

5 Key Questions for Physicians On Healthcare Information Technology (HIT)

PointClear recently formed a Physicians Research & Advisory Panel to provide the clinician's perspective regarding the use of information technology in healthcare. This feedback mechanism is intended to help PointClear design and develop high impact innovative HIT products and applications for its clients. The Panel members are all MDs coming from family practice, neonatology, hospital medicine, pediatrics, OB-GYN and urgent care. Several of them have MBAs and Masters in Health Informatics. We have chosen the Panel members for their contributions to health care technology and their passion to make it better.

Related to our Panel launch we decided to ask each member 5 hot topic questions regarding

"Communication technologies that facilitate the cost-effective sharing of information among providers are lacking in today's HIT market."

HIT today. We gathered these questions from our clients over recent months in order to better understand what is on their minds and roadmaps to the future. This article will share the results of their answers which we found highly interesting and occasionally provocative. In any event, we think we have found the right Panel given their thoughtful, strong and straightforward opinions. The questions we asked them to respond to were:

1. What has been the single best Information Technology use in the last 3 to 5 years that provides the most positive impact on the delivery of care?

2. What are the areas of healthcare that are void of good information technology that would realize significant care delivery improvement with better IT?
3. Which current healthcare information technologies need a major innovation overhaul?
4. What mobile applications do you find useful as a physician today? What new mobile applications would you find highly valuable in the near future?
5. Using just one example of automating symptom analysis to determine a prognosis and therapy plan, do you see Artificial Intelligence playing a viable role in the delivery of healthcare? If yes, how so and please cite an example?

The Panel's detailed responses follow. I encourage you to review all of the comments in detail. You will find many similarities but also a fair amount of diversity in their points of view. Clearly the federal government's push for increased rapid adoption of Electronic Health Records is fueling not only adoption, but also the anxieties in the industry associated with the problems related to EHRs - namely, the challenges of integration and interoperability.

As one of our Panelists so eloquently responded to the question of

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which technologies need a major overhaul, "interface engineering is a mess. Let's start here."

You might like this one as well, "...the promise of the EMR being the panacea to healthcare management is a farce in today's healthcare climate when efficient time management is a cornerstone to a successful practice. HIT companies will do good to focus on making the complex simple. It is unfortunately far too easy to make the simple complex." And finally this, "billions in subsidies are being spent to create a patchwork of non-integrated EHR systems." I love it. Clearly we have work to do in the HIT world. It's worth noting that it appears the provider relationship with EHRs has a love-hate dynamic to it.

The Panelists have slightly varying views on the advent and utility of mobile applications. If you have attended any HIMSS, H2.O, Healthcare Unbound or other HIT conferences in the last few years there is little doubt that the industry desires, and is rapidly adopting, the ability to deliver healthcare from anywhere. Mobile apps are part of

that answer. However, some of our Panelists feel like the inherent problems with implementing EHRs mentioned previously need to be addressed first – then go mobile. Others take the opposite point of view – go fully mobile right away (iPAD EHRs for example) and obviate the need for the enterprise monolithic EHR model. While we appreciate both perspectives, it's likely the answer is somewhere in the middle. In fact, that is what we are seeing with our clients. Plus, the inherent technical, standards adoption and business model disruption challenges related to patient information

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exchange and communications is nowhere near being settled. The incumbent technology vendors will move quickly to mobility, but will probably do so only in step with these foundational issues sorting themselves out.

Finally, our question on the adoption and viability of Artificial Intelligence in the delivery of healthcare brought the widest variation of response. And frankly, we can understand this. This is about appetite to accept risk in trade for potential benefit. Doctors are under enormous well-documented financial and risk-related pressures. If they could use a proven technology to offload risk, save time, improve outcomes and make more money...they would but AI isn't a proven technology. Although it has genuine promise, the benefits have to emerge from a practical standpoint while the risk is further wrung out. Meanwhile, we asked our Panelists to think outside the box and imagine an AI application that they think would make a difference. We are intrigued with some of their ideas.

In summary, the answers to our 5 questions confirmed what many of us believe – that doctors indeed want to use technology to deliver better healthcare and make their life's work easier, more productive and profitable. What we have also learned is that depending on where a technology is on the maturity curve, physicians have more or less divergent opinions on the value of the technology and hence, its adoption. Electronic Health Records have been around for some time but the complexity of using them combined with incomplete patient information (in terms of the full continuum of care), has resulted in slow adoption. Only an expensive government mandated/stimulated program has

accelerated adoption. But the underlying problem of poor integration, non-aggregated patient data, and sub-optimal usability still frustrates providers.

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Mobility is a newer way to deploy technology and is gaining fairly rapid

adoption but the applications are typically task-based and do not yet deliver the full suite of capability that clinicians need. Keep in mind that mobile app adoption is trending up for two key reasons: complexity is low and usability is high. But at this point in time, our panelists differed on how mobile apps should be developed and rolled out.

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President & CEO, PointClear Solutions

Last, Artificial Intelligence is not new, but it is relatively new to healthcare. As such, the panel had very different views on its viability in the performance of their care approaches.

I think you will find the responses from our Panelists representative of the views of many practicing physicians today, as well as some unique perspectives on where things ought to go in the future. Learn more about our [Panel Members](#). On behalf of the Panel and the PointClear team, we hope you find their take on the HIT market, and its potential, valuable and worthy of further consideration.

Physicians Research & Advisory Panel 5 Key HIT Questions for Physicians

Responses

1. What has been the single best information technology use in the last 3-5 years that provides the most positive impact on the delivery of care? And why?

Panelist 1: Availability of history of controlled substances dispensed to every patient statewide via the Physicians' Drug Monitoring Program database on the web allows for each treating physician to know important information that directly relates to patient care without having to wait for a returned phone call or fax from someone else's office.

Panelist 2: Electronic Health Records with the ability to access my patient data from any location improves the 24 hour delivery of medical care and advice. This enables me to review what care my partners provided, if I get called after hours, and not only depend on the recollection of loved ones.

Panelist 3: In the real world, I'd have to say ePrescribing. Over 300,000 physicians are now on the Surescripts network, most on a daily basis, which means that they've integrated a sophisticated network and hub into their patient care workflows.

Panelist 4: As a hospital based physician, IT improvements could be in one of three categories: a) improved EMR either to improve patient outcomes or to improve access; b) linking of medical records to subsequent providers to minimize hand-off issues; or c) improve information availability to patients. There has been virtually no change in the first two. There is, however, more informed disease specific information available on the internet than 5 years ago.

Panelist 5: From my perspective questions 1, 2, and 3 are inextricably linked. The single most significant healthcare information technology development in the last several years is also the area that needs the most overhaul and reform. Moreover, it unfortunately lacks sufficient advancements in IT progress. It is the simple, yet exceedingly complex process of electronic health record integration.

For years physicians, healthcare administrators, bureaucrats, and academics have opined about the need for national integrated electronic health records. National (or at least regional/local) health record integration would save billions by streamlining care and eliminating the redundancy that plagues today's loose network of healthcare delivery. In areas where integration has occurred (e.g., the VA and large regional HMOs), cost savings have come with improved healthcare delivery and patient outcomes.

The Veteran's Administration has had integrated health records for over a decade. Despite an archaic IT system, VA physicians across the country at least have access to a patient's integrated health record. Unfortunately, outside of the system, there is not ready access by other healthcare providers, and VA patients and private physicians are faced with ongoing redundancy.

A simple example occurred in my practice last week. While seeing a new Medicare patient, I reviewed labs contained within my hospital system over the last few months. During one month alone, 3 separate thyroid Panels were ordered for the patient by 3 different physicians. All were for routine monitoring.

Multiply this example by thousands of patients daily, and quickly the waste associated with duplication and redundancy becomes staggering.

The federal government is currently directly subsidizing the adoption and implementation of electronic health records by physicians and hospitals. There are now hundreds of proprietary “certified” EHR systems. The electronic exchange of health information is not fluid between physicians and hospitals using different systems. In fact, meaningful data exchange is not possible between most products. Billions in subsidies are being spent to create a patchwork of non-integrated EHR systems.

There are information technology companies attempting to create platforms to integrate various EHR systems. The creation of quasi-integrated web-based portals is a start, but secure message and data sharing is neither easy to use nor comprehensive.

If we could integrate the free electronic exchange of laboratory, radiology, pathology, and pharmacy data with primary care and specialist’s medical records, it would certainly be the “Holy Grail” of healthcare information technology.

Panelist 6: I think the single most impactful information-technology being used at the point of care is the expanded implementation of the EMR. The EMR has become the main tool that physicians and nurses use to facilitate the patient encounter. Utilization of the EMR has increased significantly over the last 3-5 years because of meaningful use as well as the increasing technological sophistication of the healthcare workforce and further development of supporting capabilities and components such as CPOE, HIE, portals/PHR electronic prescribing, and CDS.

Panelist 7: In my opinion the single most impactful IT use, not innovation per se, in the last 3-5 years is simply the increased prevalence of electronic medical records. While EMRs have been around in some shape or form for more than 20 years, the utilization of EMRs has not become prevalent until recently. Surprisingly, it is this simple use of IT that has provided more efficient and effective access to lab reports and visit notes which makes care safer and easier to manage, especially in a setting where multiple providers need to have access to the medical record. Additionally, if done well, EMRs help to organize and manage the abundance of information that a physician collects or needs to consider when evaluating patients. Not every EMR does this well, and so the promise of the EMR being the panacea to healthcare management is a farce in today’s healthcare climate when efficient time management is a cornerstone to successful practice. HIT companies will do good to focus on making the complex simple. It is unfortunately far too easy to make the simple complex.

Panelist 8: Although not new in just the last 3 to 5 years, Computerized Provider Order Entry (CPOE) with decision support is still one of the most powerful tools that can reduce unnecessary variability of care. This variability is widely believed to be one of the leading reasons that healthcare costs have skyrocketed over the last decade or so. Even when “healthcare” knows what to do, the reliability of applying that knowledge to individual patients is shockingly poor. When you factor in the “gray” areas of medicine that do not have distinct protocols/algorithms available, it is not surprising that healthcare costs are high and patients are not treated as well as expected. The push for inpatient and outpatient CPOE with ARRA/MU, if implemented appropriately, should help to improve performance dramatically. The challenge is that implementations are of highly variable quality and there is a lack of standardization of computable guidelines, etc.

2. What are the areas of healthcare that is void of good information technology that would realize significant care delivery improvement with better IT?

Panelist 1: There is a desperate need for each patient’s medical record to be available online so that each treating physician at every facility can see what studies have already been done at other facilities; who is already caring for the patient and what are their thoughts on the patient’s medical issues; what follow-up is already arranged for the patient; what medications have been prescribed and why. As much as we would like for patients and their families to be able to relay this information to us, most don’t have a clue where to begin. The lack of effective and timely communication between treating physicians is the #1 problem in healthcare today, leading to higher costs and more medical errors.

Panelist 2: True integration of electronic medical records with outside data sources (labs, x-rays) that would populate the patient record, not just become a "scanned document". This could provide real time data and easy access.

Panelist 3: Clinical messaging between providers and between providers and patients.

Panelist 4: The EMR for complex hospitalized patients has minimal utility. There is no linking system like flash drive summaries of medical records for patients to carry. Instead of a general approach to all patients in all circumstances (top down approach) there must be careful thinking in subspecialty areas for EMRs to be truly useful.

Panelist 6: All of us, in our experience as patients, have experienced repeated questioning with such duplication that it has made us wonder if any of those who are asking questions are talking to one another.

We really don't have regularly employed useful standards for confirming the accuracy of historical clinical data. Medical Reconciliation is an example. We don't have a notation system analogous to the system in mathematics that makes it easy to express and later assimilate complex concepts. These points were made by Larry Weed, M.D. in "Medicine in Denial".

There is a great deal of duplication of effort among those who gather historical clinical information. Because there are no standards for accuracy of clinical data, trust and collaboration are much more difficult. The reality is that medical assistants, nurses, primary care providers and specialists often collect their own information and document it in a manner that they feel comfortable with independently from one another.

In an EMR environment where clinical history could be trusted, much of this duplication of questioning could be replaced by an emphasis on confirmation, collaboration and progressively increasing accuracy. In this setting, I envision one synopsis with one record of the clinical information at a granular level that goes beyond interoperability. This type of transition involves a major shift in job descriptions, workflow, and cultural change.

The desired outcomes of this shift would be improved workflow experiences, improved workflow efficiency, improved patient satisfaction, more accurate data and improved clinical outcomes.

Panelist 7: Communication technologies that facilitate the cost-effective sharing of information among providers are lacking in today's HIT market. Referral and follow-up management is lacking as well as staff tracking and management. Personal care and telemedicine IT are making strides and so are not void, but there is opportunity. However, cost effectiveness still proves a struggle.

Panelist 8: Most bedside caregivers, especially the nurses, are really devoid of useful aids that help them meet defined metrics, e.g. pain must be reassessed within 1 hour after being given as need pain medications. As such, they are routinely missing time-sensitive interventions that lead to poorer results for patient outcomes and consequently for joint commission and core measure requirements. In addition, the managers of these caregivers are also in the dark as to the performance of individuals. It is not enough to just tell them retrospectively what "should" have happened; they need real-time feedback of what tasks need to be done now, what can wait, and when certain requirements will be past due. Point-of-care dashboard technology with appropriate task prioritization could be very effective if widely implemented.

3. Which current healthcare information technologies need a major innovation overhaul?

Why?

Panelist 1: The majority of EHRs to which I have been exposed are not created in a manner that makes sense to a practicing physician; therefore, use of the EHR becomes a hindrance to efficient care and can actually be an impediment to effective communication with a patient. Also, there needs to be a more effective way to upload and share data in an EHR other than just scanned documents. We need relevant information that is easily accessible. Reviewing scanned documents is inefficient.

Panelist 2: The e-prescription function in my EMR is not pediatric friendly. It is very time costly versus handwriting an RX, and does not auto calculate for weight based dosing to prevent medication errors. EMRs need to fine tuned to the needs of a specialty.

Panelist 3: Interface engineering is a mess. Let's start here.

Panelist 4: EMR for complex hospitalized patients. There is no intuitive system that does much more than tabulate lab results.

Panelist 6: The medication reconciliation process on admission to the hospital, time of discharge and follow-up in the ambulatory setting is associated with frequent discrepancies and a certain number of these are associated with serious safety events particularly in the first 30 days after hospital discharge. Adverse drug events are a frequent cause of hospital readmissions as well.

Medication reconciliation is error-prone and labor-intensive. Improvement is likely to require significant cultural change as well as several different types of information technology. I don't think that electronic prescribing, portals/PHRs, or traditional EMRs in their current form are sufficient for managing this complex issue.

Panelist 7: Clearly, the major overhaul that is needed is interoperability and standards adherence. This overhaul is now underway with the federal incentive program. Beyond that at a physician level, the pieces are there so it is not so much the technology that needs the overhaul; rather it is the implementation of the technology. With most systems, technology is just too expensive to implement and maintain. Furthermore, for far too long HIT has been developed under an old paradigm of "technology by technologists" with little understanding of how medicine is practiced. Thus, the design and usability/behavioral analysis that is so critical for adoption has been neglected. This is just now becoming more of a hot topic, but usability innovations are definitely needed. Additionally, physicians expect the systems to just work. They do not want to think about it. Despite the current federally-incented HIT market, the current paradigm of proprietary systems with limited access is the norm and a shift in the share ability of information is still needed. Single-sign on is a must for any successful implementation.

Panelist 8: As the volume of information gathered on a patient increases, not only in the inpatient environment but also across the care continuum, there needs to be some substantial innovation in the way patient data is presented to caregivers. New models of visualization need to be explored that allow caregivers to zoom in and out to see long term trends as well as fine details. The ability to focus on a particular condition, symptom or lab result by visualizing the course of data across time will become increasingly important as healthcare providers take on more financial risk for their patients, i.e. they need to be able to detect changes, see important trends, etc. without being buried in a sea of seemingly disconnected data elements. Obviously, having strong terminology standards across the care continuum will be required for this to work and is a real roadblock in the short term.

4. What mobile applications do you find useful as a physician today? What new mobile applications would you find highly valuable in the near future (and why)?

Panelist 1: The availability of web resources by smartphone is huge - whether it is to look up medical calculators or journal articles or practice guidelines or phone numbers and addresses of physicians and pharmacies. It would be nice to have an app linked to a hospital's EHR such that new lab data, radiology reports, culture data, transcribed reports, vital signs, etc, could appear as alerts (like a text message) on your smartphone. That could do wonders to facilitate efficient care. I use text messaging a lot as a way to communicate with other treating physicians, with pharmacists, and with case managers and social workers. It is much easier and effective to send a text that someone can read and respond to when they have time rather than wait on them to pick up the phone or try to track them down in person.

Panelist 2: I use Medcalc. I would love an app that could directly access my EMR or into labs so that I could continue to check labs or results when not at a computer.

Panelist 3: Epocrates is an example of an EHR designed and built for mobility.

Panelist 4: One must fix the overarching EMR issues first to have a larger impact first. However, mobile app systems are close for easing some of the computer login logjams.

Panelist 5: Epocrates Rx and Epocrates Essentials (a mobile pharmaceutical information reference with expanded access to disease and laboratory data) has been a leader in mobile physician applications for years. I have successfully used versions of it for over a decade.

The Sanford Guide to Antimicrobial Therapy mobile edition provides access to one of the most trusted infectious disease references and has a variety of mobile applications.

MD Consult mobile is an extensive database of evidence-based clinical content and has had mobile operations since late 2009.

A new mobile application I would find useful would be mobile e-prescribing. With the implementation of EHR "meaningful use," e-prescribing will soon become the standard. Various mobile applications are in use and more are in development. A secure, user-friendly application would enhance my practice and provide safe and effective prescribing options from a variety of locations outside the traditional office.

Panelist 6: The simple medical technical information lookup products like Epocrates have been very successful and I use it frequently.

What I would also like to have is an application that would facilitate making phone calls to doctors, nurses, other healthcare workers, patients and family members in an efficient manner with as little time on hold as possible, bringing the right person on the telephone quickly with a minimum of interruption of workflow for everyone.

This problem of human to human telephone communication is tied in with complex asynchronous workflow problems, and multitasking. A solution, that works well, needs to take into account human factors and time motion workflows.

I can't afford to spend a quarter my day on hold on the telephone. But the alternative, (just don't call.), compromises continuity, communication during transitions and quality of care. Older technologies such as the pager and the answering service are reliable but labor-intensive and slow. Integration of healthcare worker schedules, healthcare worker-patient assignments and the current clock time and date in a database to form a coverage list is one aspect of a solution. More studies on work-flow of healthcare workers would help design better tools.

Taken to a higher level of sophistication, there is a need for tools to facilitate virtual multidisciplinary rounds in the hospital environment. These tools should include a dashboard augmented by the EMR and facilitated by mobile devices. These tools could be used for medical team problem-solving asynchronously. A multidisciplinary approach to case management should include some intelligence about the dependency of one task upon other as well as task responsibility assignments.

Panelist 7: Currently I find the typical clinical reference tools like Epocrates and UpToDate useful. In my urgent care practice, access to the clinic EMR is not critical, but if I were practicing in a clinic and/or hospital, being able to access my EMR from my mobile device would be very appealing and valuable. Furthermore, being able to communicate with my staff through the same application would be valuable because these would provide greater efficiency.

Panelist 8: Since I only practice part-time, I do not routinely use any mobile applications for the delivery of care. My most used mobile applications, in general, are email and a web browser. I do have an e-prescribing application on my phone, but I have never used it since I have integrated e-prescribing within my office EMR. As far as future mobile applications, I think the ability to have small form-factor optimized versions of EMRs will be very important in the marketplace.

5. Using just one example of automating symptom analysis to determine a prognosis and therapy plan, do you see Artificial Intelligence playing a viable role in the delivery of healthcare? If yes, how so and please site an example?

Panelist 1: No. Medicine is much more of an art than a science and there are way too many "human factors" that have to be taken into account in each patient's illness and treatment plan. Medicine is not cookie-cutter and trying to make it that way places many patients at risk of bad outcomes because something important about their case doesn't fit into the AI's written framework. There are too many exceptions and not enough rules.

Panelist 2: I believe Artificial Intelligence is not going to provide a viable role since much of medicine is the "art of medicine". Many factors go into making a diagnosis and often many are shades of gray, not black or white. Also, patients or their parents or caregivers are often not reliable historians in reporting symptoms. This may lead to incorrect diagnoses and treatments. Also, I fear that patients who are seeking a certain outcome could fake their symptoms to create a wanted diagnosis.

Panelist 3: AI could be useful, but automation of diagnosis is not a major problem in health care, at least not for physicians most of the time. It could be very useful for informed and participating patients. What doctors need most in this area is decision support that lets them know what treatments and testing protocols are evidence based, and which are not.

Panelist 4: A healthcare AI application could be related to inherited metabolic diseases causing metabolic acidosis in the first few days. An algorithm could be developed that would lead to a flow chart with final diagnostic possibilities. Each diagnosis could have a silo of information below that would include treatment modalities, area subspecialty referral availability, printable parent information brochures etc.

Panelist 5: Artificial Intelligence will play a viable role in healthcare delivery. It already is in the setting of "weak AI" (i.e. a system that supports but does not supplant traditional medical decision-making).

For example, an AI system, integrated within an EHR, that provides basic diagnostic support based on signs/symptoms/labs, clinical care pathways, pharmaceutical reference, infectious disease support, and appropriate alerts and reminders can and will enhance care delivery, reduce costs, and improve patient outcomes.

Take, for example, a patient admitted for presumed community-acquired pneumonia. The physician or support staff inputs the patient's signs and symptoms, vitals, pertinent labs, and medical history into the EHR. The system generates a list of likely diagnoses, provides evidenced-based recommendations on appropriate antimicrobial therapy (taking into account the patient's allergies, current medications, weight, renal and liver function, and drug-resistance patterns within the hospital), and provides a standardized order set. The physician reviews the recommendations and accepts or deviates from them as he or she feels is clinically appropriate.

The AI system continuously tracks the patient's vitals, physical exam findings, and laboratory results and makes additional clinical recommendations, including reminders and alerts relating to changes in patient status. The system provides a pneumonia severity index score and helps guide the clinician as the patient improves. If key orders are missed or overlooked the system generates a critical alert that the physician must follow or override if deemed appropriate. At the time of discharge, the system generates discharge orders and reminders to follow core measures (i.e. pneumococcal immunization).

In summary, an integrative AI system of diagnostic support, disease severity/prognosis, and pharmaceutical recommendations, coupled with alerts and reminders, can lead to improved patient outcomes and cost savings.

Panelist 6: Use AI to help collect better clinical history. My specific example of using artificial intelligence is to have non-experts collect clinical history with a tool with a definable clinical process and accuracy considerations built in to emulate the history obtained by an expert for the problem at hand.

I am interested in using artificial intelligence to collect accurate clinical information and organized it in a narrative way that makes it easier for my brain to assimilate and to come to the right clinical conclusions based on my clinical knowledge and judgment. A tool that would augment my skills, knowledge and history taking ability with those of an expert in the area of the problems at hand and put it into an appropriate narrative would be very useful. Its goals would not be so focused on diagnosis but more on intermediate steps in problem solving process. A product called Flobase by Arbor Medicus does this.

I am sure that there are many other history taking programs out there that have developed over the last several years, but I find the power of this tool striking.

Panelist 7: The role of AI should never take the role of the clinician; rather it should augment the capabilities of the physician and assist in ensuring that something is not overlooked. The single largest obstacle in effectively using AI is data input as most automated symptom analysis engines are cumbersome and time consuming. Thus, outside of using verbal input technology like IBM's "Watson", AI likely has limited value in diagnosis because of the large amount of qualified information needed. Furthermore, using AI in the diagnostic role risks making clinicians essentially data entry specialists and dependent upon suggestive technology that could actually be dangerous. In addition, it has the potential to siphon intelligence from, rather than impart intelligence to, the clinician. Thus, the role of AI is likely more so in prognosis and management once a diagnosis or treatment plan has been committed to. However, even this has its limitations, as the intelligence would be based upon guidelines and treatment data that change and these are only available for a limited scope of diseases. So, the intelligence should change with the guidelines. As an example, a patient may come in for cough, fever, and malaise with a history of multiple sexual partners. A diagnosis of Pneumocystis jiroveci pneumonia with concomitant HIV is made based on chest x-ray and lab work. The software could then know based on that diagnosis which labs are lacking and should be performed and then provide a suggested treatment algorithm based on current guidelines.

Panelist 8: Yes, as the quality of structured data improves overall in the delivery of healthcare, there will definitely be more opportunities for AI to play a more active role in healthcare. It is important that these tools are able to be integrated into the workflow of the provider, i.e. the EMR needs to "feed" the data to the AI application. A simple example would be to have an algorithm that evaluates the vital signs of a patient over time, e.g. Blood Pressure, assists in the diagnosis of hypertension and then suggests appropriate drugs based on the patients age, ethnicity, other complicating conditions, etc. As simple as the above example seems, these types of algorithms are not at all routinely used within healthcare even within organizations that have so called "advanced" EMRs.