BIG DATA
& HEALTHCARE
Acknowledgments

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About the Mass Technology Leadership Council

With more than 550 member companies, the Mass Technology Leadership Council (MassTLC) is the region’s leading technology association and the premier network for tech executives, entrepreneurs, investors and policy leaders. MassTLC’s mission is to accelerate innovation by connecting people from across the technology landscape, providing access to industry-leading content and ideas, and offering a platform for member companies to collectively advance their interests. For more information on MassTLC visit www.masstlc.org
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Preface

This big data and healthcare report is part of the Mass Technology Leadership Council’s (MassTLC) work with the Mass Technology Collaborative’s eHealth Institute in support of Massachusetts Governor Deval Patrick’s ongoing initiatives to identify and exploit key economic and leadership opportunities for the Commonwealth.

We engaged in this initiative to foster greater collaboration between sectors; to spotlight and enhance the leadership capacity of Massachusetts; to attract talent, investment, and new business; and to position our region at the forefront of the Big Data revolution. We have employed a Delphi methodology to gather the leading minds within key industries to lend their expertise to help identify both short- and long-term opportunities.

Our work builds upon our 2012 report, Big Data and Analytics: A Major Market Opportunity for Massachusetts, and subsequent big data Delphi roundtable report, finding, among other themes, that leadership opportunities exist for Massachusetts in capitalizing on its strengths and focusing on actionable business insights.

With this, we set out in 2013 to “bump” and connect the region’s big data thought leaders with those in other key strength areas, including healthcare, life sciences, and urban infrastructure.

We leveraged our four-decade legacy of data and technology leadership to explore some of the most vexing challenges and opportunities of our times.

Our Delphi process involved four steps: (1) interview thought leaders representing both big data and each of the target industries, (2) survey participants to identify areas of consensus as well as differences of opinion, (3) provide survey findings back to the Delphi participants, and (4) explore the opportunities, barriers, and possible public/private interventions through an interactive roundtable.

On November 19, 2013, MassTLC, with the support of the Massachusetts eHealth Institute (MeHI) at MassTech Collaborative, convened a roundtable of big data and healthcare thought leaders from industry, academia, and government to identify and explore transformative healthcare initiatives that have already overcome data access constraints and are primed to leverage innovative data science tools and models.

We believe the reader will find it instructive to read both the healthcare and life sciences reports together as there is increasing convergence between data sources produced and used in these industries and both reports touch on common themes of data quality, metadata, and access to data.
Massachusetts plays a leading role in advancing healthcare reform for the nation and has unique resources to build upon in advancing new data-driven methods to improve healthcare delivery.

As digital technology matures in healthcare, the landscape is quickly changing from an environment of data scarcity to one of data abundance.

Naomi Fried: “I think we all agree that big data is going to be transformative in healthcare. The first step obviously is to have the data, and I think we’ve made good progress. We’ve digitized a lot of information. We have medical records going in across the country. The next piece is around liquidity, getting it out. I think progress is being made there.”

Where can big data methods be best applied to accelerate progress in transforming healthcare delivery? That’s the essential question we posed to the thought leaders that we convened for our big data and healthcare Delphi initiative.

Even with the forward-thinking innovators we assembled, it was difficult to overlook the ongoing challenges related to gaining access to, and integrating, disparate data sets, so we devote a section to the technical, cultural, and administrative challenges that still exist.

While many questions were raised about maintaining trust in the quality of the datasets that are growing in number and size, the assembled data experts agreed that the best method for gaining understanding of the data is making it more accessible.

Micky Tripathi: “In industry after industry what we’ve seen is that it only gets better by using the data. So … to the point about not letting the perfect be the enemy of the good, it only gets better by exposing it, by having people use it and play around with it.”

While we acknowledge the many challenges that remain, we directed our focus on the data science opportunities that are emerging as new sources of data are made more readily available.

Following some background on the drivers of change in healthcare analytics, we review how big data is already leading to fundamental improvements in delivering better—and more personalized — healthcare more efficiently.

A common thread amongst our thought leaders was related to moving beyond just funding a series of pilot studies; but to find a way to establish a continuously updated learning system. It’s a lofty goal to connect all of the disparate and diverse data relevant to healthcare, especially when the sources of data are growing at a fast pace. However, rather than trying to “boil the ocean” (a term that came up more than a couple of times), we chose to carve out an area where a substantial amount of data is already available and some baseline assumptions and queries have already been established, so that we can move forward on innovating with big data technologies.

We present examples of early experiments in data-driven healthcare, based in Massachusetts, along with CareMore, a Wellpoint program. These innovative companies, including athenahealth/Kyruus, Massachusetts General Hospital’s Ambulatory Practice of the Future, and Zeo, offer insights into how to leverage multiple data sources in a collaborative environment to effect positive change in healthcare delivery.
The Delphi Panel

* denotes that individual is no longer with the organization cited at print time.
See Appendix A for Panel Member bios.
Introduction

Charlie Schick: “The future of healthcare transformation is going to be data driven.”

This report focuses on areas where big data investments are likely to accelerate progress toward the concurrent goals of 1) providing better care experiences for patients; 2) improving the health of the population served; and 3) lowering per capita costs. These three goals are referred to as the Triple Aim. This Triple Aim\(^1\) paradigm (see Figure 1), which has its origins at the Institute for Healthcare Improvement (IHI) in Cambridge, MA, was referenced frequently and served as a useful model throughout the discussion.

Paul Wallace: “So I think we need to change our language and recognize that the message of the Triple Aim is that you’ve got to do them all at the same time, which means you really have to reallocate effort. We have to allocate a lot of effort at reconciling the ambiguities around trying to do all of those simultaneously, rather than thinking, just pull one lever and have it work out.”

The challenges involved in delivering quality healthcare at affordable costs are complex and can’t be solved in isolation. We need to explore ways to leverage big data science to develop new methods for measuring and analyzing outcomes, and to align the outcomes analysis with the experience of care and cost objectives.

Greg Bialecki: “From the state’s point of view, I think we’d really be interested in focusing on the healthcare delivery system. … I think our biggest interest is for the practitioners in the healthcare delivery system and I include the payers in that. What kind of information do they need in accountable care?\(^2\) We’ve got this huge shift and we’re saying that the healthcare providers now are not only the healthcare providers, but they have become the risk managers for the patients.”

Secretary Bialecki’s statement helps frame the contents of this report to focus on areas where big data can support new models of healthcare delivery.

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\(^2\) Accountable Care Organization (ACO) definition from CMS: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ACO/. Accessed April 1, 2014.
Improving quality in the healthcare delivery system has been a major objective for policy makers and practitioners alike. However, early initiatives were hampered by the lack of reliable data to use for measuring quality and outcomes. Consequently, programs, such as the Consumer Assessment of Healthcare Providers and Systems (CAHPS)³, relied on survey data to measure and benchmark quality and performance improvement from the patient’s perspective.

More recent quality initiatives, such as programs to reduce hospital-acquired conditions, have benefited from a knowledge base constructed in part from data that have been reported as part of federal and state programs.⁴

Drivers of Change: Federal and State Programs

A series of policy initiatives at the state and federal level have provided incentives for healthcare providers to adopt digital infrastructure with the aim of improving the efficiency of healthcare transactions. Examples include the establishment of the Massachusetts eHealth Institute in 2008, the federal Electronic Prescribing and Meaningful Use Incentive Programs, which started in 2009 and continue today, the launch of the statewide health information exchange, the Mass HIway, in 2012, and Massachusetts’ further investment of over $200 million in healthcare transformation through the 2012 Health Reform update, Chapter 224.

Adoption of electronic health record (EHR) technology has grown rapidly under the Stimulus/HITECH Act and the Meaningful Use program with virtually all acute hospitals in the Commonwealth now using EHRs⁵ and more than 80% of physicians using EHRs⁶. Figure 2 below illustrates the three stages of Meaningful Use and the associated goals of each stage. Currently, most eligible providers are working towards Stage 2 of Meaningful Use.

Meaningful Use and ePrescribing programs are part of a longstanding shift to value-based purchasing (VBP) initiated by the Centers for Medicare and Medicaid Services (CMS) nearly ten years ago. CMS understood that an effective VBP system required a strong foundation of data reporting and sharing upon which new clinical practices could be built, and ultimately, outcomes could be measured and compared.

Figure 2: Meaningful Use Stages

5 Based on 2014 MeHI Provider and Consumer Research not yet published as of May 1, 2014 – http://mehi.masstech.org
6 Massachusetts Medical Society 2013 Survey
However, measuring outcomes on a standardized basis is not a straightforward exercise; most healthcare providers are struggling to institute Population Health Management systems that serve this purpose at a provider-level. We’ll revisit population health management in the section on *Using Big Data to Improve Healthcare Delivery*.

**Drivers of Change: Growing Sources of Data**

Managing the growth in data sources has replaced scarcity as a major impediment to data analysis.

**Clifford Goldsmith:** “I remember meeting with Medtronic where they said that a pacemaker is an information system or an information device, not just a clinical device. So I think there’s a lot of sources of data that we’re not thinking about that actually come into the bigger picture.”

Genomic data and patient data from electronic health records (EHRs) constitute two of the fastest growing sources of data that are available for analysis. Medical devices that can transmit and receive data represent another fast-growing source of healthcare data. In addition, there are numerous other types of data that are relevant to health and wellness that can be tracked via smart devices. Consumer fitness devices have attracted a lot of attention as a way to promote exercise and fitness—and they have the added benefit of recording data that could be included in a patient’s health record or personal health record.

**Christopher Bouton:** “Another aspect that we haven’t touched on yet that I think is important is it’s not just the standard healthcare information that everyone is receiving from their physicians, but it’s also the whole new world of genomic variants and the idea that you can treat everybody the same is patently false, from drugs to treatments, so on and so forth, and that’s because amazingly, everyone is slightly different from each other. Patients are actually going outside the normal channels to companies like 23andMe or Foundation Medicine. They’re also gathering information from things like Fitbit or Ginger.io to receive information about themselves and the genomic variant information is perhaps the most impactful of all of that. If they have a view into this information over time they’re going to be able to see blips. They’re going to be able to see when something is different from normal and I think that that’s valuable.”

Extending Bouton’s point about patient recorded data, Charlie Schick noted that, not only are current clinical systems unable to accept patient-provided data and other sources of non-structured data, but the clinicians and researchers don’t know how to process and analyze these sources of data.

**Charlie Schick:** “What’s the role of the data that the patient knows?...verifying it to begin with, and then anything they want to add to it. I think a lot of the data that we talk about today is the claims data— all structured data and transaction data— rather than the copious amount of rich data in the notes or even what somebody else might write about themselves or collect about themselves with a quantified self tool or something like that.”

The supply of new sources of data adds richness to the potential models that can be used to analyze healthcare. However, the richness of the new data sources brings levels of complexity in managing data inputs. The
following section reviews some cautions from data analytic experts and leading healthcare practitioners who participated in this initiative.

**Challenge: Connecting Fragmented Data**

The growing supply of data presents challenges as well as opportunities for data scientists.

**Mara Bloom:** “Some of our biggest headaches on the operational/administrative side are really bringing together all of the disparate sources of data from patient data, research data, financial, billing volume, patient satisfaction, and having a way for us to be able to use it and make sense of it.”

**Joe Hendrickson:** “One of the biggest challenges we face is setting up all of the electronic connections across the health care delivery system. Without these connections then we cannot simply link the ordering behavior of the physician to what’s going on within the clinical encounter and back around to the results and analyze the outcomes at big data-scale. The best we can do is some form of fuzzy association between data sets (a lossy process), or some costly extraction of information from paper faxes.”

**Technical Limitations**

Metadata standards are improving and crosswalks between various coding schemes are helping to integrate data from disparate sources, but limitations remain. Even when metadata from multiple sources can be mapped together, it is important to understand the context of the data: e.g., who entered the data and for what purpose? When was the data recorded and is it still pertinent to your query? In fact, even when data are aggregated from similar source types, it is important to understand as much as possible about the origin of the data.

**Paul Bleicher:** “There is an incredible amount of electronic data that’s being collected at this point but there’s two cautions that … are important to make. One is to not be too optimistic about the ease of combining this data. It is tremendously difficult, time consuming, and involved when taking what should be the same types of data from the same types of electronic health records, from the same company’s electronic health record system, and trying to combine that into a standardized and normalized data set, let alone combining administrative claims with electronic health record data or any of these other types of data sets… The other caution is to make sure that you really understand the data at the depth of the data level and what’s really required. It may be easy to put it together and to view it as if it’s the same, but to really understand that you’re looking at the same data is very challenging.”

**Cultural Barriers to Access**

Apart from technical barriers related to data formats and common metadata schemas, strong cultural customs continue to impede the sharing of data.

**Tom Hawkins:** “You hear a lot about collaboration and sharing of data but we’ve been through this a couple of times. Every time people talk about ‘we should all collaborate and share data’, everybody wants to be the aggregator and nobody wants to be the contributor, especially if somebody else is deriving value from their data.”
Hawkins points to the lack of incentives for companies to share data with some other party who may gain a competitive edge from using the data.

Tom Hawkins: “[W]ould your own company give up data to somebody else who might gain a competitive advantage from it? What would it take for your own company to share? These are all great ideas but how are we going to actually get the data, get the collaboration between the players who are fiercely competing in the market space?”

Furthermore, HIPAA regulations and concern for patient privacy have created a culture that values protecting data rather than sharing data. Healthcare providers are facing a paradox. They are being encouraged to collaborate with researchers and other third parties to enable more data sharing, yet they are responsible for data breaches by third party ‘business associates’ under HIPAA regulations.

Patient Engagement

Patient involvement also plays an important role in the Triple Aim framework. The Meaningful Use program requires that patients have access to data in their electronic health record as one of their ‘Patient and Family Engagement’ measures and a certain percentage of patients have to have accessed and downloaded information to meet the requirement. But, exchanging electronic data with patients is new to most healthcare providers and to most patients.

Laurance Stuntz: “I think the key to really creating a difference is there has to be a cultural change in order for patients to start asking for access to their own data. There’s such a cultural divide between medicine, or big medicine, and what patients have traditionally gotten out of it that I think it’s a big leap for patients to be comfortable and feel empowered to ask for their information.”

Yet, the patient remains the only party who is directly involved in each clinical encounter and as such, motivated patients could ensure that accurate, timely data are available to all of their healthcare professionals by serving as the carrier or transmitter of data.

Robert Nagle: “It’s not just for all of us as individuals to have our data, absolutely, but for us to have the ability to bring our data wherever we want to and to send it. Not to send an agenda to your doctor, but to send your data to your doctor and ensure that she has reviewed it beforehand.”

Laurance Stuntz: “I’d love to get a patient’s data to them in a format that’s transportable by them. Make that more visible in a standardized way to make it so that the patient can then go contribute that data, whether it’s to an app or to Nike, and have that medical data interact with their Fitbit data. But some sort of way of combining those data in some visible manner and saying this is what every patient can and should be doing.”

This discussion around patient engagement and patient access to data makes clear that the need to involve patients in healthcare decision making is vital to achieving the Triple Aim.

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Using Big Data to Improve Healthcare Delivery

We can see that data science tools are making an impact. This section reviews targets for improving healthcare delivery and identifying emerging opportunities where big data technologies could be applied. 

Paul Wallace: “We’ve focused a lot on technology and what technology enables but I’m not sure we’ve taken a step back to say how it actually enables us to create different problem formulations.”

Strengthen the Evidence Base

Markus Fromherz: “I think the goal is always to have healthcare that’s evidence driven and patient-centered …. It used to be the case that getting from the event to the data to the evidence being embedded was months, years, maybe decades before it was actually useable. The ambition that we have today is that the data is … available in real-time and processed in real-time in some fashion. Another one is that it’s integrated. It’s not in silos, that it’s actually being pulled together in real-time and being integrated. That maybe it’s context aware so it includes the behavioral data, the data about living situations, family situations, demographic data and so on. I think those are all important parts when you think about the vision of where you want to be; it’s not just that it’s data because that has been around for a while, but real-time integrated context-aware and some other things I think that are part of the longer term vision.”

New healthcare delivery models, such as the Accountable Care Organization, involve analyzing outcomes for the population served9. Another important benefit of compiling outcomes data will be to serve as a base of information that can be analyzed to help establish best practices that benefit from continuous learnings.

Paul Bleicher: “… Once we have the data together we should go as fast as we can, applying machine learning and all of those things, but we have to step back and be a little cautious because in medicine it’s very easy to make some very significant mistakes because there is so much complexity, so much co-variation in the data, so many other factors which may be hidden or maybe not looked at that may dramatically influence an outcome that you may come to the exactly wrong conclusion about data if you look at it using the machine learning techniques. You have to actually still apply the methodologies of observational research and outcomes research that have been developed over years in order to get usable and valuable information out of that data.”

Still, we aren’t close to reaching the point of measuring and collecting all relevant data. With the growing digitization of everything (see the Internet of Things definition10) and the rapid growth in smart devices for consumers, the drive to include all relevant available data is unlikely to slow down anytime soon. As sources of data continue to grow,
variables that are now considered unmeasurable will be available in the future.

Vicky Mahn-DiNicola: “I do believe it’s very important to triangulate all of those touch points and find the right measures. What I think is also very important is to measure what isn’t there. For example, we really don’t have a lot of conversation yet about measuring the impact of diagnostic errors or delays in performing certain diagnostics; or what the impact of delayed access might mean to a population’s well-being. It’s the old Sherlock Holmes story of measuring the impact of the dog that didn’t bark.”

Personalize Medicine

Paul Wallace: “We haven’t necessarily questioned our basic problem formulation. I’d self-identify as a health services researcher but I’m also an oncologist in a past life. When I think about taking care of a patient, the patient in front of me is N-of-1. And I think the N-of-1 is gaining a lot of credibility but think about how we support decision making from my N-of-1. We force a pattern match to the statistical mean of Ns of many, as opposed to something more meaningful like “what if we could generate dynamically, comparison sets that are many N-of-1’s, just like the person in front of me?” Wouldn’t that be much more meaningful if I’m trying to figure out what works? That’s exactly what we’re trying to do in using genomics in cancer. If you happen to have a particular rare marker, we want to know how that marker impacts your care, not how you’re like the average non-small cell lung cancer patient….It’s really about personalization or even hyper-personalization. One of the other things is to not be constrained to just thinking about genomics as defining who we are. So take a leap and think about complex co-morbidity and what if by having multiple co-morbidities you become increasingly rare rather than being the confluence of common diseases. What if we start thinking about people with chronic co-morbidity as actually having a really common rare disease where their comparison population are many N’s-of-1 just like them but you might actually have to go to California to get enough people to actually have a meaningful comparison set.”

Richard Dale: “It becomes kind of a paradigm of big data, because naturally when you think about big data you think about how we’re aggregating all of this data so we can have much bigger populations to find the mean of but in fact, it is this opportunity to get to the opposite, to head towards the N-of-1 with the power of the big data and not the other way around. We’re not being aggregated into a big gray mass. We’re using the data in a new, powerful way to distinguish each of us whether it’s phenotype or genotype.”

Wallace and Dale describe the fundamental benefit of amassing large collections of data; that is, large data sets allow for finer segmentation, even with a large number of data inputs. With big data tools, the analysis can also include a large variety of data types.
Reduce Costs

**Jeff Levin-Scherz:** “How are we going to use big data to actually make costs lower? For instance, let’s say I could see your Fitbit data in my office. Is that going to actually make costs lower or is that going to actually give another data stream that I have to deal with that may distract me and will make me forget about the fact that your blood pressure is 95 diastolic and I should have done something about it. There’s a bit of a challenge to all of this. If we’re getting extra data we have to make it meaningful. Is there a way for us to use artificial intelligence and give much of it directly to patients? So instead of wanting to have me, probably the wrong person to look at your Fitbit data, maybe Nike’s got to get even better at delivering it back to you in a way that is really actionable to you.”

Levin-Scherz poses an important question about costs of processing new data sources and advises technologists to consider the value of data to the targeted user. No matter who the targeted user is, Levin-Scherz emphasizes the importance of applying data science tools to make the data more meaningful to the intended user.

**David Icke:** “I think a way to bring costs down is instead of getting episodic once-in-a-while care in very high cost settings, we have better information at our fingertips we can then get access to care if and when we need it. And therefore we can get people out of the hospital faster so I know that while I’m rehabbing, if I overdo it, I’ll have an early warning system, for example. Or if I have a chronic disease, I’m not waiting until I end up in the ER before giving you a call. So I think, if the data is providing a meaningful insight, there is an opportunity to use that insight proactively to get care at the right point in time and not wait too long, or go in too early. I think that happens both after you get out of the hospital with readmission as well as before that.”

Icke suggests that providing information to support patient decision-making could lower healthcare costs and improve the patient experience. The examples that follow examine this idea in more depth.
Some Early Data-Driven Experiments in Healthcare

In the previous section, we emphasized how big data analytics can be applied to challenge existing best practice guidelines and allow for new problem formulations. We now turn to examples where analyzing new sources of connected data provided information that changed behavior and challenged assumptions.

CareMore

Denny Brennan: “CareMore had a Congestive Heart Failure (CHF) initiative where they were tracking the weight of all of their at-risk CHF patients with home-based digital internet connected scales with the diagnostic assumption being that a small but significant gain in weight in a short period of time was not necessarily due to eating too much the night before, but a precursor to a cardio-respiratory event building up of water in the system. They used that [weight gain] as a signal to quickly dispatch appropriate practice providers to the patient’s home to test that patient, bring that patient in if necessary.”

Brennan describes how connected data was used to provide evidence to support the assumption that rapid weight gain signaled an oncoming cardio-respiratory event.

Denny Brennan: “And I was wondering if there wasn’t something comparable here... but what are the kind of actionable data elements around which your primary care practice, however organized, would be able to effect significant health quality and efficiency gains vis-a-vis critical populations, doing something that’s out of the box, outside of the traditional practice, but has huge impacts on patient health?”

Zeo

Through multiple trials, Zeo was able to discover what data-driven interventions engaged users and led to behavior change.

Dave Dickinson: “I ran a quantified self-company for six years, Zeo11. Some lessons learned were ‘all data is not created equal’. There are certain data which work with you, and some that don’t and it’s not about being a patient. It’s about being in fear. But not just fear of being sick, it’s fear of being old. It’s fear of not being sexy. It’s fear of being alone... [F]or example, we’ve got a thing called Sleep Age and we show you your sleep data in your age context. No one likes to learn they sleep like an 80 year old man and they’re only 45 and that was the first time when people began to change behavior. It’s real-time and meaningful time and it is about fear but don’t be so narrow thinking about it as only about being sick. And so the right kind of metrics that are more granular and powerful can motivate change, but don’t think for a second that everything matters in data. It doesn’t. And one of the problems of the wristwatches is most of that data is just too simplistic and too common sense. There’s no shock at all to it. So as a result I don’t care when it changes. You need something that’s more provocative. I think bringing in some medical data alongside data - so long as its the right data - can make a difference. And that’s a mistake people are making, they’re not putting out the right data that really matters in the big change.”

11 Zeo ceased operations in December 2012.
Athenahealth/Kyruus

Although progress is being made on data standards and data exchange at the federal level, to make a big leap forward in providing access to data in meaningful formats to providers, payers and patients, it was suggested that the EMR software vendors should focus on building their own APIs.

Joe Imbimbo: “So we’ve got to get the data out there that we’re sort of comfortable with and get it out there in release 1. What that’s going to require, I believe, is the big players today, the big software vendors, the EMRs, need to build those API’s, to build those standards so they can start exchanging this information. But I think we need to do it in a totally different way because if I look at the current, say, CMS standards for X12, are they really standards? I think there’s got to be a new innovative way to actually create those standards—tagging, whatever you want to do—so it’s easier to exchange that basic information, expose it, correct it and then get better and better.”

Athenahealth’s More Disruption Please (MDP) represents one program that offers an API to analytics partners. Kyruus is partnering with athenahealth to create a referral system that optimizes the matching of patients to specialists.

Julie Yoo from Kyruus points out that these API programs can increase awareness of data sources that are available, which can lead to better data products for healthcare providers:

Julie Yoo: “[T]he awareness of the amount of data liquidity that’s happening in this industry is actually quite low and I think there’s a role for organizations, both providers as well as vendors like us, to raise that awareness but also package that information in a way that’s usable.”

Joe Imbimbo raises another important point about using technology solutions to improve tagging and matching content, so that we don’t have to rely so heavily on content that is produced according to strict industry standards.

Ambulatory Practice of the Future

David Judge: We’ve leveraged our self-insured situation status at Mass General to create a primary care practice that breaks away from the fee-for-service monster that’s driven on behavior to try to look at the Triple Aim in that setting. I think to understand the value of data and how to use it, you’ve got to have a setting in which you can engage patients in a different kind of culture. If you start over, there’s a new kind of culture and partnership that you form with the patients. There’s evidence of course that a good patient experience leads to better outcomes in their care. Part of that is sharing data with them and we’re starting to see pieces of that. But there is an opportunity, we think, to create a living clinical innovation lab, essentially where we can

partner together academia, industry and the clinical system I live in, to actually start to figure this out. We haven’t been able to do that together.

It’s having the site, to agree to get together, to start to understand how can we better gather the data we need, mine it the right way and, I think crucially, present it to patients. To have their input about what it means, what they need to know or want to know out of it, and how they can use it to change their own behavior. That really lies foundationally at the core of whether the ACO idea is going to fly or not. You can’t manage a population really effectively unless your patients are somehow engaged in that activity, if they understand where you’re trying to go for them as well as for the population. So we’re beginning to explore that.

But I think what you’re alluding to is a new kind of partnership between academia, industry and clinical sites, innovation labs where we can tease this out. We can’t, I think, do what we just did at Partners, which is, spend a billion dollars on Epic and begin to install it over the next three or four years and then it’s not a bad tool, and I don’t know if there are any Epic folks in the room, but we are doing it. I say we can’t do it but we are doing it, but I worry that we don’t have ways to test ideas quickly, rapidly, maybe fail a little bit along the way and figure it out, so we’re sort of always behind it.
Charlie Schick: “I’ve been wanting to get the lapels of hospital directors and say, ‘Hey, if you’re not data driven, the viability of your organization is going to be in question’. I think it’s evolved, but really it is how we look at data, how we manage data, how we tie data into the way we give care and how does that data that we have inform that one-to-one touch between the caregivers and the patients?”

Naomi Fried: “We cannot change the way we deliver care if we don’t understand the care we’re giving and how much it costs us and what the implications are for our population. … We aren’t there yet, but I think when you look across the ACO pioneer organizations, the ones that succeeded were the ones that had access to data and … very rich data.”

The two quotes above neatly summarize the main themes of the healthcare roundtable discussion. There is no question that we’re in the midst of a data-driven transformation in healthcare delivery, but we need more experience analyzing new sources of outcomes data. In fact, we are not yet at a point where we know what questions to ask or what data will prove to be most valuable:

Christopher Bouton: “I think it’s still unclear which types of outcomes are the most important to look at. The analytics are challenging. You don’t know what you’re analyzing yet.”

This is precisely where techniques used in big data analytics can help. As Micky Tripathi, David Judge, and others pointed out, a degree of trial and error is needed to gain better understanding of the data.

Still, we face the question of where to focus advanced data science technologies to achieve the Triple Aim. While acknowledging that constraints to data access and availability still exist, Greg Bialecki suggests:

Greg Bialecki: “[L]et’s start with asking what questions we want to have answered…if we could focus on big data to help get a better answer. … I would start on the front line with primary care physicians and ask a question, which is “what don’t you know today”?

The Ambulatory Practice of the Future (APF) supported by Mass General Hospital, the Mass General Physicians Organization, the Stoeckle Center for Primary Care Innovation, and the Center for the Integration of Medicine and Innovative Technology (CIMIT) has created an environment where these questions can be both formulated and tested. The case study included in this report describes how the APF is in a position to overcome many of the limitations to data access outlined herein to create a “living clinical lab”.

Overall, the future envisioned by the group of industry, academic, and healthcare provider experts we convened for the big data and healthcare initiative depends heavily on compiling, sharing, and analyzing multiple sources of data. Can the application of new technologies and models for analyzing data help us achieve the Triple Aim of improving population health, lowering costs, and improving the experience of care for patients? It is too early to answer that question with a resounding “yes”.

However, we can point to early successes in reducing hospital acquired conditions and congestive heart failure through the use of data-driven surveillance techniques. And, we can point to a growing number of successes in applying
principles of behavioral economics to create alerts that will motivate patients to modify their behavior and better understand how and when to utilize the healthcare system. Also, data science and new collaborative efforts like athenahealth’s More Disruption Please are creating better methods for referring patients to specialists.
Conclusion & Next Steps

The scale of healthcare transformation over the next few decades will rival that resulting from the introduction of the Gutenberg printing press. Pervasive connectivity, data analytics, and other information technologies will transform the way we conduct research, deliver healthcare, form public opinion, and manage our wellbeing.

Massachusetts is already a global leader in healthcare delivery, biomedical research, drug development, medical devices, big data analytics, mobile communications, cloud computing, intelligent automation/robotics, and information security. Taken together with its forward-looking public sector, academic research institutions, and investment community, Massachusetts possesses a unique capacity to be a leader in creating the future, enabling people around the globe to live happier, healthier, more productive and independent lives.

This report illustrates that potential for global leadership by highlighting early positive signals of data-driven innovation in healthcare. Despite this leadership position, the state possesses significant capacity to further accelerate innovation.

MassTLC and the Massachusetts eHealth Institute at the Massachusetts Tech Collaborative will continue to work to convene public and private sector stakeholders and recommend actionable interventions, modeled in part upon Governor Patrick’s 2007 $1B Life Sciences initiative, designed to accelerate and expand the Massachusetts eHealth cluster’s global leadership.

Ideas from participants included:

1. Developing an e-health accelerator program to build upon the state’s unique attributes as a locus of entrepreneurship and education in healthcare, life sciences, and information technology.

2. Creating a set of data-driven “Grand Challenges” or “D-prizes” that combine the best features of healthcare pilot programs, incubator programs, and innovation marketplaces to match problem solvers with identified challenges.

By developing a focused, well-defined set of investments with input from healthcare, technology, public sector, and academic leaders, we can help catalyze a revolution in how we care for people while maintaining our leadership in healthcare innovation.
Appendix A – Delphi Participants

* denotes that individual is no longer with the organization cited at print time.

Paul Bleicher, MD Ph.D.
COO, Optum Labs

Prior to Optum Labs, Paul was CMO for Humedica, where he was involved in all aspects of medical informatics, data analytics privacy and regulatory compliance, and product development. Paul was founder and original CEO of Phase Forward where he helped grow the organization over an 11-year period from a concept to a publicly traded company.

Dr. Bleicher served as Vice President of Clinical Affairs at Alpha-Beta Technology with responsibility for Phase I through III clinical development of a novel carbohydrate drug. Dr. Bleicher was previously the Director, Early Phase Services at PAREXEL International where he assisted pharmaceutical and biotechnology companies with the initial development of novel therapies.

Dr. Bleicher currently serves on the editorial boards of Applied Clinical Trials, the Drug Information Journal, and Research Practitioner. He has held various leadership positions in the Drug Information Association, including Chairman of the Steering Committee of North America for the Drug Information Association, a member of their Board of Directors and a member of the Board of the DIA Foundation. He served as a member of the Massachusetts Life Sciences Leadership Council.

In 2002, Dr. Bleicher won the Ernst and Young Entrepreneur of the Year Award in New England and was appointed to the Ernst and Young Entrepreneur’s Hall of Fame. He was in the first group of PharmaVoice’s 100 Most Inspiring Leaders in Life Sciences, and was named a Champion in Healthcare by the Boston Business Journal.

Dr. Bleicher trained in internal medicine at the Beth Israel Hospital, and dermatology at Harvard Medical School/Massachusetts General Hospital. He did a post-doctoral fellowship at the Dana Farber Cancer Institute in molecular biology, and began his career as a physician/investigator and Assistant Professor at the Massachusetts General Hospital and Harvard Medical School.

Mara Bloom
Executive Director, Cancer Center, Mass General Hospital

Since 2009, Mara Bloom, JD, has been executive director of the Mass General Cancer Center. Mara brings passion, energy and vision to this position, as well as a commitment to keeping one of the world’s great cancer centers in the global vanguard of cancer care and research.

Mara oversees clinical and research operations at all Cancer Center facilities, including the main campus and all satellite and affiliate sites. Working closely with leadership across the myriad research and clinical disease centers and programs of the Cancer Center, Mara is guiding development of its strategic direction.

An attorney by training, Mara came to discover that health care was her calling as director of oncology services at New York-Presbyterian Hospital.

Fitting about 50 meetings into a typical 60-hour work week, Mara inspires and engages colleagues throughout the Cancer Center who share her desire to bring its front-line caregivers, researchers and staff the resources they need to continue providing the best patient experience and highest quality of care.
Building upon the Cancer Center’s unique assets — including a multidisciplinary model that incorporates the latest therapies and technologies and a collaborative culture among physicians and scientists — Mara is helping her colleagues evolve Cancer Center operations to advance next-generation paradigms of cancer care.

Christopher Bouton  
CEO and Founder, Entagen

Dr. Bouton received his BA in Neuroscience (Magna Cum Laude) from Amherst College in 1996 and his Ph.D in Molecular Neurobiology from Johns Hopkins University in 2001.

Between 2001 and 2004 Dr. Bouton worked as a computational biologist at LION Bioscience Research Inc. and Aveo Pharmaceuticals, leading the microarray data analysis functions at both companies.

In 2004 he accepted the position of Head of Integrative Data Mining for Pfizer and led a group of Ph.D. level scientists conducting research in the areas of computational biology, systems biology, knowledge engineering, software development, machine learning and large-scale genomics data analysis. While at Pfizer, Dr. Bouton conceived of and implemented an organization-wide wiki called Pfizerpedia for which he won the prestigious 2007 William E. Upjohn Award in Innovation.

In 2008 Dr. Bouton assumed the position of CEO at Entagen, a biotechnology company that provides computational research, analysis and custom software development services for biomedical organizations.

Dr. Bouton is an author on over a dozen scientific papers and book chapters and his work has been covered in a number of industry news articles.

Denny Brennan  
Executive Director, Massachusetts Health Data Consortium

Denny Brennan is the Executive Director of the Massachusetts Health Data Consortium (MHDC). MHDC is a not-for-profit convenor of the state’s health providers, health plans, government agencies, industry associations, and health technology and service providers. MHDC’s mission is to maximize the value of collaboration in the application of health information and technology to achieve and sustain improvements in health quality, cost, and effectiveness across the Commonwealth.

Mr. Brennan brings over two decades of experience as a consultant and entrepreneur working with the country’s leading academic medical centers and medical schools, integrated delivery networks, hospitals, life sciences companies, industry services providers, and industry associations on strategy, organizational effectiveness, and information management and technology challenges. He brings specialized expertise in assisting organizations in aligning healthcare information and business strategies for success under increased market competition and health reform. His areas of emphasis include strategic and financial planning, organization structure and development, formation and management of Accountable Care Organizations, payment and reimbursement reform, and information technology strategy, including health information governance, security, and exchange.

Mr. Brennan has a Masters of Public and Private Management from the Yale School of Management and a Masters in Human Development and Psychology from the Harvard University Graduate School of Education.
Richard Dale  
**COO, Optum Labs**

Richard Dale is COO of Optum Labs, the health care industry’s first open research and innovation facility, designed solely around the goal of improving patient care.

Previously Richard was a Principal at Sigma Partners where he was a member of the deal team and also worked on special projects for the benefit of the entire portfolio. Richard came to the VC world after a long period as an entrepreneur and startup executive. He co-founded and had various leadership roles at Phase Forward, a provider of software services for pharmaceutical clinical trials which went public and later was sold to Oracle.

Prior to that, Richard was VP Operations for Vermeer Technologies, creators of FrontPage which was acquired by Microsoft in 1996. Prior to Vermeer, Richard held roles in professional services management, senior product management and IS management at some of industry’s best technology companies including SQL Solutions, Sybase, Epoch Systems (acquired by EMC) and MicroTouch Systems. Richard also provided early stage advice and consulting to FirstSense, OnDisplay, Vignette and QXL.com.

Richard’s career began as a software engineer and database expert, and he has maintained a strong interest in data and application technologies.

Dave Dickinson  
**CIO, Optum Labs**

Prior to joining Optum Labs as Chief Innovation Officer and Senior Vice President of Business Development, Dave was the CEO of Zeo, Inc. a digital health startup. He also served as the COO of StemCyte Inc, a cord blood stem cell banking pioneer.

Dave’s experience also includes Global New Business Development, Marketing, and Sales roles within Fortune 500 companies: Bristol-Myers Squibb/Mead Johnson, Church & Dwight/Arm & Hammer, Johnson & Johnson and Procter & Gamble.

Dave has deep consumer healthcare, startup and global business development experience. He was an early pioneer of the Quantified Self social movement. Dave is an experienced entrepreneur, intrapreneur, innovator, and marketer.

Naomi Fried  
**Chief Innovation Officer, Boston Children’s Hospital**

Naomi Fried, Ph.D. is Boston Children’s Hospital’s first Chief Innovation Officer. She leads the Innovation Acceleration Program, aimed at improving care quality and assisting the hospital in shaping the future of health care.

The Innovation Acceleration program focuses on enhancing the innovation culture by supporting strategic innovation initiatives, resourcing grass roots innovation, and identifying unmet innovation opportunities. Naomi oversees the Innvestment Seed Grant program and FastTrack Innovation in Technology Program. She is also leading the development of Boston Children’s telehealth strategy.

Previously, she was the Vice President of Innovation and Advanced Technology at Kaiser Permanente (KP) where she led an effort to identify and assess new and emerging health care technology and was involved in the start-up and governance of KP’s Innovation laboratory, the Sidney R. Garfield Center for Health Care Innovation.
Prior to this position, she was Managing Director of KP’s Archimedes Project. Before KP, Naomi advised two venture capital firms on life science and health care information technology investments; served as the General Manager and Vice President for Business Development of 1747, Inc., which conducts online clinical trials for new drugs; and was instrumental in the formation of the medical informatics internet start-up company (e-SKOLAR, formerly SHINE) spun out of Stanford School of Medicine, serving as interim President for its first year. Naomi has a BS in Chemistry from the University of California, Berkeley and a Ph.D. in Materials Science from MIT.

Markus Fromherz  
**Chief Innovation Officer, Healthcare, Xerox**

As Chief Innovation Officer, Healthcare, Markus Fromherz is responsible for disruptive innovation in Xerox’s payer, provider, government, and employer healthcare businesses.

Until 2010, Markus was a Vice President at PARC, Inc. (Palo Alto Research Center), where he directed PARC’s Intelligent Systems Laboratory. PARC, “the business of breakthroughs”, works with its partners, from global corporations to government agencies to startups, to bring innovative concepts to commercial fruition. The Intelligent Systems Lab develops advanced information and automation systems based on intelligent user interfaces, language and image understanding, and reasoning algorithms. Applications range from business software to embedded systems to cleantech applications.

Markus also was a Principal Engineer at PARC, where he led and contributed to several research, development, and technology transfer efforts in intelligent control systems for Xerox products, including the award-winning flagship iGen3™ digital production printing system.

He received his Ph.D. in Computer Science from the University of Zurich, Switzerland, and his M.S. in Computer Science from ETH Zurich.

Clifford Goldsmith  
**Healthcare Solution Strategist, Microsoft Corporation**

Dr. Goldsmith brings a unique experience to Microsoft as a physician who also has over twenty-eight years of know-how envisioning, designing, developing, and selling high-performance technology solutions for the healthcare industry. He specializes in technology for shared accountability for health and health care through models like Accountable Care Organizations and Patient Centered Medical Homes.

Dr. Goldsmith has been with Microsoft’s Healthcare team for more than 14 years. In his tenure he has served in several roles, including a Managing Consultant in MCS, US Director for the Provider Industry and a national Health Plan Strategist. Dr. Goldsmith has focused on numerous areas of healthcare information technology including accountable care organizations and patient centered medical homes, healthcare analytics, pharmaceutical clinical trials, medical devices and embedded systems, agents for home care, patient engagement, Microsoft’s Physician Digital Dashboard and Clinical Portals.

He has also served as CMO of Aptima Corporation, where he led a team in transitioning well-tested concepts on human-centered engineering from aviation and the military into healthcare. Dr. Goldsmith was the co-founder of LINK Medical Computing, which produces a commercial product for integrating medical devices with Hospital Information Systems. Before LINK, he worked for Harvard University’s Department of Medicine and the Center for Clinical Computing,
developing and managing various aspects of the HIS for both Beth Israel and Brigham and Women's Hospitals. During this appointment, he pioneered full, remote access electrocardiograph (ECG) integration HIS and implemented it at the Beth Israel Hospital. He was a founding member of Microsoft Healthcare Users Group (MSHUG) and joined the HL7 (Health Level 7) Committee in its early years.

Dr. Goldsmith received a B.S. and a M.D. from the University of Witwatersrand, South Africa. He has practiced clinical medicine and also worked for the National Center for Occupational Healthcare, Division of Epidemiology, Johannesburg, South Africa, where he designed, developed and supported software for clinical research, including pulmonary function and surgical pathology databases.

**Dmitri Gunn**
**MIT Media Lab**

Dmitri is an entrepreneur with over a decade of expertise founding and accelerating the growth of early-stage companies. His unique blend of strategic perspective and tactical execution suited to environments where uncertainty is the rule rather than the exception. Dmitri is adept at conceptualizing and implementing partnerships and assembling technology coalitions to launch new growth initiatives. He is an active member of the Boston startup and TEDx community, who enjoys bringing individuals together to make great things happen.

Dmitri is currently Executive Director of TEDxCambridge, Founder of Entrepreneur and Investors - a quarterly event bringing together leaders of the Boston startup ecosystem, and an advisor at the MIT Media Lab.

**Thomas Hawkins**
**Medical Director, Health Informatics, Health & Medical Management, Blue Cross Blue Shield of Massachusetts**

Dr. Hawkins is the Blue Cross Blue Shield of Massachusetts Medical Director for Health Informatics. He is responsible for clinical development and presentation of Health Informatics, providing employer customers with population-based reporting linking financial, utilization, and clinical data, and data-driven suggestions for health management and prevention interventions, and the medical liaison to BCBSMA's Wellness Team. As a board certified Internist, Dr. Hawkins practiced primary care for 11 years in Peabody, and is a Clinical Instructor at Harvard Medical School in Population Health and Clinical Epidemiology, with a masters in Health Policy and Management from the Harvard School of Public Health.

Dr. Hawkins is the BCBSMA medical lead for race/ethnicity disparities analytics, is a Multi-Cultural Ambassador, and has developed diabetes avoidance population modeling based on the DPP trials.

Dr. Hawkins primary experience is in helping employers understand and act on comparative cost and quality data, and understanding their perspective – including 6 years as the New England Federal Reserve Bank’s Medical Director. At Harvard Pilgrim Health Care for 20 years, Dr. Hawkins was the Director, eHealth Strategy and Associate Medical Director for Employer Health Programs. He is a past member of the National Blue Health Intelligence Board of Managers and InteliMedix Corp. Board of Directors.
Joseph Hendrickson  
**Vice President, athenaNet Intelligence**

As Vice President, athenaNet Intelligence, Joseph is responsible for the payer and pay for performance (P4P) rules engines, as well as for mining and analyzing data across athenahealth’s network. Prior to his role as Vice President of athenaNet Intelligence, Mr. Hendrickson served in several leadership roles at athenahealth: in athenaNet Intelligence as Director of Payer Intelligence, and in Research and Development as a Software Architect. Before joining athenahealth in August of 2003, Joseph was a Research Fellow at the RAND Corporation in Santa Monica.

Mr. Hendrickson graduated from Reed College, and holds an M.S. in Economics from the University of Wisconsin-Madison and an M.Phil in Public Policy from the Pardee RAND Graduate School.

Tom Hopcroft  
**President and CEO, MassTLC**

Tom Hopcroft is President & CEO of MassTLC, a business association that addresses the critical leadership issues of innovative technology and technology-enabled companies.

A Massachusetts attorney and former adjunct professor at Northeastern University’s College of Business Administration, Mr. Hopcroft formerly led and founded the New England Business and Technology Association (NEBATA) which merged with the Mass Software Council in 2005. After the merger he led the Council’s cluster development activities, growing the cluster portfolio from three to ten active groups.

Prior to founding NEBATA, Hopcroft served on the American Bar Association’s Information Security Committee, where he contributed to the drafting and editing of the ABA’s Digital Signature Guidelines: Legal Infrastructure for Certification Authorities and Secure Electronic Commerce, published in 1996. He also participated in the International Chamber of Commerce’s ETERMS Repository project, an international repository for incorporating terms by reference into EDI messages.

Hopcroft has served on various advisory boards and commissions including: the Information Technology Task Force for Commonwealth’s Mobilization for Federal Economic Recovery Infrastructure Investment (2009), Governor Deval Patrick’s Creative Economy Council (2008-2014), and the Marketing and Branding Working Group of the Massachusetts e-Government Strategic Plan (2001).

David Icke  
**CEO, MC10**

Dave Icke joined MC10 as CEO in March 2009. Dave built his career growing and scaling businesses that solve customer problems with breakthrough technology. Dave understands semiconductor manufacturing, starting as a process engineer at Cypress Semiconductor, then helping chipmakers worldwide quickly ramp their fabs in different leadership roles over 11 years at KLA-Tencor. He then led and grew several businesses in semiconductor test equipment at Teradyne.

In 2005, he took the plunge into the startup world with Advanced Electron Beams, a venture-backed cleantech company with a disruptive platform technology serving multiple markets. MC10 offers a unique opportunity to combine Dave’s experiences in semiconductor manufacturing with breakthrough platform technology.

Dave has a B.S. degree in Chemical Engineering from Stanford University, and an M.B.A. degree from Harvard Business School.
David Judge*
Medical Director, Ambulatory Practice of the Future, Mass General Hospital

David C. Judge, MD is a general internist who was responsible for the creation, design and implementation of the APF and is now the Medical Director and a physician in the practice.

Dr. Judge attended Brown University (B.A. Public Health Systems / Biomedical Engineering) and the University of Massachusetts Medical School (M.D.). He completed his residency training in internal medicine at Columbia Presbyterian Medical Center in New York City and joined the Bulfinch Medical Group at MGH in 1999.

While practicing at MGH, Dr. Judge pursued an interest in re-engineering the primary care experience for patients and care providers. He launched the APF design team and has overseen the development, implementation and management of this new practice model and of the APF Innovation Learning Program for several years. Dr. Judge has been invited to speak nationally and internationally about the APF and the future of primary care.

In addition to his clinical work, he has co-chaired a physician group assisting Partners Healthcare Information Systems in development of the electronic health record and patient portals now used across the organization. Dr. Judge has served as the co-chair of CIMIT’s Clinical Systems Innovation Program. He is currently an advisory board member for the Harvard Medical School Primary Care Center.

Jeff Levin-Scherz, MD, MBA
Assistant Professor, Harvard School of Public Health and Harvard Medical School

Jeff has had diverse positions within health care, including most recently the Chief Medical Officer of One Medical Group, an innovative national technology-enabled primary care. He’s also served as the Chief Medical Officer of the network division of Partners HealthCare where he focused on pay for performance contracts and programs, and at Harvard Vanguard and Atrius Health, where he focused on primary care hiring and quality reporting.

Jeff has also consulted for employers at Towers Watson, where he helped develop the firm’s approach to behavioral economics, and for health plans with Reden and Anders, where he assessed effectiveness of medical management programs.

Jeff was previously a Vice President and Corporate Medical Director at Tufts Health Plan, where he led the department responsible for physician utilization management, health programs and disease management, and measurement of clinical quality, and co-chaired the plan’s Provider Strategy Team. Previously, he was the President of the Mount Auburn Cambridge Independent Practice Association, comprised at the time of 350 physicians at three community teaching hospitals caring for 40,000 patients under managed care contracts. He practiced primary care internal medicine for nine years in the Boston area.

Jeff graduated from Boston University School of Medicine and completed his residency at Mount Auburn Hospital in Cambridge, MA. He is board certified in Internal Medicine, and a Fellow of the American College of Physicians. He completed his MBA at Columbia University.
Vicky Mahn-DiNicola  
Vice President, Research and Market Insights, Midas+,  
A Xerox Company

Vicky Mahn-DiNicola RN, MS, CPHQ is Vice President of Research and Market Insights for Midas+, A Xerox Company. In this role, she contributes to the organization’s mission through the development of research and discussion themes relevant to healthcare and provides publications, public speaking and facilitation of client-centered advisory forums for the purposes of high impact learning.

Previously, Ms. Mahn-Dinicola was responsible for developing clinical analytics for acute care hospitals, and developing software solutions to capture metrics used by CMS and The Joint Commission for public reporting and accreditation. With a clinical specialty in cardiovascular and critical care nursing, Vicky has authored numerous articles and book chapters on Outcomes Evaluation for Advance Practice Nursing, Nursing Case Management, Readmission Analytics, Patient Centered Care Work Redesign, and Interdisciplinary Collaboration.

Vicky received her Master’s in Science from the University of Arizona, where she continues to serve as Adjunct Faculty. She represents Midas+ at The National Quality Forum and was recently selected to serve as an expert panelist on the AHRQ Quality Indicator Workgroup to guide the continued refinements to the AHRQ QI measurement life cycle, including methodological advances, applications towards quality improvement, new data sources and data enhancements.

Marilyn Matz  
CEO & Co-Founder, Paradigm4

Marilyn Matz is CEO and co-founder of Paradigm4, the creators of SciDB, an open source, next-gen data-science platform that helps bioinformatics and clinical informatics researchers, data scientists, quants, analysts, and scientists tackle their toughest “Big Data” management and complex analytics challenges.

Marilyn has an M.S. in Computer Science from MIT. She left the Ph.D. program at MIT to co-found Cognex Corporation, a publicly traded, global machine vision company for industrial automation. At Cognex, Marilyn was Sr.V.P. for World-wide PC Vision Engineering and then Sr.V.P. and Business Unit Manager for PC Vision Products. In 2005, along with her two Cognex co-founders, she received the SEMI industry award for outstanding technical contributions to the semiconductor industry. In June 2013 she received the sixth annual Women Entrepreneurs in Science and Technology (WEST) Leadership Award. She has served on the Board of the Automated Imaging Association, has been co-chair of a peer-mentoring program for women executives, is a member of the technical advisory board for The Accelerated Cure Project for MS, and is currently a co-chair of the Massachusetts Technology Leadership Council’s Big Data cluster and the Big Data in Life Sciences working group.

Robert Nagle  
Vice President and GM, Data Platforms, InterSystems

Robert Nagle is responsible for the database and integration technology business at InterSystems. Prior to joining the company, he spent five years doing molecular
modeling research with Nobel Laureate Martin Karplus at Harvard University.

Previously, he was general manager and vice president, Life Sciences, of Molecular Simulations. Before that he held technical or senior management positions at Automatix, Cognition, and Computervision. He also spent eight years as a professional extreme sports athlete.

He has a Master’s degree in mathematics from Carnegie-Mellon University and a Master’s in mathematical physics from University College, Cork. He is a Trustee of the Museum of Fine Arts, Boston; Chair of the School of Museum of Fine Arts, Boston and an overseer at the Institute for Contemporary Art, Boston.

Charlie Schick
Director, Big Data, Healthcare and Life Sciences, IBM

Charlie Schick, is Director, Big Data, Healthcare and Life Sciences, at IBM, driving solution development, sales consulting, and go-to-client activities. Prior to that he worked at Children’s Hospital Trust, the fundraising arm of Boston Children’s Hospital, where he led the Trust’s engagement with patients families, advocates, and donors of all levels through online social networking services and innovative media channels.

Before that, as Editor-in-Chief, he built and ran Nokia Conversations. His career at Nokia also includes kick-starting Ovi.com, launching Nokia Lifeblog and the Series 60 Platform, and providing Internet strategy consulting throughout the company.

Prior to joining Nokia, he was an editorial consultant for various online and print publications. In addition to having written numerous articles for online and print telecom publications, he has written several research papers in leading journals and co-authored a book on advanced phone systems.

One of his dark secrets is that he spent 12 years in basic Molecular and Cellular Biology research, reaching the level of Research Fellow and Instructor at Children’s Hospital Boston, part of the Harvard Medical School. He has a graduate degree from the University of Massachusetts Amherst.

Laurence Stuntz
Director, Massachusetts eHealth Institute

Laurence Stuntz is the Director of the Massachusetts eHealth Institute, the Commonwealth’s entity for health care innovation, technology, and competitiveness. The eHealth Institute advances health IT throughout Massachusetts, and is working to ensure that all Massachusetts providers adopt electronic health records, are meaningfully using those EHRs and are connected to the statewide Health Information Exchange.

Prior to joining the eHealth Institute, Mr. Stuntz worked for private industry and has over 20 years of experience in healthcare information technology product development, systems integration and management consulting. He was the Senior Vice President responsible for product development for NaviNet and was a Partner at Computer Sciences Corporation (CSC) with responsibility for CSC’s Collaborative Communities solution area.

He has led, worked on and contributed to some of the most significant health information exchange efforts in the United States, including the New England Healthcare Exchange Network (NEHEN), MA-SHARE ePrescribing and Clinical Exchanges, the Metro Chicago HIE, and the CAQH Committee on Operating Rules for Information Exchange (CORE) project.
Micky Tripathi
President and CEO, Massachusetts eHealth Collaborative

Micky Tripathi is the founding President and CEO of the Massachusetts eHealth Collaborative. His activities range from policy guidance at the federal level, to collaborative strategic planning at the state and community levels, to implementation of health IT systems at the frontline of healthcare delivery.

Prior to leading MAeHC, Micky worked with U.S. and international clients as a Manager at the Boston Consulting Group, a leading strategy and management consulting firm. While at BCG, he served as the founding president and CEO of the Indiana Health Information Exchange, where he led the design and launch of one of the largest and most successful statewide laboratory results-delivery businesses in the country. Micky serves on a number of boards and steering committees, including the Information Exchange Workgroup of the HIT Policy Committee, the eHealth Initiative, and the New England Health Exchange Network (NEHEN).

Micky holds a Doctorate of Philosophy in Political Science from the Massachusetts Institute of Technology, a Masters in Public Policy from Harvard University John F. Kennedy School of Government, and a Bachelors in Political Science from Vassar College.

Paul Wallace, MD
Chief Medical Officer & Senior Vice President for Clinical Translation, Optum Labs

Paul Wallace, MD, is Chief Medical Officer and Senior Vice President for Clinical Translation at Optum Labs. Prior to this he was a Senior Vice President and Director of the Center for Comparative Effectiveness Research at Lewin Group, where he and his colleagues led policy and business development to manage, promote, and support the use of comparative effectiveness research to inform decisions that help achieve the most effective patient outcomes, health care policies, and deployment of health care resources.

Dr. Wallace was formerly a Medical Director and clinician with Kaiser Permanente. He was the Executive Director of Kaiser Permanente’s Care Management Institute (CMI) and led and contributed to several KP national initiatives in evidence based medicine, population health and use of Health IT. Board certified in Internal Medicine and Hematology, he previously taught clinical and basic sciences and investigated bone marrow function as a faculty member at the Oregon Health Sciences University.

Dr. Wallace is vice-Chair of the board of directors for AcademyHealth and a Board member of the eHealth Initiative. He was Chair for the IOM Committee for Integrating Public Health and Primary Care. He previously served as a member of the Institute of Medicine Board on Population Health and Public Health Practice, the Committee on Performance Measurement and Standards Committees for NCQA, the National Advisory Council for the Agency of Healthcare Research and Quality (AHRQ), the Medical Coverage Advisory Committee for the Centers for Medicare and Medicaid Services (CMS), the Medical Advisory Panel for the Blue Cross and Blue Shield Technology Evaluation Center, and Boards for the Center for Information Therapy, and The Care Continuum Alliance.

Wallace is a graduate of the University Of Iowa School Of Medicine and completed further training in Internal Medicine and Hematology at Strong Memorial Hospital and the University of Rochester.
Julie Yoo, MS
Chief Product Officer

Julie is a Co-Founder of Kyruus and serves as the company’s Chief Product Officer. She was previously the VP of Clinical Product Strategy at Generation Health, where she oversaw the development of the company’s clinical programs and data analytics platform. Julie also led the Product Management efforts at Knome, the private arm of George Church’s Personal Genome Project, where she developed and launched a bioinformatics platform for conducting individualized genomic sequence analysis.

Julie’s passion for data-driven businesses began as a software engineer at Endeca Technologies, where she ultimately helped to lead Endeca’s efforts in the health care industry as a Sales Engineer for Strategic Accounts.

Julie has an undergraduate degree in computer science from MIT, an MS in biomedical sciences from the Harvard-MIT HST Program, and an MBA from the MIT Sloan School of Management.