient across the care settings represented by care team members. Among other things, the registry would list the healthcare services that each patient had received, when the services had been provided and by whom, the patient's recent lab values, and when the patient was due for preventive and/or chronic disease care. Those functions are similar to those included in EHR registries and standalone registries connected to EHRs. But on the care collaboration platform, the central registry would include all of the key data from the disparate EHRs, as well as claims data to fill in the gaps where patients visited providers outside of the network. It would also encompass patient-generated health information, including prescreened remote monitoring data.

The data that feeds the registry would include not only structured but also unstructured data, which comprises about 80% of the information in EHRs[3]. That encompasses not only information that was dictated or typed rather than entered into EHR fields, but also procedure notes, discharge summaries, and observations about patients that don't easily fit into discrete data fields. Fortunately, an advanced natural language processing (NLP) application that can contextually "read" the concepts in unstructured text is now available. The accuracy of this type of NLP depends on the data itself, the use case, and the technology available. But concepts extracted from unstructured data would be identified as such in the registry, so that providers could determine its reliability.

Cognitive computing

The advanced NLP engine is the product of a next-generation big data approach known as cognitive computing, which combines massively parallel processing with augmented intelligence. Besides converting unstructured data into structured data, cognitive computing makes it possible to search the medical literature quickly, and find connections and patterns among myriad types of data.

Applications that use cognitive computing are capable of learning, which means they can get smarter over time. And as with big data generally, cognitive computing can absorb and analyze far more data and more different streams of data than any human being could. It is logical then, to make the connection that providers will benefit from a cognitive system's ability to access and analyze volumes of medical literature, as well as real outcomes from similar patients, to make more informed decisions about diagnosis and treatment.

Cognitive computing makes it possible to utilize data on social determinants of health and genetic and environmental factors that have a decisive influence on health. Cognitive computing can also be used to individualize clinical guidelines, so that care plans for each person are more effective. Moreover, cognitive systems can improve their clinical decision support over time. This means the kinds of data they gather and the way they analyze it will progressively create more precise smart care plans that can help lead to better outcomes.

Central registry

With the help of cognitive computing, the central data registry could be expanded to include many elements not typically available through clinical and/or claims data alone.

Part of the additional registry data would come from care managers, home health nurses, and others who make pertinent observations about patients that they might not be able to document in an EHR. For example, they might note that a person lives in a so-called food desert, where healthy food is hard to obtain, or that the person has difficulty getting to appointments, or that an asthmatic patient has mold in the home.

Because social determinants such as these play an important role in health, an increasing number of healthcare organizations engaged in PHM have added social workers, dieticians, and behavioral health specialists to their care teams. In some cases, these professionals are integrated into primary care practices. In other cases, they continue to work in separate organizations.

When a care team is expanded in this manner, all team members should have access to the care collaboration platform and be able to contribute to the care plan. But not every person requires visibility into all of the data in the registry. First, as previously mentioned, sensitive data may be off-limits to some care team members. Second, the data provided to specific care team members should be relevant to their role. The cognitive system that underlies the care collaboration platform could have data governance protocols in place to recognize which data was relevant to certain kinds of professionals, such as physicians, care coordinators, or behavioral specialists.

The central registry would not be a complete medical record. It would be an evolving data matrix that would be presented to care team members to keep them abreast of what was happening with the patient at any point in time. A physician's EHR would contain the data entered by the provider and the care team within the practice, but would not include much of the data in the central registry. Conversely, the central registry would not encompass all of the details from every source that supplied the data lake. Instead of delivering a huge bolus of information that would be unusable, the system would curate the data and present it in a manageable form. Care team members could explore the registry by using a dashboard, and the registry would also serve as the basis for a wide range of PHM analytics.

Efforts to use HIEs for this type of data exchange have foundered, not only because the data is incomplete, but also because the HIE platform is not part of physicians' EHR workflow. When doctors have to leave their EHR to visit a portal that contains data that might or might not be relevant, they tend to ignore that source of information. So providers would have to be able to launch the care collaboration platform directly from their EHRs. While some EHR vendors might not want to cooperate, the emerging FHIR/RestFUL API standards will eventually make it easy to connect the platform with any EHR.

The smart care plan

In Part 1, we explained why a single EHR cannot be the hub of the infrastructure for PHM. Such an infrastructure must be able to ingest not only data from many different clinical systems, but also claims data to fill in the gaps in health services and data on exogenous factors such as the social determinants of health. The volume, variety, and velocity of this data calls for a big data solution capable of analyzing it and turning it into actionable information in near real-time.

One feasible solution is the smart care plan enabled by cognitive computing. Such a care plan would combine the knowledge base of the medical literature and evidence-based guidelines with data-driven insights derived from analyzing a broad range of factors. All of this, of course, would merely form the framework for the smart care plan. The patient's personal physician, with input from the care team, would have to particularize the plan. But cognitive computing would make the initial plan much more holistic than most plans are today.

The traditional approach to care planning is for the physician to examine the patient, have some tests done, reach a diagnosis, and prescribe one or more treatments, often including a drug prescription. In some cases, the doctor advises the patient to make a lifestyle change, perhaps by exercising more or eating healthier foods. The doctor then writes the treatment plan in the record and may give the patient a copy.

The information upon which the doctor bases the treatment plan comes from personal observation, interviewing, lab results, and whatever is in the patient record. The physician also draws on knowledge and experience, and may look up studies or guidelines to draw upon, as well.

A smart care plan goes beyond the traditional treatment plan. In building a smart care plan, some of this process would remain the same. But so much more information is now available or could be discovered that no physician could possibly know it all or be able to find it. Moreover, this is not only medical information. The factors that must be considered in a smart care plan include potential barriers to the patient's adherence to their treatment plan: the patient's behavioral health, socioeconomic status, physical environment, and genetic makeup. That is where cognitive computing can make a big difference, as described above.

Care management

To successfully manage the health of a population, each person's needs must be carefully evaluated and considered. In an ideal situation, all members of the population become engaged in managing their own health. Consider these examples: A healthy person who uses a mobile app with an activity tracker, meal plan, and wellness tips to stay on track; a patient with diabetes who is able to self-manage a care plan through mobile devices; a patient with multiple chronic conditions who, in addition to online tools, interacts regularly with a care team to follow an established care plan. While only high-risk patients normally have care managers, a care management system can be used to track progress against goals, help with workload balancing, and adjust risk as the patient's status changes.

Cognitive computing could improve care management in a number of ways. For example, it can leverage care managers' expertise to identify data patterns across a patient population and improve how care is delivered between visits. It can apply insights gleaned from literature searches to nurses' and care managers' notes, filtering those that contain related concepts to evaluate whether best practices are being followed. And it can use the thousands of data points in the notes to help care managers fine-tune their workflows, so that they're delivering more optimal care.

Specially designed algorithms can be used to assess the personality traits of care managers and patients to match these people together better. Also, by using cognitive capabilities to scan the entire record for data points that may otherwise be hidden, care managers can quickly understand not only what data is there, but also what specific assessments are still needed to further understand the individual patient and enhance that patient's care plan.

All of this comes together in the smart care plan, which includes patients as active members of the care team with their own set of tools for self-management. Through a mobile device, for example, a patient can keep a food diary, communicate with the care team, or update an action plan. If the care plan recommends physical therapy, but transportation is a problem, the care management system can offer insights into transportation options.

Creating the care plan

An effective care plan is set up in collaboration with the individual. Ideally the care plan is the fruit of shared decision making and alignment with the patient's personal goals. This tends to improve the willingness and ability of the patient to achieve the agreed upon clinical goals.

With access to data from all providers who are caring for a patient, as well as the psychosocial factors affecting health outcomes, there is a much broader palette of information available to the care team. Evidence-based guidelines, computer algorithms, and cognitive insights can suggest the optimal care plan based on all of the information the system has available, and then the care manager can complete it based on observations and conversations with the patient.

After the smart care plan has been set in motion, it is not set in stone. It will continue to change over time in response to changes in the patient's condition, data from other providers, and more. For example, changes in the individual's personal situation—such as the new availability of a family member to help with care—are factored in. Everyone on the care team, including the patient, will have the opportunity to suggest changes in the care plan, so that it continues to meet the patient's needs as goals change.

Sources of truth

If care collaboration platforms were to emerge, what would be the role of EHRs? They would still be required for several reasons.

First, EHRs provide the mechanism for documenting encounters, procedures, vital signs, and physical exams. Second, they regulate much of the workflow that clinicians follow in their everyday work. Third, practices use EHRs to justify billing codes. And fourth, the EHR is the basis of the medical-legal record, which is critical for discovery and defense in the event of a malpractice claim.

In that sense, the notes that a doctor signs off on every day constitute the source of truth for that physician. But this is not the only source of truth. For example, staff members must ensure the accuracy and completeness of clinical data for quality reporting. Organizations must also make sure that data is accurate and comprehensive before applying analytics to it. And when providers exchange data with other providers, they may integrate additional data into their EHRs, creating a new source of truth.

Therefore, it is very possible to have two sources of truth operating side by side within an accountable care organization (ACO) or a clinically integrated network. One would consist of the limited patient records within individual EHRs, which practices rely on for workflow, billing, and medical-legal purposes. The other might be the more extensive and reliable record in the central registry and the smart care plan on the collaborative care platform. Providers could use their EHRs as the source of truth for narrow, practice-specific purposes, while the central registry would serve the same purpose for PHM.

Let's think about how this construct might affect the IT infrastructure required for PHM. Today, ACOs apply their analytic and automation software to a patchwork quilt of partial clinical and claims data. In contrast, the care collaboration platform would be built on a data lake that included comprehensive and timely clinical, claims, patient-generated, and other types of data. On top of that platform, individual EHRs would continue to function as they do now, with a few key differences:

– Clinical decision support in the EHR would come from the analytics applied to the central registry
– Health information exchange would occur on the care collaboration platform, rather than through point-to-point exchanges between EHRs or between EHRs and HIEs
– Care planning would occur on the platform, with pertinent information shared in the EHR, as well
– Exogenous data, such as remote monitoring data, would go straight to the data lake and from there to the central registry; it would also be made available to the provider in case anything required immediate action
– PHM functions would use central registry data, rather than the registries in individual EHRs

Data infrastructure

Let's examine how the process might work. Beneath the care collaboration platform is the data lake, where data of all types is stored until needed. This is fed by multiple EHRs, claims data, and a wide range of exogenous sources, including patient-generated data and data related to social determinants of health, genetic factors, and the physical environment.

After being aggregated, normalized, and curated at the patient level, the data goes to the central registry, where it can be used in multiple ways, including:

– Performance management with retrospective, concurrent, and predictive analytics applied to new payment and delivery models
– Risk identification and stratification of populations into cohorts for PHM
– Operational process improvement

Conclusion

While EHRs will continue to serve a critical purpose in the administration of healthcare, a new kind of health IT infrastructure is required for PHM. In the post-EHR world in which we find ourselves today, healthcare organizations are asking for help in leveraging all of their enterprise data together into a PHM platform. That data can then be fed into analytics, performance, and workflow tools designed for this new paradigm in healthcare.

For this platform to support strategic value-based care initiatives, such as care management, it needs to be able to easily ingest new data sources as they become available to the organization. Exogenous data from many other sources that may not be medical in nature, but are related to the business of healthcare, round out the picture of each individual's overall situation.

When the insights of cognitive computing are applied to this broad lake of data, it becomes possible to individualize care with associated social services and other interventions to enable the best overall outcomes.

Notes

[1] Office of the National Coordinator for Health IT, "Connecting Health and Care for the Nation: A Shared Nationwide Interoperability Roadmap," 2015, 45, accessed via https://www.healthit.gov/sites/default/files/nationwide-interoperability-roadmap-draft-version-1.0.pdf

[2] Chilmark Research, "Population Health Management: Aligning IT Solutions to Strategy," April 2015, 10, accessed via http://www.chilmarkresearch.com/2015-population-health-management-insight-report-aligning-it-solutions-to-strategy/

[3] "Why Unstructured Data Holds the Key to Intelligent Healthcare Systems," *HIT Consultant*, accessed via http://hitconsultant.net/2015/03/31/tapping-unstructured-data-healthcares-biggest-hurdle-realized/

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