

The Meeting at Harvard on a

Health Information Technology Platform

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Executive Summaries









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Table of Contents

Session Title	Speakers	Page
Key Themes		3
Opening Keynote: Building the Health Internet	Mitch Kapor, Senior Advisor on Health Information Technology, Center for American Progress	5
Open or Closed Platforms? One or More Platforms?	Moderator Isaac Kohane, Henderson Professor of Pediatrics and Health Sciences and Technology, Harvard Medical School; Director, CHiP; CBMI; Countway Library of Medicine	7
	Panelists Hamish Fraser, Assistant Professor, HMS/Brigham and Women's Hospital; Director, Informatics and Telemedicine, Partners in Health John Halamka, Chief Information Officer, HMS and Beth Israel Deaconess; Chairman, Health IT Standards Panel David McCallie, Vice President, Medical Informatics, Cerner; Director, Cerner Medical Informatics Institute Sean Nolan, Chief Architect, Microsoft Health Solutions Group	
Business-Government Interactions to Support a Platform	Moderator Mark Frisse, Accenture Professor of Biomedical Informatics, Vanderbilt University, Director, Regional Informatics Programs through Vanderbilt Center for Better Health	9
	 Panelists Charles Friedman, Deputy National Coordinator for Health IT, Office of the National Coordinator for Health IT, Department of Health and Human Services Robert Kolodner, Self-employed; retired as National Coordinator for Health IT, Department of Health and Human Services David Liss, Vice President, Government Relations and Strategic Initiatives, New York Presbyterian Hospital Alfred Spector, Vice President, Research and Special Initiatives, Google 	
Keynote: The Innovator's Prescription: How Disruptive Innovation Can Transform Health Care	Clayton Christensen , Robert and Jane Cizik Professor of Business Administration, Harvard Business School	11
Models for Adoption of Platforms	Moderator Kenneth Mandl, Associate Professor, HMS/Children's Hospital Boston; Director, Intelligent Health Lab, Children's Hospital Informatics Program	13
	Panelists Henry Chueh, Chief, Division of Biomedical Informatics, HMS/Massachusetts General Hospital; Director, Lab of Computer Science Ahmed Ghouri, Co-Founder and Chief Medical Officer, AnvitaHealth David Kibbe, Senior Advisor, American Academy of Family Physicians Ross Koppel, Professor, University of Pennsylvania School of Medicine; Research Director, Center for Clinical Epidemiology and Biostatistics Mike Stein, Medical Director, Map of Medicine (UK)	
Technical Requirements for a Successful Health IT Platform	Aneesh Chopra, Chief Technology Officer, Executive Office of the President, Office for Science and Technology Policy Todd Park, Chief Technology Officer, Department of Health and Human Services	16
Closing Keynote: Who Killed Health Care?	Regina Herzlinger , Nancy R. McPherson Professor of Business Administration, Harvard Business School	18
Biographies		



Key Themes

Background

The Meeting at Harvard on a Health Information Technology Platform, held at the Countway Library of Medicine at Harvard Medical School on September 29 and 30, 2009, brought together about 100 of health information technology's foremost leaders. The focus of this meeting was on practical, actionable steps to create a health IT platform.

One particular metaphor was used to prompt thought: the iPhone. The iPhone platform has been widely embraced, and almost 85,000 substitutable applications have been developed for it; these applications have been downloaded more than 1 billion times. Perhaps such a metaphor can be used to spur thinking in health IT.

Key themes from this meeting are summarized below. Summaries of each keynote and panel discussion follow.

Key Themes

• The government plays many roles that affect health IT. To create a Health Internet, the government must be a facilitator.

Throughout this meeting, the government was mentioned as a regulator, a provider of funding, and a developer of policies and programs. But in the opinion of many meeting participants—including keynote speaker Mitch Kapor—to bring about an interoperable health Internet, the role that the government must play is that of facilitator that catalyzes action. As the government did in helping bring about the original Internet, the government can help create a Health Internet by bringing together the key players, defining a lightweight set of protocols, and creating critical mass around the use of these protocols.

The Obama Administration is committed to the concept of a Health Internet, and used this meeting to lay out a specific proposal for moving forward.

Creating a robust technology infrastructure is seen by the Administration as critical to health care reform. At this meeting, White House CTO Aneesh Chopra and Health and Human Services CTO Todd Park laid out a vision and offered a specific proposal.

- The vision: create a Health Internet by turning the current NHIN (Nationwide Health Information Network) into the Health Internet. Then, use this Health Internet to bring consumer health data into consumer-controlled personal health records (PHRs).
- The proposal: undertake an initiative to begin using this Health Internet to move live data into live PHRs by the second quarter of 2010. Doing so entails identifying the gaps in the current NHIN protocols, addressing these gaps by creating new protocols (and possibly eliminating existing ones), updating CONNECT, and then initiating live betas.

A practical example of how this could work: An individual could open a Microsoft HealthVault account. At the patient's request, providers who have adopted the Health Internet (like the VA) could send the patient's medical data to the individual's HealthVault account via the Health Internet (the updated NHIN).

Meeting attendees were extremely enthusiastic about this vision and proposal. There were commitments from a wide array of stakeholders to support the proposal and to work together collaboratively to make it happen. An oft repeated phrase was, "We are in!"

Participants voice strong support for the idea of openness.

Among the lessons learned from the PC revolution and the formation of the Internet was the importance of openness. Participants supported open standards, open source, open architecture, an open data platform, modularity, and an opening of previously closed vendor platforms to allow greater customization.

• Participants emphasized the need for data liquidity as a prerequisite for all else.

Participants supported the idea of substitutable applications and most (but not all) like the concept of an "app store." But many attendees focused on the importance of first being able to get at the data in EHRs and PHRs. It is the access to and availability of data, and the ability for data to easily flow ("data liquidity"), that will make apps useful.

Access to data will drive development of substitutable applications. Once apps are being developed, the creators/ sellers will benefit from offering their applications through an app store, and users/buyers will benefit by being able to use an app store to easily find relevant applications that meet their needs. Also, the aggregation of data for overall population health is essential.

There was a proposal that most attendees supported: defining a narrow, common, and non-controversial set of data—possibly around medications and/or immunizations —and then developing standards so that this data can be accessed. This in turn will spur development of applications.

• Disruptive innovations help people do jobs they are trying to get done.

Professor Christensen emphasized that there is no way to force clinicians to use EHRs or applications. Instead of trying to force a solution upon people, follow the formula used by disruptive innovators: create solutions that help people do a job easier, faster, and cheaper. Such a solution will then be embraced. (He also noted that when disruptive innovations occur, entrenched incumbents do everything they can to forestall the disruptive innovation, including trying to get regulation imposed to block it.)



Creating a Health Internet, data liquidity, and a platform with substitutable applications requires overcoming many formidable obstacles.

Realizing the vision for an interoperable health technology platform faces many obstacles. These issues include technology, security, privacy, legal, regulatory, policy, and states' rights issues. There is a lack of a common vocabulary, lack of EHR adoption, especially among individual primary care physicians, and conflicting interests among businesses of different sizes and stages. There is a lack of use cases, perverse incentives throughout the system, a lack of proven business models, and at times lack of a clear and compelling value proposition. Yet in spite of those challenges, there was tremendous optimism among those in attendance regarding what is possible. Attendees believe that through collaboration, by focusing on specific use cases and pilots, value can be shown and positive momentum will be built. Once an interoperable platform is developed, a tipping point will occur. In a short period of time health IT adoption will increase and a huge number of applications will be developed. The end result will be improvements in health outcomes and lower costs.





Opening Keynote: Building the Health Internet

• Speaker: Mitch Kapor, Senior Advisor on Health Information Technology, Center for American Progress

Overview

The experiences of the PC revolution and the creation of the Internet offer valuable lessons that should be considered in working to create a Health Internet. Among these lessons are the importance of openness and decentralized architecture, and the catalytic role government can play.

In contemplating how to pursue the vision of a ubiquitous, interconnected network that allows for a seamless exchange of information, one proposal is to "start with what we have," which is the NHIN (Nationwide Health Information Network). With this as the starting point, stakeholders—including consumer health platform providers and consumer health organizations—can come together to identify gaps as well as required changes and desired extensions to NHIN specs to support consumer requirements. By creating a critical mass of stakeholder support, a goal of live patient data flowing over the NHIN by the second quarter of 2010 is feasible.

Context

Mr. Kapor drew from his extensive technology background to share lessons from the PC revolution and the formation of the Internet that are relevant to health information technology. He assessed the current state of health IT, put forth a vision for a Health Internet, and offered a specific proposal with near-term goals and actions.

Key Takeaways

• Important lessons can be learned from the PC revolution which are relevant to health IT.

The PC revolution created a platform and an ecosystem that allowed tremendous innovation to take place. Lessons from the creation of this platform are relevant to building the Health Internet. Among them:

- New capabilities. The PC created new, disruptive capabilities compared with mainframes.
- Standard APIs (Application Programming Interfaces).
 The development of APIs meant that PCs were not vertically integrated. Any developer could develop and distribute applications to work on PCs; developers didn't need permission to do so.
- New vendors. APIs that didn't require permission to develop applications for PCs meant there were low barriers to entry for new software vendors. This lead to the development of Microsoft, Lotus, and tens of thousands of software companies and applications.
- New users. These applications empowered new participants—both individuals and businesses—to use computers and applications for the purposes that they defined. PCs and software applications created tremendous value for users and fundamentally changed the world.

But not all of the lessons from the PC revolution are positive. Other lessons include that lack of full openness, particularly in the operating system (which was controlled by Microsoft), led to a stagnation of innovation. Also, because PCs were originally non-networked devices (since networking didn't exist), there was chaos in the enterprise as management had no visibility about what was going on. There were disconnected "islands of innovation."

• Lessons from the creation of the Internet can inform creation of a Health Internet.

Even in the early 1990s the Internet was not widely anticipated. The telecom communities were focused on "fiber to the home" and companies like AOL created "walled gardens." Yet it was DARPA and DARPANET—an obscure research project used by academics, the government, and the military—that turned out to be the winner and has led to tremendous value creation.

What made the Internet so powerful was:

- Open standards. It was built on open standards and there was a democratic process in creating them.
- Open source. It was built through a hybrid of open source and proprietary software.
- Decentralized architecture. The Internet's architecture was highly decentralized. Most things on the Internet, like connecting a server, required no permission. This resulted in a mantra of "Anyone can...." and encouraged widespread participation and experimentation.
- Pragmatic process model. The process model for how things got done was extremely pragmatic. The model was "rough consensus and running code."
- Government's role. The U.S. government played a crucial role in the development of the Internet. First, as is well known, initial funding for DARPA came from the Department of Defense. But less well known is that in the late 1980s and early 1990s, the Department of Defense turned over responsibility for the noncommercial Internet to the National Science Foundation (NSF). The NSF set the rules of the game and oversaw a gradual transition to a more open network. The NSF orchestrated, catalyzed—and then got out of the way. This provides a critical lesson for the Health Internet.

"The U.S. government had a completely crucial and catalytic role in the Internet." — Mitch Kapor

• The IT currently being used in health care reflects providers' incentives.

As a relative outsider entering the world of health IT, Mr. Kapor met with various health care stakeholders about health information technology. His conclusion: everyone is unhappy. Health IT in its current form is hard to use and there is a significant gap between what stakeholders want



and what they are getting. The situation is analogous to the high tech world in the mid-1980s.

The technology that has evolved and is being used supports the existing volume-driven, fee-for-service payment system. So, good IT exists for billing, because this supports providers' revenue models. But bad IT exists to coordinate care, measure outcomes, and support prevention. This isn't what providers get paid for. Providers want to do the right thing, but there have been no financial incentives to adopt health IT; there have actually been disincentives.

Yet, amid this sea of unhappiness there have been a few small islands of success where organizations have done things differently. An example is Kaiser Permanente, which is producing great value by leveraging the power of health IT.

- Done properly, health IT is essential to making health

The forces driving health care reform are well known: high and unsustainable costs, not the highest quality, and lack of universal coverage. The problems are systemic and everyone has a stake in them.

The HITECH Act provides incentive payments to health care providers for health IT adoption that displays "meaningful use." Meaningful use should include reporting on population health. Measurement of population health and other health outcomes is essential and requires health information technology. This makes health information technology essential for sustaining health care reform and making it effective.

> "Health IT done properly is essential to health system reform." — Mitch Kapor

Creating the Health Internet requires a clear vision, a set of principles, some specific actions, and a critical mass of support.

The Mr. Kapor's vision for health IT is creation of a "Health Internet." In creating this Internet, certain principles should be adopted based on the experiences of the PC revolution and the formation of the Internet. These include embodying the design principles of these two ecosystems, including open standards, open source, and decentralized architecture. The goal for the Health Internet is to link all classes of health care stakeholders in one ubiquitous, interconnected network that allows for a fluid, seamless exchange of information. Like PCs and the Internet, this platform would enable disruptive innovations for improved health and lower costs. While obvious to many, this vision is not agreed to by all. Evidence for this is that a great deal of money is still being spent on disconnected special purpose networks.

The reality is that this vision is a long way off. But there are specific, practical steps that can be taken immediately to advance this vision and to produce meaningful near-term results. In this spirit, Mr. Kapor offered a practical proposal consisting of the following components:

- Start with what we have. The building blocks for the Health Internet can begin with something the government is already doing. Specifically, begin with the NHIN (the Nationwide Health Information Network).
 Many people are not familiar with the NHIN, which to date has focused on standards, policies, and specifications for health information exchange among providers and government organizations. The NHIN is embryonic and obscure, but so was the Internet in its early days.
- Engage stakeholders. Specifically, engage consumer health information platform providers (like Microsoft, Google, and Indivo) and consumer health organizations as NHIN participants (as the NSF did with the Internet).
- Create an agenda. These stakeholders will need to come together to identify gaps, as well as required changes and desired extensions to NHIN specs to support consumer requirements. Stakeholders are also encouraged to implement the open source CONNECT reference code AND ELSEWHERE.
- Set a goal. Mr. Kapor suggested a goal of having live patient data flowing by the second quarter of 2010.
- Deal with the issues. Among the challenging issues that must be dealt with are privacy and security, the scope of the NHIN, the definition of "good citizenship" for participants, and who owns and controls the data.

While this won't be easy, what is needed is to build momentum to create critical mass among the stakeholders, reach agreement, and move forward.

Other Important Points

- A "light federal approach." In response to a question about why Mr. Kapor was proposing such a top-down approach, he responded that it isn't top-down; it is a "light federal approach," as was the approach with the Internet.
- Early adopters. How this plays out is unknown. But there will be early adopters and late adopters, and it is reasonable to believe that the early adopters will realize benefits.



Open or Closed Platforms? One or More Platforms?

- Moderator: Isaac Kohane, Henderson Professor of Pediatrics and Health Sciences and Technology, Harvard Medical School; Director, CHiP; CBMI; Countway Library of Medicine
- Panelists: Hamish Fraser, Assistant Professor, HMS/Brigham and Women's Hospital; Director, Informatics and Telemedicine, Partners in Health
 John Halamka, Chief Information Officer, HMS and Beth Israel Deaconess; Chairman, Health IT Standards Panel

David McCallie, Vice President, Medical Informatics, Cerner; Director, Cerner Medical Informatics Institute Sean Nolan, Chief Architect, Microsoft Health Solutions Group

Overview

Panelists support the general notion of open platforms and a health information technology infrastructure that allows for the sharing of data. However, "openness" can mean different things to different stakeholders. It can mean complete open source development; a completely open platform; an open data platform; open architecture; and even a vendor's propriety software being opened so that current customers can extend it. There is agreement that openness can help foster a more coordinated health care environment and help drive innovation.

Context

After reiterating Mitch Kapor's comment from the opening keynote that PCs didn't have fully open platforms, and noting that the iPhone platform is also not fully open, Dr. Kohane asked the panelists to share their thoughts on openness, standards, platforms, substitutable applications, and health information exchanges. They also fielded a wide variety of questions from attendees.

Key Takeaways

• There is general support for more "openness" but people define and think about it differently.

Each panelist was asked a question dealing in some way with open or closed platforms, standards, and/or substitutable applications. Their responses focused on and emphasized different aspects of openness.

Nolan

Mr. Nolan believes that an open platform is essential to substitutability and innovation. However, in his view the key question is, "At what level in the stack is openness important?" His answer is that openness is important at the data level—what truly matters is creation of an open data platform; not a standards-based data platform. Standards are great, but aren't a necessary requirement.

The key properties of a platform for substitutable applications would be:

- Accessible data repositories. Applications that create data must have accessible repositories of this data; the data has to be made available in some reasonable way.
- Defined semantics around the data. Users have to be able to know and understand what the data is.

By focusing on data openness and liquidity, it makes the switching costs for applications very low. Because the

switching cost is so low, it doesn't really matter whether the applications are open or closed. Mr. Nolan commented that he would love for consumer advocates to start demanding and rating data openness and semantics.

> "If we [Microsoft] created an open data platform around personal health, maybe we would get innovation, allow other people to build, and create a lower switching cost between applications." — Sean Nolan

Halamka

Dr. Halamka suggested creating standards with different degrees of specificity based on the specific type of transaction. For example:

- E-prescribing. For this type of data exchange, there should be great specificity around the name of the drug, the dosage, and the form. And there must be security and data integrity when data is transmitted from place to place.
- A physician's note. It is unreasonable to expect the same type of specificity and to mandate some form of highly structured clinical documentation. What may be required here is a secure transport mechanism, maybe some general way of formatting information, and a userfriendly way of reading the information, such as a pdf.

Different types of transactions would be reviewed and the appropriate level of specificity determined. Ultimately health care reform will demand quality measures, many of which will be extremely specific in order to have comparability across clinicians. The only way to achieve them will be to have good data input that is vocabulary controlled, and a constant way of transmitting content from place to place. There could be a glide path which starts with the basics and gets more specific over time.

Dr. Halamka emphasized complete openness of data architecture; in no way should his suggested standards constrain architecture. Providers will be responsible for the specific data that is required for a certain transaction, but they can use whatever architecture they desire. This allows for innovation.

> "Nowhere in all the standards have I tried to constrain architecture. Give people the specificity they need for the job in question, but allow innovation on the architecture side." — John Halamka



McCallie

The prediction offered by Dr. McCallie is that we will see open but not standardized platforms. As Cerner is in the process of doing, vendors will open up their platforms to customers, enabling customers to extend these platforms. Cerner will be opening its platform to clients in several different ways, including a service-oriented architecture that allows clients to build an interactive API. For clients, this will look similar to a typical open source development project. In limited exposure, this model has proven extremely powerful and popular for Cerner's clients. Dr. McCallie expects other vendors to go down this road.

However, while vendors will make their platforms more open, Dr. McCallie does not expect these platforms to become standardized. This would be extremely complex and vendors don't have an incentive to do so.

> "We will see the emergence of open, but not standardized, platforms that allow vendors" customers to extend the model in ways that the vendor can't do on their own." — David McCallie

While Dr. McCallie is doubtful about common standards for vendor platforms, he is more hopeful about the health information exchange (HIE) space. He hopes to see an open standards-based platform that would create a plug-in market or a platform-extension market that would apply across the entire country. He believes we need to shift from today's service-oriented architecture in local markets to a resource-oriented model. In a resource-oriented model patients' data follows them wherever they go and is available via a standardized health URL. This would create a national market, which would give vendors incentive to develop products/applications.

Fraser

Dr. Fraser co-founded the OpenMRS collaborative. OpenMRS is an open source medical record system platform used in developing countries. In developing OpenMRS, the challenges faced included being able to scale a system for use in developing countries with very limited resources. Developing and supporting this system required engaging and leveraging a broad community, which necessitated that OpenMRS be an open system.

> "We couldn't have built collaboration without being very open." — Hamish Fraser

This open philosophy allowed people to innovate on top of the platform and resulted in a modular architecture and creation of APIs. Also, proprietary software can be difficult to support, but an open source system can make support much easier.

Participant Discussion

After the panelists' comments, attendees raised questions and offered comments on several topics. Among them were:

- Extracting data. All participants support the idea of allowing and enabling data extraction. Issues of privacy and security have to be worked through, but participants support this concept.
- Meaningful use. Questions were raised about why the meaningful use criteria are so important; iPhones have been widely adopted without criteria for meaningful use. The answer is that "meaningful use" is an "instrument of reform." As part of health reform, the government will provide funds to organizations that adopt electronic medical records. However, to receive these funds, providers must demonstrate "meaningful use," which means EMRs are being used in specified ways to improve outcomes. Essentially the government is saying, "I will give you \$44,000 but you have to use your EMR in reasonable ways."
- Sequencing. A question was asked about the most appropriate sequencing of activities to move forward. Dr. Halamka responded that the meaningful use criteria actually provide a pretty good sequencing. In 2011, meaningful use focuses on having the capability to "push" data out—to pharmacies for prescriptions, to an organization that measures quality, to a PHR, etc. In 2013, meaningful use requires releasing data in a standard way, under a patient's control, to a PHR (which gets around some privacy and security issues). In 2015, it is essentially necessary to be able to share everything with everyone, with specific goals still to be defined. This sequencing will get us to data liquidity.
- Use cases. In Mr. Nolan's experience, tremendous learning can be derived by identifying and pursuing just a few meaningful use cases of important transactions. Pick a use case, agree on the measures, determine the actions, and start executing. An attendee expressed concern that instead of a standards-based approach what is more desirable is to create a platform (like the iPhone) where applications for unimagined use cases are developed.
- Certification. Dr. Halamka indicated the government will publish its certification process in December, followed by a comment period. He expects the certification process to be relatively light and to be focused on privacy, security, and the basics of exchanging data. He sees the likely certification process as reasonable. (However, Dr. Kohane commented that it sounds like a lot more certification than other platforms.)
- Coordination of care. Participants believe that openness and the ability to share data will facilitate innovation and lead to more coordinated care.
- UK experience. An attendee from the UK advised Americans to learn from the experience of the UK, which this attendee termed "a disaster." Based on the experience in the UK, this individual strongly recommended open platforms.



Business-Government Interactions to Support a Platform

- Moderator: Mark Frisse, Accenture Professor of Biomedical Informatics, Vanderbilt University, Director, Regional
 Informatics Programs through Vanderbilt Center for Better Health
- Panelists: Charles Friedman, Deputy National Coordinator for Health IT, Office of the National Coordinator for Health IT, Department of Health and Human Services

Robert Kolodner, Retired as National Coordinator for Health IT, Department of Health and Human Services **David Liss**, Vice President, Government Relations and Strategic Initiatives, New York Presbyterian Hospital **Alfred Spector**, Vice President, Research and Special Initiatives, Google

Overview

It is likely that business will create platforms and applications, but the government plays a key role in creating an environment where entrepreneurs and innovators can flourish. Government creates and implements policies, but more importantly, can bring stakeholders together and facilitate action. One idea for government is to focus stakeholders on specific use cases that can help bring about a platform and substitutable applications.

There are many obstacles that hinder the development of a platform and applications, including perverse incentives and regulations that limit the access to data. But panelists and attendees expressed optimism around the idea of selecting perhaps one use case (such as immunizations) and working together to overcome the barriers.

Context

Panelists and attendees discussed the role that government plays in supporting creation of an IT platform for substitutable applications. In addition, issues were raised that inhibit the development of a platform and applications, and ideas were shared for overcoming these issues.

Key Takeaways

 Government can play a variety of roles in supporting creation of a platform for substitutable applications; it can also erect barriers.

Numerous governmental roles were identified including:

— Policymaker. An obvious and critical role of government is to develop laws and policies. Mr. Liss explained that getting laws passed around open platforms is challenging because the issues are complex and members of Congress don't understand them. The key to influencing policy is for the health information technology community to align on what it wants from government and to convey this message to Congress through a simple, clear narrative.

> "We are going to have to be able to tell Congress what it is that we want." — David Liss

Dr. Kolodner described that the details of policies are often created not by elected officials, but by people in agencies. And the process for developing policies involves government bureaucrats laying out detailed plans, which can delay and kill innovation.

- Policy implementer. In addition to developing policies, government agencies also implement them. At times, multiple agencies can work collaboratively for the greater good. At other times, differing agendas and missions will prevent any progress from occurring.
- Creator of an environment for innovation. Dr. Friedman explained that ONC (the Office of the National Coordinator for Health Information Technology) is trying to create an environment where health IT innovation can flourish. ONC's approach is based on lessons that have been learned from successful innovations and from innovation failures. These lessons and the approach ONC is taking include:
 - Anticipating and embracing innovation. Innovation, which largely comes from outside of the government, can have profound effects. When countries and leaders ignore or stifle innovation, there are dire consequences. ONC's goal is to be as agile as possible in supporting innovation.
 - Helping early-stage innovative ideas survive. An innovation's early stages are the most perilous. To help important health IT innovations survive, ONC is considering supporting a set of test labs/simulation environments where innovative ideas can be tested.
 - Minding the culture. Innovators often fail because they don't understand the cultural context for their innovation. ONC is contemplating ways it can help innovators avoid this mistake by helping provide a better cultural understanding. One idea is an innovation council which would provide entrepreneurs with access to health IT veterans.
 - Anticipating unintended consequences. With innovations, things can go out of control in unexpected ways. ONC plans research to understand the unintended consequences of health IT innovations.

"We are trying . . . to create an environment where [innovators] can develop the next generation of [innovations] that will take us in many directions that many in this room feel we need to go." — Charles Friedman

- Developer of programs. Dr. Friedman indicated that he and others in ONC don't view themselves as regulators or policymakers; their role is to develop programs.
- Facilitator. Mitch Kapor reminded attendees that government can do more than enact policy; government can facilitate the emergence of the Health Internet infrastructure, as it did with the Internet. It can do this through a lightweight process model that spurs



innovation by catalyzing the government and other players to reach consensus and developing code. Of all of the roles that government can play, Mr. Kapor argued that this is the role government most needs to play.

 Regulator. The government regulates by setting policies such as "meaningful use" and regulations such as CLIA (the Clinical Laboratory Improvement Amendments).
 States are also big players in regulation, with states considering their own meaningful use requirements and other regulations that could restrict the sharing of data.

Business is not monolithic. Policy development must not be shaped just by large, existing businesses.

Mr. Kapor explained that there are multiple classes of business stakeholders whose interests are not always aligned. There are incumbents who are in the health IT business and want to protect their positions, and there are large companies such as Microsoft and Google who want to enter this space. These companies have resources they can expend to try to influence standards and policies.

There are also start-ups that are fragile and are just trying to get going, and there are tomorrow's start-ups—the Amazons, eBays and Googles of the Health Internet that have not yet even been envisioned. There are no advocates for these start-ups, yet this is where a great deal of innovation in platforms and applications will come from.

There are many issues inhibiting the development of an interoperable platform and substitutable apps.

Currently, progress in the EHR space has been slow. It is often hard to get and move the data that is necessary for shareable applications. Key issues include:

- Poor data availability and quality. For shareable applications, access to good data is needed. Dr. Spector explained that Google has faced significant challenges getting access to good data.
- Adoption takes time. Dr. Kolodner emphasized that "having a good idea doesn't mean you can get it out there." Ideas can be simple to articulate but hard to bring about.
- Perverse incentives. The health care industry as a whole has perverse incentives.
- Regulation. Regulations such as CLIA, which are often based on privacy concerns and pushed by advocacy groups, play a significant role in restricting the flow of data. There is a large, growing, confusing, and inconsistent body of state regulations which adds complexity.
- Details. Dr. Spector said there are countless details that complicate the process of getting data. There may be workflow issues where physicians have to provide their blessing before lab data can go into a PHR, or patient identity/authentication/validation issues. Every use case has its own unique and complicating details.
- A sustainable model. Even when hard work has resulted in an island of success, these successes have not been sustained, replicated, and expanded.
- Lack of value. One participant argued that as complex as the technical and policy issues are, these are not the

greatest barriers inhibiting adoption of EHRs and development of applications. He argued that the lack of stakeholder adoption is because stakeholders have not derived value.

— Lack of use cases. It was suggested that the technologies that exists today has not focused on the most important real-world use cases. Such a focus would help provide value and bring about adoption.

• There are positive ideas for bringing about change, including working together on a few select use cases.

Meeting co-chairs Ken Mandl and Isaac Kohane and session moderator Mark Frisse asked participants for specific ideas on how to overcome these barriers and make progress in the area of substitutable applications. Several comments and ideas were shared.

- Government funding will drive action. A representative from a vendor commented that the significant government funding flowing to the sector will make an immediate difference. In his own company, he has seen immediate action.
- Collaborate to achieve quick, easy wins. Participants coalesced around the idea of developing a "lead application" by selecting one use case or a few use cases in important, non-controversial areas (such as an immunization application) and working together to develop a solution. There was strong support for this idea. There was general belief that the experience working together would yield valuable learning and the results would show others what is possible and would spark pursuit of applications for additional use cases.

"Some of us could come together on a lead initial application." — Alfred Spector

- Focus on an application that shows a benefit for the population. Mr. Liss agreed with the idea of collaborating on something easy. He also suggested the need to do something harder that would involve aggregating data to support the health of a broad population. He believes this is necessary to show the capabilities of electronic medical records and applications.
- Create adequate standardization for disruptive innovation. Dr. Kolodner doesn't necessarily believe that topdown government policies will create the platforms and applications of the future. He believes that change will be disruptive, that it will evolve over time. Enabling a "good enough platform" requires adequate standardization.

"Moveable data . . . can be successful if you have adequate standardization." — Robert Kolodner

— Advocate for specific government changes. There are actions that government can take to remove barriers. The health IT community needs to come together to advocate for specific and meaningful changes, such as help removing some privacy barriers and regulations like CLIA.



Keynote: The Innovator's Prescription: How Disruptive Innovation Can Transform Health Care

• Speaker: Clayton Christensen, Robert and Jane Cizik Professor of Business Administration, Harvard Business School

Overview

The problems in health care are largely innovation problems, similar to situations that have been experienced in other sectors. The health care industry is centralized and most care is d in high-cost venues (hospitals) by experts who use expensive technology and rely on intuition. Disruptive innovation is needed so more services can be delivered in lowercost venues, using lower-cost technology, by less expensive providers who use evidence; not intuition. Ultimately, lowercost, higher-quality, "coherent solution shops" will disrupt today's costly, inefficient general hospitals.

Disruptive technologies are needed to enable disruptive innovation. But trying to push technology on clinicians won't work. Adoption of technologies such as electronic medical records (EMRs) will occur only when these technologies help clini-cians perform important tasks ("jobs") more quickly and easily. When that occurs, clinicians will enthusiastically embrace new applications.

Context

Professor Christensen described the pattern of innovation in all industries and explained how this pattern will play out in health care. He also discussed the role that technology will play in disrupting health care.

Key Takeaways

Innovation follows a repeatable pattern.

The main problem in healthcare—that products and services are expensive and inaccessible—is not unique. Most industries experience a similar problem. At an industry's beginning, customers are underserved. Solutions are complicated, expensive, and can be used only by experts. Over time, a solution's performance improves; it become less expensive, easier to use, and more broadly accessible.

The history of computing provides an example. The first computers—mainframes—were highly centralized. They cost millions of dollars and required expertise to use them. Then, micro-computers came along and the industry began to decentralize. This technology—which initially wasn't as good as mainframes—was simpler, less costly, and could be used by more people. Decentralization continued with personal computers, then notebooks, and now handhelds. At every stage of innovation, products became simpler, less expensive, and more broadly used.

Usually, the winners at one level of centralization aren't the winners at the next level. Here's why:

 Incumbents focus on "sustaining" innovations. These are incremental innovations that help companies make better products, at higher margins, for existing customers. Sustaining innovations help incumbents retain their dominant position.

— New entrants focus on "disruptive" innovations. These aren't more sophisticated or technically complex. In fact, they are simpler, lower-margin offerings sold to nonconsumers. These innovations are usually ignored by incumbents as pursuing them would mean selling inferior products at lower margins to non-existent customers. As a result, with disruptive innovations, new entrants almost always win and incumbents lose.

Digital Equipment Corporation (DEC) provides an example. DEC was the dominant micro-computers player, but ignored PCs. DEC's customers weren't asking for them. PCs initially performed poorly and were sold at far lower margins, and there was no market for them. So, new entrants targeted non-users of micro-computers who found PCs to be "good enough." Over time, the performance of PCs improved, rendering micro-computers obsolete and killing DEC.

"It never makes sense for the incumbent to invest at the low end of the market... this is a process that repeats itself in every company and every industry." — Clayton Christensen

Innovation doesn't always result in lower prices.

Conventional wisdom holds that competition and innovation result in lower prices. Conventional wisdom isn't always right. While disruptive innovation results in lower prices, sustaining innovations actually increase prices. This is seen in health. When one hospital gets a new technology, like an MRI, competitors are compelled to follow, which increases prices.

Decentralization is beginning in health care. It will mean delivering services in lower-cost venues.

Health care remains highly centralized with much care taking place in hospitals. The players in the current system won't agree to make less money. For disruption to take place, lower-cost venues need to use technology to deliver more care. Outpatient clinics need to do things being done today in hospitals. Technology needs to allow primary care physicians to perform tasks being done by specialists. We must bring technology to nurse practitioners so they can do things that today require a doctor; and technology must be able to be used in patients' homes.

> "Disruptive innovations and technologies will cause health care services to be delivered at lower-cost venues of care by lower-cost caregivers. That is how healthcare will become more affordable and accessible; not by expecting the existing system to lower their costs and margins." — Clayton Christensen



Successful, profitable innovation requires getting the architecture right.

Early in a product's lifecycle, when it is not yet good enough, the architecture must be proprietary. At this stage, companies must be vertically integrated, doing everything themselves. (In the early stages of computing, IBM made its own components, did its own product design, handled its assembly, created its own operating system and applications, performed its own sales and distribution, and dealt with its field service.) When one company does everything, the focus is on optimizing performance, reliability, and functionality; customization is hard.

When a solution becomes "good enough" an evolution to modularity takes place. Now Intel makes the microprocessor and Microsoft supplies the operating system. Products become commoditized through modularity, then de-commoditized through sub-systems.

In looking at EMRs and other health care IT, the data will become commoditized, systems will become modular, and money will be made in applications.

Killer applications will be developed by understanding the "job" that clinicians are trying to get done.

Companies usually focus on customers as their unit of analysis, or products or categories. But that is not how customers think. They think about "jobs" they are trying to get done. Companies should focus on developing products that customers will "hire to do the job."

Any job has functional, emotional, and social dimensions. The most successful innovators (such as Ikea) integrate these dimensions together.

"It is the job we have to understand; not the customer." — Clayton Christensen

By understanding jobs, companies can develop integrated solutions to help customers perform their jobs better, quicker, and cheaper. When a new product helps customers perform a job they are trying to do, it will be a killer application. If a product doesn't help customers do a job they are trying to do, the product won't be accepted.

> "Make it easier for customers to do a job they want to do."

- Clayton Christensen

This is relevant in thinking about the use of technology in health care. EMRs can't be pushed into use; you can't preach "you should do this." Technology is pulled into use when applications are developed that help clinicians get jobs done they are trying to get done.

Disruptive innovation in health care has a certain set of critical enablers of.

Three things have to happen to enable decentralization:

— Intuition evolves to rules-based methods. At the beginning of an industry, problems can only be solved by experts who have intuition and experience. Over time, patterns can be recognized and people can be taught to solve problems. Eventually, expertise is commoditized and rules are developed. When the ability to treat a disease becomes rules-based, the treatment can be simple and fast, and quality can be consistently high. Right now in health care, the expertise of doctors is being replicated and evidence-based medicine (a simplifying rules-based methodology) is taking hold.

- Rules-based methods become embedded in innovative business models. These methods are used to deliver simpler, better, lower-cost, disruptive innovations.
- Innovative business models are embedded in a new ecosystem. For disruptive innovations to flourish, they often need completely new ecosystems, which can include new suppliers and distribution channels.

General hospitals are not a viable business model. They will be disrupted by "coherent solution shops."

The value proposition of general hospitals' is "we solve any problem." But having the resources and processes to solve any problem creates tremendous costs and complexity. General hospitals engage in three distinct businesses, each with a separate model. They are:

- Solution shops. Like law or consulting firms, these are businesses that diagnose problems and recommend solutions. They get paid on a fee-for-service basis because they don't affect the outcomes.
- Value-added process businesses. These businesses, like manufacturing, bring in raw materials, do something to them, and produce a result. Medical procedures fall into this category. These businesses can be paid a fee based on their outcome.
- Facilitated networks. These businesses connect people.
 Examples include telecommunications businesses and eBay. These businesses have a fee-per-member model.

Disruption of hospitals and other parts of health care is beginning to occur. Examples of what is likely include:

- Coherent solution shops will disrupt general hospitals. They provide value-added processes for specific procedures or chronic diseases. They do one thing well and inexpensively, delivering better outcomes at lower cost. For example, the Shouldice Hospital only does hernia repair, with just one "route" for patients versus 110 for a general hospital. Shouldice's total costs are \$2,300 per procedure versus \$7,000 at a general hospital.
- Retail clinics will disrupt primary care physicians.
- Primary care physicians will disrupt specialists.
- EMRs and apps are necessary to enable disruption.

EMRs are needed to coordinate care. But to get them adopted, substitutable applications must be developed that clinicians want to use because they help them do a job. Information technology in health care must be open and modular, and there must be a common language.

Other Important Points

 Incumbents' reaction. Incumbents initially ignore disruptive innovation, then they seek regulations to protect themselves from it.

The Meeting at Harvard on a Health Information Technology Platform September 29-30, 2009



Models for Adoption of Platforms

- Moderator: Kenneth Mandl, Associate Professor, HMS/Children's Hospital Boston; Director, Intelligent Health Lab, Children's Hospital Informatics Program
- Panelists: Henry Chueh, Chief, Division of Biomedical Informatics, HMS/Massachusetts General Hospital; Director, Lab of Computer Science
 Ahmed Ghouri, Co-Founder and Chief Medical Officer, AnvitaHealth
 David Kibbe, Senior Advisor, American Academy of Family Physicians
 Ross Koppel, Professor, University of Pennsylvania School of Medicine; Research Director, Center for Clinical Epidemiology and Biostatistics
 Mike Stein, Medical Director, Map of Medicine (UK)

Overview

The panelists and attendees all want widespread adoption of electronic health records, and want an interoperable platform that allows data liquidity, enables substitutable applications, and encourages innovation in the development of applications. The question is, "How to get there?"

The prevailing sentiment in this session was to focus on data liquidity, possibly identifying a core set of data to be exposed (such as medication, allergy, and immunization data), and developing standards for sharing data and common API. The ability to access data will encourage application developers to develop innovative applications. The emergence of an application store (or possibly multiple stores) would provide an efficient vehicle for application developers to distribute/sell their applications and for users/purchasers to learn about and obtain new applications.

Context

The panelists shared insights and experiences about adoption of electronic health platforms. Dr. Mandl then led an interactive discussion about APIs, data liquidity, and an "app store."

Key Takeaways

The panelists gave short presentations where they were asked to respond to a specific question about models of adoption.

Chueh

Dr. Chueh has implemented a custom-built electronic medical record platform at Massachusetts General Hospital (MGH). He described the system and relevant lessons learned.

- Architecture matters. The platform you choose makes a difference. For years, MGH had a proprietary platform. In the mid to late 1990s, the organization faced a choice of sticking with its proprietary, monolithic platform or using the Web, which was open and more agile, but controversial and risky. The MGH team ended up building on a web platform, which ultimately made a huge difference.
- Applications are a nuisance. Applications cause developers to think about technology and features and functionality as opposed to the tasks and jobs people need to get done. What has evolved at MGH is not an

application or an EMR; it is a tool to help people get their job done.

"We are not trying to create an application, because most physicians don't care. They don't think about Word or Excel as applications. They just want to get their job done." — Henry Chueh

— Everyone's a specialist. To be more cost effective, every clinician is going to have to be a specialist at what they do, including primary care generalists. At MGH, each function and department wanted their own customized version of an EMR, built to work for their specific tasks and workflow. There are now 20 different versions of MGH's electronic medical record, with new ones being developed.

Ghouri

Dr. Ghouri was asked about the characteristics for an application that health professionals could purchase from an app store. His company, Anvita, provides a real-time clinical analytics engine that is delivered in a modular web services format. They have a series of applications integrated into EMRs. An application for an app store should have the following characteristics:

- *Disruptive usability.* It must be light, modular, interoperable, and simply abstracted.
- Disruptive clinical value. This means it must have some type of interpreted information that cannot be found elsewhere. The information must be just-in-time, highly relevant, and highly modifiable; the application must be painless to implement. An example would be an application a physician could use in the ER for patients presenting with certain symptoms. The application could indicate that among the last 7,000 patients presenting with those exact symptoms, 92% had a certain condition. The application would recommend tests to run and treatments. This is not based on a journal article but on real-time knowledge of high clinical value.

"[A substitutable application] has to have disruptive clinical value." — Ahmed Ghouri

 Negligible barrier to availability. Things like a search engine and Wikipedia should be immediately available.



Anvita has developed a thesaurus which can be delivered as a web service; it is a Rosetta Stone that inferences from the data.

Kibbe

Dr. Kibbe was asked whether substitutable applications can have an emergent property of interoperability without having a great deal of advanced planning. (Dr. Mandl pointed out that iPhone apps talk to each other through common protocols. Certificates will be introduced that allow iPhone apps to share data if they trust each other.)

He answered that "yes"; interoperability is an important and emergent property of electronic health records.

Dr. Kibbe advised focusing on the 70% to 85% of physicians that have not adopted EMRs, who are primarily doctors in small and mid-sized primary care practices. These physicians have no problems adopting iPhones but do have a problem adopting EMRs. This situation is ripe for the disruptive innovation Professor Christensen described. Currently, a handful of products dominate the EMR market. They continue to add features and raise prices, without attracting more physicians to purchase them. There has not been an introduction of cheaper, lower cost, modular products. Even if physicians were given the current products at no cost, they wouldn't want to use them as these products don't meet their needs.

What will stimulate the market to grow is a modular, interoperable approach. We may not be far away. There are companies that make applications for e-prescribing, decision support, and registries that can plug into products and services of other companies. Companies are starting to create "clinical groupware" (which are modular, substitutable, standards-based products).

The key is the specifications that ONC will be coming out with. If they are lightweight enough and open enough, there could be five or six platforms by the end of 2010, with substitutable applications being built for them. It is critical not to tie down the specifications and standards around interoperability. This will allow small entrepreneurial companies to develop new applications.

"One of the keys is to not tie down too tightly the
specifications and standards around
interoperability."
— David Kibbe

Koppel

Dr. Koppel offered comments on the usability of electronic health records and how to make them more usable. EHRs offer a less-than-perfect user experience which can be made much better.

Today tensions exist between data structure, data presentation, interoperability, and navigation. One way to resolve them is through substitutable applications that free and use the data in ways that make sense. Today, workarounds are the norm. They should be studied to figure out what actually works. One form of workaround is customization, which:

- Allows for use of a product.
- Gives a sense of mastery and control.
- Reflects the limitations of the original product.
- Impedes updates.
- Generates cascades of often unwanted consequences.

Better systems are need. Instead of paying physicians lots of money to adopt EHRs, just create better systems that they will want to use. (No one begs or pays clinicians to buy iPhones or wear gloves; they just want to.)

Stein

Dr. Stein's organization focuses on getting evidence into practice, a problem that has existed for hundreds of years. In 1601 Captain James Lancaster led four ships from England to India. On one ship crew members received lemon juice daily, and no one died of scurvy. The crews of the other ships didn't receive lemon juice and 40% died. Despite this, it took the British Navy 194 years and the merchant navy 295 years to put this learning into practice.

The same problem exists today. Research on 30 common conditions shows that recommended care is not provided. There is a huge gap between the evidence and how physicians practice. Yet, there is a great deal of knowledge on how to close that gap. Physicians who use a decision support system are six times more likely to put evidence into practice; if decision support is automatically provided as part of the workflow, a clinician is 112 times more likely to put evidence into practice.

Dr. Stein also shared a few lessons from the UK's experience with electronic medical records. The country made huge mistakes by giving two companies geographic monopolies to install systems. These systems will be in place for 10-15 years. Also, there was no mandate placed on these companies that the systems had to be on an open platform.

Participants' Discussion

Dr. Mandl began the discussion by asking panelists and attendees to consider specific pilot projects ("stop talking and start doing") with a Holy Grail of an "app store" that makes substitutable applications available. Participants discussed the critical aspects of possible pilots. Key points from this discussion included:

- Common API. An application developer suggested a separation between the underlying data and the front end applications that use this data. Data could be exposed to an application through APIs. Having a common API would enable small businesses or individuals to build substitutable applications.
- Lightweight platform. Dr. Chueh suggested development of a lightweight platform that could be made available by



the government at low or no cost, and any user could adopt it regardless of what legacy system is being used.

- Core set of data. Because the prerequisite for any useful application is the ability to access relevant data, one participant suggested identifying a very specific subset of clinically relevant data that is stored in all electronic health systems that can be used for applications. When this core set of data is defined, apps could be developed using it. It might grow over time, but would provide a starting point. (Several other participants strongly supported this idea.) This would likely be a medication list, an allergy list, an immunization record, and other "basics."
- Data availability and liquidity. Some attendees thought that it was less important to focus on an app store and more important to focus on data availability and liquidity. One participant said, "Apps are emerging when data is available . . . what's hard is getting the data." (When Google posted data about the spread of H1N1, people grabbed this data and have done a great deal with it.) Once a core set of data can be defined, the next step is then enabling the liquidity of this data. Many participants want standards to easily move data, making it liquid. Data liquidity with standard APIs would make it easy to pull data out of one system and move it to another. This will drive development of substitutable apps. Some participants believe this can happen relatively quickly—even more quickly than the timing of the meaningful use criteria.
- What about the iPhone? While the iPhone was mentioned as a metaphor, one participant suggest actually considering the iPhone as the platform. As this individual said, "Why not the iPhone, actually?" (Dr. Mandl indicated

that he thought Apple was asking itself that exact question.)

- Pros and cons of an app store. Some participants didn't see an app store as the foremost priority; others concurred with the concept of an app store, but didn't support the idea of just one app store. (Dr. Kohane described the efficiency benefits in the sales process of having one location to go to where all apps resided. It could drive innovation by easily connecting buyers and sellers. Dr. Mandl emphasized that getting one app store up and running would be a start; if multiple app stores emerged, that's fine, but creating one would be a starting point.)
- Dealing with "junk." Some participants expressed concerns that there are a lot of terrible applications that have been developed for the iPhone. Developing terrible apps for health care could be dangerous. Mitch Kapor responded by indicating that in any ecosystem that yields big innovations, there is always a lot of junk. Having experimentation and many different ideas—some of which are great, many of which are junk—is a part of the innovation process. Today medical students use Google and Wikipedia. There is no way to prevent the emergence of new ideas/applications. But the great solutions, the winners, will rise to the top.
- **Common language.** Dr. Stein pointed out that in the UK, the "spine" of an electronic medical record system has been developed but a common language is lacking, which is problematic. He strongly encouraged that HHS invest to create a common terminology.



Technical Requirements for a Successful Health IT Platform

- Speakers: Aneesh Chopra, Chief Technology Officer, Executive Office of the President, Office for Science and Technology Policy
 - Todd Park, Chief Technology Officer, Department of Health and Human Services

Overview

The Obama Administration aims to take a bold step in fostering the development of the country's health technology infrastructure. These speakers presented an idea of reframing the NHIN as the Health Internet and using this Health Internet as a way to advance the use of personal health records (PHRs). By creating the appropriate protocols, participating providers can use the Health Internet to transmit data into an individual's PHR. People will create their own PHRs and will then demand that their providers transmit their data into their PHRs. This will benefit consumers and could be a major factor in driving providers to adopt health IT.

Attendees voiced strong support for this concept and pledged to participate in efforts to launch a pilot in 2010. However, a wide range of considerations were raised including privacy, security, and legal issues, communication issues, policy issues, and more. Participants were universally excited about the focus on collaboration and execution.

Context

These two government officials put forth a vision to turn the NHIN into the Health Internet and laid out a specific proposal for an initiative to begin making the Health Internet into a platform for personal health records. Attendees provided extensive and overwhelmingly positive feedback regarding these ideas.

Key Takeaways

 The government has a vision of turning the NHIN into the Health Internet and using it as the platform for consumer-controlled personal health records.

Mr. Park presented an in-progress idea with the following key components:

- Turning the Nationwide Health Information Network (NHIN) into the "Health Internet." The NHIN is a set of standards and protocols that have been developed to enable organizations to exchange health information over the Internet. Mr. Park suggested referring to the NHIN as the Health Internet. Related to creating the Health Internet is CONNECT, an open source gateway that enables organizations to connect their health IT systems with health information exchanges using the NHIN/Health Internet.
- Bringing consumer health information and personal health records onto the Health Internet. To date, there has been a great deal of work on the Health Internet and on CONNECT, which has been exclusively focused on providers and government organizations. There is a major need and an opportunity to get consumer health information platforms and consumer-controlled personal health records (PHRs) onto the Health Internet.

"There a major need and opportunity... to enable consumers to access and control and direct their own health information using the same fundamental Health Internet that providers and government organizations use to talk to each other." — Todd Park

Actually, having consumers able to access their own health information was part of the original charter of the NHIN. It just hasn't been executed on.

• The vision will be translated into action through a specific initiative, unveiled at this conference, to begin using the Health Internet for PHRs by early 2010.

A specific initiative was proposed by Mr. Park which he described as focused, pragmatic, entrepreneurial, and rapid. This initiative consists of:

- Identifying gaps. The first part of the initiative will involve looking at the protocols that have been developed, assessing whether these protocols are adequate to support PHR platforms, and identifying any gaps in these protocols.
- Addressing the gaps. This would be done by creating iterations of protocols to address the gaps.
- Updating CONNECT. The changes to the protocols would be rolled into CONNECT as an open source gateway to create a "CONNECT2."
- Going live. Mr. Park expressed urgency to move forward. He envisions that this initiative will proceed with identifying the gaps, addressing the gaps, and implementing changes in CONNECT by February 2010. The will enable the new protocols for the Health Internet and the new version of CONNECT to be used in live betas with live patient data no later than the second quarter of 2010. The goal is to prove that this can work.

A practical example of how this could work is as follows: An individual could open a Microsoft HealthVault account. At the patient's request, providers who have adopted the Health Internet (like the VA) could send the patient's medical data to the individual's HealthVault account via the Health Internet (the NHIN). Lots of consumers will be knocking on the doors of lots of providers asking their providers to upload their data. The Health Internet will make it easy for providers to do so.

> "We're all going to be collectively knocking on the doors of folks who we want data from." — Todd Park

The expectation is that these steps will lead to an ocean of data, which will prompt people to start developing applications. It is these applications that will make the data in the PHRs and the entire Health Internet more useful.



The White House strongly supports creating a strong technology infrastructure for health care.

While Mr. Park presented this vision and described the initiative, Mr. Chopra expressed the support of the White House. There is no greater priority for the Obama Administration than health care reform, and necessary for health care reform is a strong, vibrant technology infrastructure. In developing policies to encourage the development of this infrastructure, the Administration's focus is on spurring innovation.

"We need as the foundation for health care reform a strong and vibrant infrastructure of technology." — Aneesh Chopra

In addition to supporting this initiative, Mr. Chopra's role includes coordinating support among other parts of the government, support which has been forthcoming. To date, CMA, the VA, and the Department of Defense all support this initiative. The support of these organizations means that there is potential for data on millions of individuals to be accessed via the Health Internet.

• Participants enthusiastically embraced this concept and shared ideas to consider.

In soliciting reaction and input to this proposal, conference attendees expressed near unanimous and enthusiastic support for the overall vision and the proposed initiative. One participant who had worked at the CDC for several years indicated that the CDC had identified PHRs as a key disruptive innovation with the potential to dramatically improve the population of the United States.

Participants committed to work with the government to hit the aggressive timelines that were expressed. In addition to various government organizations, strong support was voiced by companies like Microsoft, Google, and IBM, from the open source community, from multiple provider organizations, and from organizations such as the Dossier Consortium, CIMIT, and more.

While expressing their support for this initiative, participants raised several topics for consideration. Among them:

- *Transparent process*. It is essential that this entire process be public and transparent.
- Security and privacy. These are obviously priorities and authentication of the patient will be critical.
- Policy issues. There are both technology and policy issues, but participants see the policy issues as more challenging, particularly around ownership of data.
- Legal challenges. This undertaking will definitely face legal challenges that shouldn't be underestimated.
- PR challenges. Communication and trust building must take place to elicit support for this vision and initiative, even among moderates. Part of the PR and communications efforts that must take place include conveying a clear value proposition to consumers about why this is beneficial.

- Focus on the user interface. The leaders of this initiative were urged to pay close attention to the user interface for entering and manipulating data.
- Focus on the borders between platforms, databases, and apps. An issue that must be considered is the changing of data that resides in a PHR. Once data is sent from a provider to a PHR, who may change this data? Also, once the data is used by an application or is shared, the data is no longer controlled and may change. The borders between the platform, the data repository, and the application are critical.
- Linking PHRs and EHRs. Related to exchanging data is the subject of interoperability between PHRs and EHRs. This is an area where middleware and APIs and apps can come in. (A participant indicated that the PHR/EHR issue could be stepping into legal quicksand; if a physician misses something that a patient wrote in his or her PHR, the physician could be held liable.)
- Using the PHR as a communication platform. A few participants noted that the focus of the PHR has been around exchanging data. However, this platform needs to support more than just an exchange of data; it needs to be a communication platform. While a tethered PHR may serve this role in some way, a PHR that has a form of secure messaging may be a way to go.
- Don't forget providers. In addition to companies like Microsoft and Google, providers and other organizations should also be thought of as consumer health data organizations.
- Instrument the environment. One participant suggested the need to "instrument the environment" to know what information is going to which places.
- Roll back some protocols. Several participants agreed that this initiative should involve not just finding and filling gaps in protocols, but also rolling some back.
- Coordination. Several types of coordination were urged, including coordination with ONC around meaningful use (which is important to vendors), coordination with the Federal Trade Commission about how PHRs should be governed, and coordination with the FDA about software applications that may be classified as medical devices and require FDA approval.
- Dealing with states. Will the system truly be consumer oriented and national, putting the consumer at the center regardless of where they are? If so, how will the states react?
- Underserved communities. A participant stressed the importance of ensuring that underserved communities can participate in this initiative. In some ways these communities have the most significant needs and are responsible for significant costs.
- Workforce required. As new platforms and ecosystems are envisioned, a workforce, which is lacking today, is needed to create and operate this ecosystem.
- Scope creep. While lots of organizations want to play, they all have their own agendas and concerns. For progress to be made, a limited scope must be defined and adhered to.





Closing Keynote: Who Killed Health Care?

• Speaker: Regina Herzlinger, Nancy R. McPherson Professor of Business Administration, Harvard Business School

Overview

The U.S. health care system is badly broken with high costs, uneven quality, and a huge uninsured population. The costs of health care hurt the competitiveness of U.S. companies. New legislation will provide universal coverage but is unlikely to address the cost problems. Some people favor a singlepayer solution, but this would cause rationing and hinder the innovations that are needed to change the delivery system.

The solution: consumer-driven health care. The idea is for consumers to spend their own money (tax free) on health insurance and out-of-pocket health services. Suppliers of insurance and health services will develop innovative new offerings to attract consumers, as has occurred in other industries. Transparent information will enable consumers to make informed decisions. To compete, the delivery system will reorganize to provide more personalized, higher-quality, lower-cost health care. This is happening in Switzerland.

Context

Professor Herzlinger described the problems that plague the U.S. health care system. She then explained what consumerdriven health care is and shared her perspective on why this is the solution.

Key Takeaways

• The U.S. health care system provides bad value.

Symptoms of the broken U.S. health care system include:

- Uneven quality. While the U.S. has excellent doctors, hospitals, and technology, the system produces erratic quality. Nearly 300,000 people are killed by hospital errors every three years.
- High costs. The U.S. spends 17% of GDP on health care, while many other countries spend 10% or less of their GDP on health care with comparable results.

"What is the problem with health care?... Essentially, it is that health care is a very bad value for the money." — Regina Herzlinger

- Hurts competitiveness. Health insurance in the U.S. is largely paid for by employers, which can purchase it with pre-tax dollars; individuals must spend post-tax dollars. (In most countries health care is financed by broad-based taxes.) A result is that U.S. companies are at a competitive disadvantage versus global competitors. For example, due to health care costs, General Motors' costs per car are about \$1,000 more than Toyota's, placing GM at a disadvantage. Most CEOs hate having to deal with health care because of the costs and because it is a major distraction.
- 40 million+ uninsured. The number may be 50 million. Most of the uninsured are employed and many (33%)

earn \$75,000 or more per year, placing them in the top 20% of U.S. earners. Many of these individuals work for small employers that don't provide insurance. Because of the cost, these individuals can't afford to purchase it. A family making \$75,000 per year (less than \$40,000 after taxes) can't afford a \$17,000 insurance policy.

- Millions of under-insured. For most who are insured, their lifetime coverage maximum is \$1 or 2 million (a fact which few people know). While this lifetime maximum sounds high, consider that with personalized medicine some drugs can cost \$300,000 or more per year. If a person with a \$1 million lifetime limit required such drugs, their insurance would be exhausted in three years; they would be uninsured and uninsurable.
- Job lock. Many people would like to leave their job to work in start-ups. But they can't afford to because they will lose their health insurance.

We got in this situation because the money for health care has been given to the government and insurers, which provide little choice in options. In addition, in most markets, there are usually just a few (1 or 2) major hospitals or health systems, that act as monopolies or oligopolies.

• Health care reform remain will result in universal coverage, but little else.

There is little question that legislation will result in universal coverage. More people will be insured and Medicaid will be broadened. This much we know. But missing in this legislation is a solution to dealing with health care costs.

The theories for controlling costs are: a single-payer solution or consumer-driven health care (CDHC). The consumer-driven theory will ultimately prevail.

The idea that managed care can control costs has proven incorrect. That leaves two theories for controlling costs: a single payer or consumer-driven health care. Which theory prevails will determine how much money people can spend on health care, what kinds of insurance they can buy, where they can buy it, how much doctors are paid, and whether people can buy the drugs they want.

> "These are the two options. Who is going to control your health care—you or the government?" — Regina Herzlinger

— A single payer. The idea is that all money goes to the government, which as a powerful payer can control costs. To control costs, the government would focus on the 20% of the population that is sick and accounts for 80% of health care spending. The government would tighten spending on this 20% resulting in a rationing of care. In the UK, which has a single-payer system, the rates of treatment for diseases such as end-stage renal disease and breast cancer are far lower than in the United States. Rationing care—withholding treatment for those who need it—isn't a viable option in the U.S.



The other problem with this model is that it would inhibit innovation. Entrepreneurs wouldn't have an incentive to innovate in a single-payer model. It would be too risky, because the government could set prices or impose regulation, and the upside wouldn't be attractive.

— Consumer-driven health care. In this model, employers would provide employees the money previously spent on health insurance, the tax laws would be changed so individuals could purchase insurance with pre-tax money, and through a consumer-driven market. Costs would be controlled, through the following:

- Innovation. Look at the revolution in computers. Entrepreneurs like Steve Jobs, Bill Gates, and Michael Dell have made computers that are better and cheaper, and which consumers gladly purchase.
- Information. A wealth of information, like Consumer Reports, is available to help consumers make informed purchase decisions. Such information, which doesn't exist in health care, would help consumers determine which providers and services were the highest quality and best value.

"I don't think a single payer will work. Instead, we are likely to get consumer-driven health care." — Regina Herzlinger

There is a model where consumer-driven health care is working: Switzerland.

In Switzerland, individuals have to purchase insurance with their own money. There is no Medicaid. Poor people are provided subsidies to purchase insurance. As a result, providers don't know who is rich and poor. This is unlike the U.S. where providers know who is on Medicaid (and 50% refuse to see Medicaid patients).

Currently in Switzerland, 84 insurers compete for people's business. They offer a range of policies, risk-adjust each other, and reinsure each other. Innovation takes place in insurance and in health care. For example, there is a five-year insurance policy that refunds half of a policyholder's payment if he or she meets certain health goals.

Switzerland has excellent information about price and quality, which is used by consumers in making their decisions. Access to health care is high. The quality of care is better than in the U.S. and health care spending represents just 11% of GDP versus 17% in the U.S..

Shifting to a consumer-driven system will increase the amount of demand and will cause supply innovation.

When consumers spend their own money on health insurance, they will spend it differently. Implications include:

— A transition phase. This is similar to what happened with 401k plans. At first employers provided employees a "defined contribution" and employees shopped under the employer's umbrella. Over time, employees viewed their 401k as a personal, tax-sheltered savings vehicle, and a consumer market emerged. Consumer-driven health care could follow a similar trajectory.

- New health insurance policies. Consumers will want choices in all things, including insurance policies. (Consumers' desire for choice is evident in that 35,000 to 40,000 titles are rented from Netflix each day. As has occurred in Switzerland, insurers will compete by creating new offerings. For example, Professor Herzlinger would want a high deductible policy with a \$25 million lifetime maximum. (In Switzerland, 25% of consumers purchase high deductible policies.)
- Reorganization of the delivery system. Increasingly payment will be for "bundles of care." This will lead to a reorganization of the delivery system where "focused factories" emerge to provide services for specific chronic diseases. For example, a diabetic will want care from a focused team of experts and an individual with breast cancer will prefer personalized diagnosis and treatment at a focused breast cancer center.
- Creation of a retail market. As many consumers elect to have high deductible insurance policies, many things that were previously covered by insurance will now be paid for out of pocket. This will lead to more retail medicine. There will be more retail clinics, more concierge medicine, more personalized medical devices, more genetic testing, and more Lasik-type procedures.
- Adoption of personal health records. In a consumerdriven system, consumers will have to manage the integration of services they receive. To do so, they will want a personal health care record (PHCR). But there will be impediments to adoption. These include resistance by providers, insurers, governments, and academics, all of whom will resist the loss of control they will experience as consumers assume greater control.

Ultimately, the market will evolve toward personalized demand, which will lead to personalized supply. The power of the marketplace will result in higher-quality, more integrated health care delivered at lower cost.

• A few very specific steps are needed to help bring about the transformation to CDHC.

These key steps are:

- Tax equality. For employers to stop purchasing health insurance and individuals to start, the tax inequality that exists must be ended. Employers and individuals must get the exact same tax treatment.
- Transparency. To make informed purchase decisions, consumers must have adequate quality and price information about insurance and providers. In 1933, there was a lack of transparency in the financial markets. Instead of regulation, FDR opted for transparency. The government should learn from this precedent.
- Individual mandate. As is the case in Switzerland, all individuals must be required to purchase health insurance (with policies having certain minimum standards), and with subsidies for those who can't afford policies.

Bringing about this transformation will be a long journey, until the tipping point comes. The transition to managed care demonstrates this. Over a seven-year period the adoption of managed care went from 29% to 75%. The same can happen with CDHC.

KEYNOTE SPEAKERS



Mitchell Kapor

Center for American Progress | Sr Advisor on Health IT Kapor Enterprises, Inc | President

Mitch Kapor is the founder of Lotus Development Corporation and the designer of Lotus 1-2-3, the "killer application" often credited with making the personal computer ubiquitous in the business world in the 1980s. He has been at the forefront of the information technology revolution for a generation as an entrepreneur, investor, social activist, and philanthropist. Other organizations in which Mitch has played an important role include UUNET (founding investor), the first successful independent commercial

Internet Service Provider; The Electronic Frontier Foundation (co-founder), which protects freedom and privacy on the Internet; Real Networks (founding investor), which pioneered the use of streaming media over the Internet; the Mozilla Foundation (founding Chair), maker of the open source web browser Firefox; and Linden Research (founding investor, Board Chair), the creator of the first successful open virtual world, Second Life. He received a B.A. from Yale College in 1971 and studied psychology, linguistics, and computer science as part of an interdisciplinary major in Cybernetics.



Clayton Christensen

Harvard Business School | Robert and Jane Cizik Professor

Professor Christensen, regarded as one of the foremost experts on innovation and growth, holds a B.A. with highest honors in economics from Brigham Young University (1975), and an M.Phil. in applied econometrics from Oxford University (1977), where he studied as a Rhodes Scholar. He received an MBA with High Distinction from the Harvard Business School in 1979, graduating as a George F. Baker Scholar. He was awarded his DBA from the Harvard Business School in 1992.

Christensen is an experienced entrepreneur, having started three successful companies. Prior to joining the HBS faculty, Professor Christensen served as chairman and president of CPS Technologies, a firm he co-

founded in 1984. He became a faculty member at the Harvard Business School in 1992, and was awarded a full professorship with tenure in 1998.

From 1979 to 1984 he worked as a consultant and project manager with the Boston Consulting Group. In 1982 Professor Christensen was named a White House Fellow, and served through 1983 as assistant to U.S. Transportation Secretaries Drew Lewis and Elizabeth Dole. In 2000, Christensen founded Innosight, a consulting firm that builds on disruptive innovation frameworks to help companies create new growth opportunities. In 2007, he founded Rose Park Advisors, an investment firm, which is focused on identifying investment opportunities by applying the framework of disruptive innovation. Christensen is also the founder of Innosight Institute, a non-profit think tank, whose mission is to apply his theories to the most vexing problems in the social sector.

Professor Christensen is the bestselling author of five books, including his seminal work The Innovator's Dilemma (1997) which received the Global Business Book Award for the best business book of the year. Recently, Christensen has focused the lens of disruptive innovation on social issues such as education and health care. Disrupting Class (2008) looks at the root causes of why schools struggle and offers solutions, while The Innovator's Prescription (2009) examines how to fix our healthcare system.

Professor Christensen's writings have won a number of awards, such as the Production and Operations Management Society's William Abernathy Award, presented to the author of the best paper in the management of technology; the Newcomen Society's award for the best paper in business history; and the 1995, 2001, and 2008 McKinsey Awards for articles published in the Harvard Business Review.

Professor Christensen was born in Salt Lake City, Utah. He worked as a missionary for the Church of Jesus Christ of Latter-Day Saints in the Republic of Korea from 1971 to 1973 and speaks fluent Korean. He has served the Boy Scouts of America for 25 years. He and his wife Christine live in Belmont, MA. They are the parents of five children.



Regina Herzlinger

Harvard Business School | Nancy R. McPherson Professor Regina E. Herzlinger was the first woman to be tenured and chaired at Harvard Business School and the first to serve on a number of corporate boards. She is widely recognized for her innovative research in health care, including her early predictions of the unraveling of managed care and the rise of consumer-driven health care and health care focused factories, two terms that she coined. Money has dubbed her the "Godmother" of consumer-

driven health care. She was profiled most recently by BusinessWeek in "If Health Care Were Run like Retail" and by Roll Call in "Obama, Congress: Take a Look at the Swiss Answer to Health Care."

All her health care books have been best sellers in their categories. Her newest book, Who Killed Health Care? (NY: McGraw-Hill, 2007), was selected by the U.S. Chamber of Commerce as one of the ten books that changed the debate in 2008. Noted Merrill Matthews; "There are two powerful, well-respected and highly accomplished women who are driving the health care reform debate in the United States. One is Secretary of State Hillary Clinton, whose first attempt at dramatically reforming the U.S. health care system turned into a political disaster. The other is Harvard Business School economist Regina Herzlinger, one of the country's most knowledgeable and articulate experts on the U.S. health care system, who has been pointing the way toward a "consumer-driven" system for years."

She has won the Consumers' for Health Care Choices Pioneer in Health Economics award, the American College of Healthcare Executives' Hamilton Book of the Year award twice, the Healthcare Financial Management Association's Board of Directors award, and Management College of Physician Executive. Modern Healthcare's readers regularly selected her among the "100 Most Powerful People in Healthcare" and Managed Healthcare named her one of health care's top ten thinkers. In recognition of her work in nonprofit accounting and control, she was named the first Chartered Institute of Management Accountants Visiting Professor at the University of Edinburgh. In addition, she has delivered many keynote addresses at annual meetings of large health care and business groups and been selected as one of the outstanding instructors of the Harvard Business School MBA Program.

Professor Herzlinger has served on the Scientific Advisory Group to the U.S. Secretary of the Air Force and as a board member of many private and publicly-traded firms, mostly in the consumer-driven health care space, often as chair of the Governance and Audit subcommittees. Regina Herzlinger received her Bachelor's Degree from MIT and her Doctorate from the Harvard Business School.

She has been married to Dr. George Herzlinger, her MIT classmate, for 43 years. Both of their children graduated from Harvard College. Her daughter is a Fellow in Endocrinology; her son, an Infantry Captain in the U.S. Army who served two tours in Iraq, has safely returned to the U.S.

MEETING CO-CHAIRS



Kenneth Mandl

Harvard Medical School | Associate Professor Intelligent Health Laboratory, Children's Hospital Informatics Program | Director

A pioneer in both consumer informatics and population health monitoring, Dr. Mandl has innovated and published extensively in the areas of personally controlled health records, disease outbreak detection, public health surveillance, and national health information infrastructure. Recognized for his teaching and research, he has received the Barger Award for Excellence in Mentoring at Harvard Medical School and the Presidential Early Career Award for Scien-

tists and Engineers, the highest honor bestowed by the United States government to outstanding scientists and engineers. Mandl co-directs a CDC Center of Excellence in Public Health Informatics. He is working to translate biosurveillance approaches to pharmacosurveillance. He is a member of the Advisory Committee to the Director of the CDC. He is an attending physician in pediatric emergency medicine and is also a faculty member of the Harvard Medical School Center for Biomedical Informatics and affiliated faculty at the Harvard-MIT Division of Health Sciences and Technology.



Isaac Kohane

Harvard Medical School | Henderson Professor Children's Hospital Informatics Program | Director HMS Center for Biomedical Informatics | Co-Director HMS Countway Library of Medicine | Director

Isaac (Zak) Kohane is the director of the Children's Hospital Informatics Program and is the Henderson Professor of Pediatrics and Health Sciences and Technology at Harvard Medical School (HMS). He is also the co-Director of the HMS Center for Biomedical Informatics and Director of the HMS Countway Library of Medicine. Dr.

Kohane leads multiple collaborations at Harvard Medical School and its hospital affiliates in the use of genomics and computer science to study diseases (particularly cancer and autism) through the perspective of biological development. He also has developed several computer systems to allow multiple hospital systems to be used as "living laboratories" to study the genetic basis of disease while preserving patient privacy. Among these, the i2b2 (Informatics for Integrating Biology and the Bedside) National Computing Center has been deployed at over 30 academic health centers internationally. Dr. Kohane has published over 180 papers in the medical literature and authored a widely used book on Microarrays for an Integrative Genomics. He has been elected to multiple honor societies including the American Society for Clinical Investigation and the American College of Medical Informatics. He leads a doctoral program in genomics and bioinformatics at the Division of Health Sciences and Technology at Harvard and MIT.

PLANNING COMMITTEE



Mary Lee Kennedy

Harvard Business School | Executive Director, Knowledge and Library Services

Mary Lee Kennedy is Executive Director of Knowledge and Library Services. The group is responsible for enabling the exchange of ideas, expertise and information in support of research and teaching at Harvard Business School. She oversees four practice areas: Research and Course Support, Information Management, Knowledge Dissemination, and Content Sourcing. Prior to joining Harvard University Mary Lee led global knowledge management teams at Microsoft Corporation and Digital Equipment Corporation. Mary Lee has presented in na-

tional and international forums, as well as published, on the topics of knowledge management, collective intelligence, digital scholarship and strategies for designing and implementing information products and services. Mary Lee can be reached at <u>mlkennedy@hbs.edu</u>

Don Oppenheimer

Harvard Kennedy School of Government | Associate Dean and Chief Information Officer

As the school's CIO, Don Oppenheimer has direct responsibility for information technology, telecommunications, media services, knowledge services and the school's library. Don's background includes nearly thirty years of general management, information technology and organizational strategy experience in the private sector. Prior to joining the Harvard Kennedy School in January 2008, he was an independent consultant providing advice and counsel to senior managers at large professional service firms in the areas of organizational development, information technology and knowledge management. Prior to becoming an independent consultant, Don spent ten years as a CIO at two professional service firms and fifteen years as a management consultant and Partner at Mercer Management Consulting, a leading global strategy consulting firm. He received his BA, magna cum laude, from Claremont McKenna College and his MBA from the Kellogg Graduate School of Management at Northwestern University.

OPEN OR CLOSED PLATFORMS? ONE OR MORE PLATFORMS?



Sean Nolan

Microsoft Health Solutions Group | Chief Architect

As chief architect for the Health Solutions Group at Microsoft Corp., Sean Nolan is responsible for design and development across the suite of HSG products. His specific responsibilities include product definition and design, partner engagement and support, and engagement with key customers to ensure success in the marketplace. Before rejoining Microsoft in 2006, Nolan served as founder and president of Software Poetry Inc., a software and management consultancy. While at Software Poetry, Nolan worked with venture capital firms to deliver technical diligence on early-stage investments, and provided product definition, strategy and execution services to startup ventures, focusing on the online advertising and e-commerce sectors. Before Software Poetry, Nolan was chief technical officer for drugstore.com inc., where he led the design and implementation of its award-winning e-

commerce systems. While there, he was honored as one of the nation's Premier 100 IT Leaders for 2001 by Computerworld magazine. Nolan has co-founded a number of other technology ventures, including Cognisoft Corp., where he architected one of the first Web-based knowledge management systems. Cognisoft was ultimately acquired by Verity, where Nolan served as vice president of Technology for Information Applications. A graduate of Dartmouth College, Nolan began his software career at Microsoft, where he was the development manager for the original Microsoft Network (MSN®) client tools and their conversion to Internet technologies.



Ben Adida

Harvard Medical School/Children's Hospital Boston | Research Faculty Indivo Project | Director

Ben Adida is Research Faculty at Harvard Medical School / Children's Hospital Boston, a research fellow with the Center for Research on Computation and Society at Harvard, and an affiliate with Harvard's Berkman Center for Internet and Society. He is a technical advisor to Creative Commons and, in that capacity, chairs a W3C task force on bridging the semantic and clickable webs. His research focuses on autonomy, or how to empower individuals on the Internet with secure, private, irrevocable, and efficient access to their data. Specifically, Dr. Adida studies security and privacy of personal health records, the security of web applications, interoperable web-based structured data, and the design of secure voting

systems. He has developed extensive free software for more than 10 years. Dr. Adida received his PhD at MIT in the Cryptography and Information Security group. Previously, he co-founded two software startups that developed database-backed web application platforms based on free/open-source software.



Hamish Fraser

Harvard Medical School/Brigham and Women's Hospital | Ass't Prof Partners in Health | Director, Informatics and Telemedicine

Dr Fraser is an Assistant Professor of Medicine at Harvard Medical School and Associate Physician at the Brigham and Women's Hospital. He trained in general Medicine, Cardiology and knowledge based systems in the UK and completed a fellowship in Clinical Decision Making and Cardiology at MIT and the New England Medical Center. As the Director of Informatics and Telemedicine at Partners

In Health he leads the development of web-based medical record systems and data analysis tools to support the treatment of drug-resistant tuberculosis and HIV in Peru, Haiti, Rwanda, Lesotho, Malawi and the Philippines.

Dr Fraser is a cofounder with colleagues from the Regenstrief Institute and the South African Medical Research Council, of an international collaboration to develop flexible, open source medical record system platform for use in developing countries- the OpenMRS collaborative. OpenMRS is now also used to support patient treatment in PIH projects in Rwanda, Lesotho, Malawi, Haiti and Peru as well as projects in at least ten other countries led by collaborators and other organisations. He also leads the development of pharmacy information management systems, and has a strong interest in the evaluation of medical information systems in developing countries.



John Halamka

Harvard Medical School/Beth Israel Deaconess Medical Center | CIO Health IT Standards Panel | Chairperson

John D. Halamka, MD, MS, is Chief Information Officer of Beth Israel Deaconess Medical Center, Chief Information Officer of Harvard Medical School, Chairman of the New England Healthcare Exchange Network (NEHEN), Chair of the US Healthcare Information Technology Standards Panel (HITSP), co-Chair of the HIT Standards Committee, and a practicing Emergency Physician. As Chief Information Officer of Beth Israel Deaconess Medical Center, he is responsible for all clinical, financial, administrative

and academic information technology serving 3000 doctors, 14000 employees and two million patients. As Chief Information Officer of Harvard Medical School, he oversees all educational, research and administrative computing for 18000 faculty and 3000 students. As Chairman of NEHEN he oversees clinical and administrative data exchange in Massachusetts. As Chair of HITSP/co-Chair of the HIT Standards Committee he coordinates the process of electronic standards harmonization among stakeholders nationwide.



David McCallie

Cerner | Vice President, Medical Informatics

Cerner Medical Informatics Institute | Director

David P. McCallie, Jr., MD, is responsible for a research and development team focused on cultivating innovations at the intersection of computer science and clinical medicine. His team is currently working on applications of semantic content extracted from the clinical record using natural language parsing techniques. Previous projects include the design of Cerner's ePrescribing system and of the Community Health Record (PHR.) McCallie has participated actively in the definition and promotion of personally-controlled health records, known as Independent Health Record Trusts. McCallie joined Cerner in 1991. He was previ-

ously responsible for the development of Cerner's clinical nomenclature system and the PowerNote structured clinical documentation tool. He also was the chief architect for Open Clinical Foundation, Cerner's clinical data repository.. Prior to joining Cerner, McCallie served as Director of Research Computing at Children's Hospital in Boston. He was an Instructor in Neurology at Children's Hospital and at Harvard Medical School. His research background includes using computers to create three-dimensional models of seizure-induced brain electrical activity. At Duke University, McCallie earned a bachelor's degree in electrical engineering. He earned his medical degree from Harvard Medical School. McCallie was recently appointed to the Office of the National Coordinator's HIT Standards Committee, where he is active in the Privacy and Security workgroup. McCallie has published numerous works and presented frequently on the subject of healthcare informatics. He is a member of the American Medical Informatics Association.

BUSINESS-GOVERNMENT INTERACTIONS TO SUPPORT A PLATFORM



Google | Vice President, Research and Special Initiatives

Alfred joined Google in November of 2007 and is responsible for research across Google and also a growing collection of special initiatives – typically projects with high strategic value to the company, but somewhat outside the mainstream of current products. They include Google's health, open source, and university initiatives. Previously, Alfred was Vice President of Strategy and Technology IBM's Software Business, and prior to that, he was Vice President of Services and

Software Research across IBM. He was also founder and CEO of Transarc Corporation, a pioneer in distributed transaction processing and wide area file systems, and was an Associate Professor of Computer Science at Carnegie Mellon University, specializing in highly reliable, highly scalable distributed computing. Alfred received his Ph.D. in Computer Science from Stanford and his A.B. in Applied Mathematics from Harvard. He is a member of the National Academy of Engineering, American Academy of Arts and Sciences, a Fellow of the IEEE and ACM, and the recipient of the 2001 IEEE Computer Society's Tsutomu Kanai Award for work in scalable architectures and distributed systems.



Rob Kolodner

Dept. of Health & Human Services | Retired as National Coordinator for Health IT

On September 22, Robert M. Kolodner MD, retires from Federal service after 31-years as a clinician and leader. As National Coordinator, Dr. Kolodner acted as the principal advisor to the HHS Secretary on all health IT initiatives. His responsibilities included developing, maintaining, and directing implementation of a health IT strategic plan as well as directing national activities needed to advance the nationwide adoption of personcentered, interoperable health IT solutions. Dr. Kolodner's long-standing interest is in how computer use might be used by health care providers to

support and improve the quality of mental health care delivery in the Department of Veterans Affairs (VA). For over 28 years prior to transferring to HHS, Dr. Kolodner had been a key clinical leader in VA where he contributed to and led the most extensive implementation and use of health IT in the nation. During his first 15 years in VA, Dr. Kolodner not only provided care to veterans as a front-line psychiatrist at the Atlanta and Dallas VA Medical Centers but was also chair of the clinical group that oversaw the release of the first national VA software for mental health clinicians and then chair of the national VA interdisciplinary group responsible for the requirements across all clinical modules. In 1993, Dr. Kolodner moved to Washington, DC into a national health IT leadership position as the Director of the Medical Information Resources Management Office, responsible for all health automation activities in VA. In 1996 Dr. Kolodner was selected as Associate Chief Information Officer for Enterprise Strategy in the newly created Office of Information in the Veterans Health Administration. Over the next 10 years, Dr. Kolodner was the leading clinician and national champion in the development, deployment,

and integration of the VistA system throughout VA, ultimately as VA's Chief Health Informatics Officer. Moreover, he promoted and guided VA activities related to the establishment of a life-long, comprehensive, computerized clinical record for military personnel and our nation's veterans. In support of this latter goal, Dr. Kolodner was instrumental in establishing the Federal Health Information Exchange program – an interagency health technology initiative that supports improving care to veterans – and strengthening the working relationship between VA and the Department of Defense. In addition, he fostered the idea for My HealthVet – a health portal for veterans and their families to access health information, tools and services via the Internet. Dr. Kolodner received his undergraduate degree from Harvard College and his medical degree from Yale University School of Medicine. He completed a clinical fellowship in Medicine at Harvard University School of Medicine and his Psychiatric residency at Washington University School of Medicine. Dr. Kolodner has medical specialty board certification in psychiatry.

David Liss



New York-Presbyterian Hospital | Vice President, Government Relations and Strategic Initiatives

J. David Liss is responsible for developing strategic resources to support the mission of New York State's largest private provider of healthcare. These efforts include government relations, the hospital's grant program and its technology development and transfer office. Through partnerships with government and private industry, Mr. Liss develops models for achieving NYP's efforts to provide the best quality healthcare in the world. In one example of these activities, Mr. Liss helped NYP to develop the largest civilian telemedicine project ever funded, the \$56 million CMS diabetes telehealth project known as IDEATel (www.ideatel.org).

Before accepting the position with NYP, Mr. Liss was Executive Director of the Center for Advanced Technology (CAT) at Columbia University. In this role, he was responsible for transferring technology from the University's Departments of Medical Informatics and Computer Science and its Genome Center to the private sector. In that role, he has worked closely with established companies such as Verizon and GE as well as developing new technology start-up companies such as Memory Pharmaceuticals—a new drug company—and RemoteRealtiy, manufacturers of the Omnicam. The CAT's expertise in medical informatics has led to breakthrough work in the fields of electronic patient records and Web-based telehealth.

Prior to working at Columbia, Mr. Liss was Director of Government Affairs at Verizon Corporation, responsible for federal and New York City intergovernmental relations and political communications. As the leader of the company's political communications section, he created the newsletter *Teleforum* that is mailed to 75,000 New Yorkers and he started the company's op. ed. advertising program in local media. He first became involved with the fields of telehealth and medical informatics while addressing congressional legislation that created standards for telehealth.

Before his nine-year tenure with Verizon, Mr. Liss worked for the City of New York in a variety of communications roles, including speech writing and media relations.

Mr. Liss is a steering committee member for the e-Health Initiative and advises Connecting for Health, a program of the Markle and Robert Wood Johnson Foundations. He serves on the policy committee of the National Alliance for Health Information Technology. He serves on the legislative committee of the Clinical Research Forum of the Academic Health Centers—an advocacy organization sup-

BUSINESS-GOVERNMENT INTERACTIONS TO SUPPORT A PLATFORM (CON'T)

porting clinical research. He is a board member of NYCRx, a not-for-profit organization led by the New York City Department of Health and Mental Hygiene seeking to help the City's at need population have greater access to pharmaceuticals.

Mr. Liss served from 2001-2003 on the New York Region Counter Terrorism Committee, a task force organized by the Office of the Mayor and the FBI to coordinate regional response to terrorism. He served on Mayor Rudolph Giuliani's New Media Advisory Commission and was Chairman of its Research Subcommittee. He is a member of the American Telemedicine Association and former Co-Chairman of its Legislative Task Force. In 1990, Mr. Liss served on the NYC Mayor's Management Task Force for Education under David Dinkins. Mr. Liss also served from 1994-97 on the Policy Committee of the of the New York Chamber of Commerce. He has served as past committee member of Government Affairs Professionals (a New York-based industry association) and served from 1995-97 on the New York City Host Committee, a joint effort of the Mayor's office and the Convention and Visitors Bureau.

Charles Friedman

Dept. of Health and Human Services | Deputy National Coordinator for Health IT

MODERATOR



Mark Frisse

Vanderbilt University | Accenture Professor of Biomedical Informatics Center for Better Health | Director, Regional Informatics Programs

Mark Frisse is the Accenture Professor of Biomedical Informatics at Vanderbilt University. He also serves as Director of Regional Informatics Programs through the Vanderbilt Center for Better Health and in this capacity is responsible for coordinating regional, state, and national projects aimed at the application of information technology to advance patient care. Working through the office of the Governor of the State of Tennessee, he is director of one of the Nation's six AHRQ-funded state and regional demonstration programs in health information technology, focusing on the development of a comprehensive health information exchange system for southwest Tennessee. Mark has also served as Vice President in First Consulting Group's Clinical Transformation Practice and as Vice President and Chief Medical

Officer of Express Scripts, one of the Nation's largest pharmacy benefits manager. While at Express Scripts he helped create RxHub, was director of a data management subsidiary, and oversaw the development of DrugDigest.org, a consumer pharmacy information web site. A Board Certified Internist, Dr. Frisse was a Professor of Medicine and Associate Dean at Washington University School of Medicine and he served as academic director of the Health Services Executive MBA program at the John M. Olin School of Business.

MODELS FOR ADOPTION OF PLATFORMS



Ahmed Ghouri AnvitaHealth | Co-Founder and Chief Medical Officer

Ahmed Ghouri, M.D., co-founder of Anvita Health, is a board certified anesthesiologist and principal author of 70 scientific publications. As chief medical officer for Anvita he oversees all clinical informatics and serves as Anvita's liaison to the medical community. Dr. Ghouri served as co-investigator on the Phase III trials for FDA approved pharmaceutical products flumazenil (Romazicon) and desflurane (Suprane). He served as an assistant clinical professor at the University of California, Irvine School of Medicine, and held an attending anesthesiologist position at Cedars Sinai Medical Center in Beverly Hills, California. He received a medical degree from the Washington University School of Medicine in St. Louis, Missouri, where he also completed a biomedical engineering research fellowship.



Mike Stein

Map of Medicine | Medical Director

Mike qualified as a medical doctor and subsequently completed a doctorate in Immunology at the University of Oxford as a Rhodes Scholar. He was appointed Junior Research Fellow in Medicine at Trinity College, Oxford (1991-95) where he taught medical students, conducted molecular and cell biological research, and co-authored The Hands on Guide for House Officers (Donald and Stein; 3rd Edition, Blackwell Publishers) which is provided by the Medical Defense Union to all junior doctors in the UK.

Mike became Medical Publisher for Blackwell Publishers (1996-99), the largest society publisher in the world. In 1999, he co-founded Medschool.com

(now called MedSN (www.medsn.com), a leading California-based online medical education and informatics company. In 2001 he established Medic to Medic with University College London, and directed development of the Map of Medicine®, a novel knowledgebase for healthcare, which is currently being deployed across the National Health Service (NHS) in England. The product was acquired by Hearst Business Media in April 2008 and Mike transferred to Hearst as Medical Director at Map of Medicine Ltd.



Henry Chueh

Harvard Medical School | Assistant Professor Massachusetts General Hospital | Chief, Division of Biomedical Informatics MGH Laboratory of Computer Science | Director MGH/MGPO Lawrence Ctr for Quality & Safety | Chief Medical Informatics Officer

In addition to his academic leadership and research responsibilities, Dr. Henry Chueh is a practicing staff internist at the MGH Internal Medicine Associates. A graduate of Harvard College, he received a medical degree from Harvard Medical School and a

master's degree in medical informatics through the combined Harvard/MIT Health Sciences and Technology Program. After his residency training in internal medicine at MGH, Dr. Chueh was an NIH/NLM Fellow in Medical Informatics at the MGH Laboratory of Computer Science. Following his informatics fel lowship, Dr. Chueh joined the MGH Department of Medicine faculty. His research at MGH has revolved around novel platforms and architectures for electronic health records and clinical research informatics.

In 1998 he created and continues to foster the Oncall clinical systems platform that serves as the

MODELS FOR ADOPTION OF PLATFORMS (CON'T)

basis for electronic health record activities in over seven different clinical specialties at MGH. Oncall is uniquely positioned as a system developed entirely at the LCS, but fully integrated with Partners Information Systems infrastructure. Current research efforts involve the exploration of specialized electronic health records; XML Web services architectures for clinical data sharing and transformation, informatics to transform health care delivery models, clinical population informatics, and clinical data warehouses for assessing outcomes.

Dr. Chueh was a past member of the NIH Biomedical Library Review Committee, the primary research study section for the National Library of Medicine, and is currently serving on the Board of Scientific Counselors for the Lister Hill Center for Biomedical Communications, the research division of the National Library of Medicine. He has been an elected member of the American College of Medical Informatics (ACMI) since 1999.



David Kibbe

American Academy of Family Physicians | Senior Advisor

Dr. Kibbe is well known and highly respected as an innovator and independent thought leader in the fields of primary care EHR technology and consumer health IT in the United States. A co-developer of the ASTM Continuity of Care Record standard, or CCR, that utilizes XML for computable health information exchange, he is an experienced clinician who practiced medicine in private and academic settings for more than 15 years. Dr. Kibbe has taught informatics at the School of Public Health, University of North Carolina at Chapel Hill, and founded two health care IT companies. From 2002 until 2006, Dr. Kibbe was the founding Direc-

tor of the Center for Health Information Technology for the American Academy of Family Physicians (AAFP), the membership organization that represents over 95,000 U.S. family doctors. The Center is now the locus of the AAFP's technical expertise, advocacy, research and member services associated with health IT, and a leading international resource on information and communications technology for physicians in primary care. Kibbe maintains his relationship on a part time basis with the AAFP as Senior Advisor, is an active blogger on health IT policy, and provides strategic, policy, and IT consulting to a wide variety of firms and institutions. He is a frequent speaker on health IT trends and innovations, especially on the topics of patient engagement and physician-patient information sharing.



Ross Koppel

University of Pennsylvania School of Medicine | Professor Center for Clinical Epidemiology and Biostatistics | Research Director

Professor Koppel's work in medical informatics reflects his 40 year career as an applied sociologist and professor of statistics, ethnographic research, survey research, sociology of work and organizations, and medical sociology. Dr. Koppel has taught at the University of Pennsylvania for the past 17 years. For the last seven years, he has been the principal investigator of Penn's study on hospital workplace culture and medication errors, at the Center for Clinical Epidemiology and Biostatistics (School of Medicine). In addition to his role as principal investigator, Koppel is also an affiliate faculty member at Penn's Medical School. Much of Professor Koppel's recent

work focuses on the impact of technology and the workplace on medication error. He has also examined workflow in medical workplaces, medical sociology, the link between technology and jobs, and ethics in social research. Dr. Koppel has authored or co-authored more than 160 academic papers and articles, several monographs, and several books and book chapters. Koppel is the recipient of the William Foote Whyte Award, the Robert E. Park Award, the Distinguished Career Award, and several other awards for his work in sociological practice. He has served as president of all of America's associations of applied sociologists.

TECHNICAL REQUIREMENTS FOR A SUCCESSFUL HEALTH IT PLATFORM

Aneesh Chopra

Executive Office of the President, Office for Science and Technology Policy | Assistant to the President and Chief Technology Officer

Aneesh Chopra is the Chief Technology Officer and Associate Director for Technology in the White House Office of Science & Technology Policy. He was sworn in on May 22nd, 2009. Prior to his appointment, he served as Secretary of Technology for the Commonwealth of Virginia from January 2006 until April 2009. He previously served as Managing Director with the Advisory Board Company, a publicly-traded healthcare think tank. Chopra was named to Government Technology magazine's Top 25 in their Doers, Dreamers, and Drivers issue in 2008. Aneesh Chopra received his B.A. from The Johns Hopkins University and his M.P.P. from Harvard's Kennedy School. He and his wife Rohini have two young children.

Todd Park

Dept. of Health and Human Services | Chief Technology Officer

Todd Park joined HHS as its new Chief Technology Officer at the end of August. In this role, he is responsible for helping the leadership of HHS and its agencies harness the power of data, technology, and innovation to improve US health and the delivery of essential human services. Prior to joining HHS, Todd served as a Senior Fellow at the Center for American Progress (CAP), focused on health IT policy and health reform. Prior to CAP, Todd co-founded health IT company Athenahealth in 1997 and co-led its development over the next decade into a leading provider of web-based software and business services to US physicians. He also cofounded Ventana, a company which is developing a new type of web-based service to help patients navigate the American health care system, and Healthpoint, a company dedicated to improving the health of the rural poor in India through primary care telemedicine, clean water, and affordable drugs and diagnostics. Prior to Athenahealth, Todd served as a management consultant with Booz Allen and Hamilton, focused on health care strategy and operations. Todd graduated magna cum laude and Phi Beta Kappa from Harvard University with an A.B. in Economics.