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Innovation Advisory Committee Meeting

Monday, May 16 | 12 – 1:15 p.m. | BRB 381

Agenda

PROCEDURE FEEDBACK MOBILE APPLICATION FOR SURGICAL RESIDENTS

Karen Brasel, M.D., M.P.H., F.A.C.S., and Kelly Haisley, M.D.

Feedback is an instrumental part of the training of surgical residents. We feel that there is an obvious opportunity to improve the platform on which feedback is completed from antiquated paper forms which are challenging to find and easily lost, to an electronic platform which would allow for effortless accessibility and data integration.

COPYRIGHT AND LICENSING 101

Trina L. Voss, Technology Development Manager

Many technologies require patent protection to bring them to the market. Other inventions, including software, educational programs, videos and artwork, are protected by copyright. Learn more about the best protection for your product.

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Unable to join us at the Innovation Advisory Committee Luncheon? Check out www.mindjet.com for a free trial of their popular MindManager software program.

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PROCEDURE FEEDBACK MOBILE APPLICATION FOR SURGICAL RESIDENTS
Karen Brasel, M.D., M.P.H., F.A.C.S., and Kelly Haisley, M.D.

Case Entry Views

BACKGROUND

Feedback is an instrumental part of the training of surgical residents. While traditions of verbal feedback are undoubtedly ingrained in surgical teaching, changing cultures have encouraged us to make this feedback more timely, directed, and meaningful. The importance of feedback is such that the ACGME now requires that surgical residents receive documented feedback on their operative performance, which, here at OHSU, is required 10 times every 6 months. However, due to outdated methods and multiple barriers to completing the mandate in its current form, our residents are failing to meet this requirement, struggling to average 6-7 documented feedback sessions each 6 months, frequently rushing them all the week they are due and, thus, limiting their true meaningfulness.

DESIGN

In the electronic world that we live in, where nearly every individual is equipped with a smart phone, we feel that there is an obvious opportunity to improve the platform on which feedback is completed from antiquated paper forms which are challenging to find and easily lost, to an electronic platform which would allow for effortless accessibility and data integration in a way that will not only facilitate surgical feedback, but will have applications across multiple medical specialties and in quality improvement and education research.

Case Submission and Review Views

CURRENT STATUS

Our mobile procedure feedback application is currently under development by Due North innovations with a plan to integrate procedure feedback into the upcoming Qview software package at OHSU to create a meaningful, centralized and user-friendly method for meeting the ever increasing number of standards imposed by the ACGME. We expect to begin beta testing soon with product launch concurrent with the Qview rollout.
Often when we think of technology commercialization we focus on patents. Many technologies require patent protection to bring them to the market. Without the opportunity to prevent others from using a patent, developing devices and algorithms may not be considered a good investment. Without patent protection, it may be difficult to find a company and investors to develop a technology to the stage that it is ready to help the general public. There can be some downsides to pursuing patent protection, however. It can cost tens of thousands of dollars and take years to prosecute a patent, and the protections are relatively short. Patents expire within 20 years from filing an application. Furthermore, some inventions are simply not “patentable subject matter.”

CONSIDERING IP PROTECTION? ASK YOURSELF THESE QUESTIONS FIRST:

- Is the invention a “thing” which you can hold which “does something” (such as a wrench which tightens bolts)?

  If so, it is a candidate for a patent.

- Is it a work of art which entertains or educates?

  It is likely to be a candidate for copyright protection.

- Is the invention a medical device or drug which will require extensive and expensive regulations?

  If so, it may require a patent to attract the investment to bring it to market. Companies cannot spend millions of dollars developing a drug they cannot stop others from making and selling.

- Where will the invention be made or sold?

  Because each country issues its own patents, which can be expensive, inventions should only be patented in countries where the product will be made or sold, and where it can be enforced. An issued patent is not a good investment if it is in a country where you will have no way to know if the products are being made or sold.

- Can we tell if a patent is being infringed?

  Some patents are on methods, such as a chemical process which is more efficient. If it would be impossible to tell if a company is using a patented method (such as heating the same chemicals to a different temperature to produce the same product slightly faster), it may not be a good investment to file a patent.

For more information about software, patents and licensing, contact Trina Voss at vosst@ohsu.edu or visit www.uspto.gov/patents-getting-started/general-information-concerning-patents

Other inventions, including software, educational programs, videos and artwork, are protected by copyright. As soon as these ideas are made tangible, generally by writing or drawing them, they are protected by U.S. Copyright law. This allows you to prevent others from using your work. Additional protection can be gained by registering a copyright, which includes submitting your materials to the Library of Congress and paying fees which are generally under $100. Registering a copyright is not normally required, however, and mostly affects penalties a court can impose if your copyright is infringed. Copyrights last longer than patents, generally 70 years after the author’s death or 120 years.

Copyrighted materials can be licensed and in some cases can be easier to license than patents. The need to be reimbursed for patent costs can make patent licenses too expensive for some companies. Patents provide protection only in specific countries and can only be enforced after they are issued. Copyright protection is immediate and automatically international. Nearly one-third of all licensed OHSU technologies are protected by copyright. Some examples of licensed copyright materials from OHSU include photographs used in television programs, software and data sets for teaching computers the English language, pain management and relaxation programs, health and wellness programs, medical workflow software, and patient questionnaires used for diagnoses.
Mobile engagement and CRM software for life sciences

Mobility is the new normal and virtually everything is – or will be – mobile. People, devices, apps...the way we communicate, interact, work, consume and find content...it’s all become mobile.

People’s expectations have changed. Whether working or playing, our mobile devices are always with us, and they’re always on. The “consumerization of IT” has drastically impacted the workplace. People expect work-related applications to provide the same experience as their consumer apps, particularly in a BYOD (bring your own device) environment.

Many companies took early steps, deploying iPads to the field; but, passing out iPads is not a mobile strategy. Nor is creating dozens of internal apps, many of which have similar functionality. These present challenges for the enterprise, so it’s critical you correctly define a mobile strategy.

Prolifiq Software was founded in 2000 by pioneers in the high-tech industry who wanted to prove that complex systems don’t have to be complicated for users. Today, Prolifiq serves some of the world’s largest medical technology and pharmaceutical companies, reimagining customer relationship management with tailored solutions that drive better patient outcomes. Prolifiq is headquartered in Portland, Ore. with an office in Princeton and employees based in London, Seattle, San Jose, and Chicago. Visit their website to learn more.
Prolifiq’s **TOP 10** recommendations to follow when developing your mobile strategy

1. **Design Apps, Tools and Content for Mobile First**
   Plan for mobility; it’s not an afterthought. Optimize apps, tools and content for use on mobile devices, regardless of type, operating system and screen size, rather than retrofitting for a mobile environment. It’s like putting a square peg in a round role...it doesn’t fit...and it shows.

2. **Develop A Company API (Application Programming Interface)**
   This is what allows apps, databases and websites to communicate with each other. Embracing and standardizing interoperability makes it easier for companies to integrate new apps with legacy systems.

3. **Plan For TCO (Total Cost Ownership)**
   Total Cost of ownership is a financial estimate to help determine direct and indirect costs of a product or system. Often times, mobile application deployments neither ignore TCO or underestimate it. It’s critical to plan beyond initial development costs, whether you build, buy or rent. Account for the integration with other systems, device migrations, revision level upgrades, feature expansion and operational support when calculating a realistic TCO.

4. **Integrate**
   Embrace existing and third party apps with those you want to create. Disparate, stand-alone apps with overlapping functionality cause confusion for users.

5. **Provide One Place To Go**
   Give users a single location to access enterprise apps with a branded, common look and feel. A common user experience makes it easier for people to find the apps they need and it increases their adoption and usage. Single sign on (SSO) uses one set of login credentials to access different company systems.

6. **Embrace Single-Purpose Apps**
   So many enterprise apps have been created that people don’t know which apps to use or find the ones they need. To avoid confusion, create apps with one task and one action. Unify them in a common interface so people easily can find and use them.

7. **Focus On The User**
   Mobility is no longer just about Apple. We live in a poly-screen, poly-device world. New devices and operating systems emerge all the time. For apps to be successful, they must work on all devices and operating systems.

8. **Embrace the Cloud**
   The invention of “the cloud” has transformed the way we store and share data, content and information. Cloud-based architectures have infiltrated both consumer and enterprise applications. Yet organizations are reluctant to make the move to the cloud. Fortunately, there is a middle-ground: the hybrid cloud. It's more technically complex but it provides on and off-line operation, cloud back-up and performance, and leverages your legacy investments.

9. **Engage**
   Regulated companies want to engage customers, but require compliant, transparent and discoverable communications. Systems of engagement connect people, fulfill requests, use compliant content and measure customer engagement. Mobility requires these systems to be usable from mobile devices.

10. **Embrace The Mobile Employee**
    Empower employees to be productive wherever they are, whenever it's convenient – regardless of their devices. Provide mobile tools so they perform daily tasks and access critical company systems in a simple, friendly user interface.
The Department of Surgery Announces Alliance with The Department of Biomedical Engineering

“In Partnerships between knowledge institutes are vital. This new alliance draws upon the Department of Biomedical Engineering’s design expertise and our core strength of clinical care.”

- John G. Hunter, M.D., F.A.C.S., F.R.C.S. (Edin.)
Mackenzie Professor and Chair
Department of Surgery

In April 2016, Innovation Manager Sharon Kryger, Department of Biomedical Engineering Chair Dr. Owen McCarty and Biomedical Engineering Graduate Program Director Dr. Monica Hinds met to finalize the details of an alliance between the Department of Surgery and the Department of Biomedical Engineering. The alliance specifically supports the Surgical Innovation Intern Program, with an agreement that M.D./Ph.D. biomedical engineering students will take on the role of innovation intern midway through their education. The benefits to both departments are tremendous: biomedical engineering students will have the opportunity to apply their skills and knowledge in a real life setting while the innovation program will gain the expertise needed to accelerate the program and provide coverage for an increasing portfolio of technologies.

This year’s biomedical engineering students turned surgical innovation interns are Jenya Zilberman-Rudenko (M.D./Ph.D. in process) and Matt Hagen (Ph.D. in process).

The Departments of Surgery and Biomedical Engineering look forward to developing their alliance into a strong partnership in the coming years.
About the Department of Biomedical Engineering

The Department of Biomedical Engineering’s research and teaching are focused on solving unmet clinical needs in the areas of cardiovascular and infectious diseases, rehabilitation medicine, and cancer.

The Department is home to over 40 Ph.D. students and postdoctoral fellows. The BME curriculum is designed to provide both breadth and depth in human (patho) physiology and the use and development of measurement science approaches to address unmet clinical needs. Didactic training includes training in biochemistry and cell biology, biomedical optics, fluid dynamics and signal processing. The curriculum is tailored for each student based upon their background, research direction and career goals. The major emphasis of the training program is centered on the use of this knowledge base to develop an experimental approach to test a hypothesis, analyze and present data in both written and oral form, communicate within a team of interdisciplinary learners, and develop an understanding of the translation of basic science discoveries towards clinical utility. Finally, students are mentored in opportunities to develop coursework for didactic teaching and serve as a mentor for undergraduate and high school student interns. Students have the opportunity to develop workshops and tours for local high school and college students through strategic partnerships with Saturday Academy and the OHSU Summer Equity and CURE Programs.

Typically, students complete the combined M.D./Ph.D. Program within seven to eight years, although the actual time will vary depending on each individual’s rate of progress in fulfilling the requirements for both the M.D. and Ph.D. degrees. The normal sequence of instruction begins with the first pre-clinical years of medical school, followed by graduate school and completion of the doctoral dissertation, and culminates in the remaining years of medical school.
Surgical Innovation Internship

The Department of Surgery’s Innovation Internship Program is a project-based experience for students with a passion for entrepreneurship and a commitment to improving healthcare through medical technology. We offer 3 month and 6 month internships. Each team consists of an engineer and a M.D. who are partnered with a faculty mentor.

Our mission is to train our interns and faculty in the systematic approach to needs-finding and the invention and implementation of new biomedical technologies. Key components of our internship include workshops in MedTech innovation, mentoring in the technology transfer process and community educational events.

Introducing our 2016 Bioengineer-in-Residence

Joseph Pia, M.S., is a bioengineer with a passion for innovating technologies in medicine. He is a recent graduate of the Center for Bioengineering Innovation and Design at Johns Hopkins University. There, he worked on a team of bioengineers to identify clinical needs, analyze market opportunities, and develop novel medical devices.

Joseph has a background in mechanical engineering with a B.S. in Engineering from George Fox University, in Newberg, Ore., and experience working with orthopedic implants in the Portland area. He is committed to making a difference in medicine, whether it’s by empowering others to improve their own health or creating impactful solutions to unmet needs.

Congratulations to our 2015 Summer Surgical Innovation Intern, Dr. Younes Jahangiri for his acceptance into OHSU’s 2016 Neurology Residency Program. He is currently wrapping up his research of designing comprehensive, outcome-based interventional radiology procedure databases with the Dotter Interventional Institute. Key components of our internship include workshops in MedTech innovation, mentoring in the technology transfer process and community educational events.

Our mission is to facilitate, drive and manage the innovation process for busy surgeons

Contact Innovation Manager Sharon G. Kryger, C.C.R.P., C.C.R.A., M.S.

krygers@ohsu.edu | tel. 503 494-7477
Meet this year’s Innovation Intern Teams

**Team 1**

**Elaina Gabriel, B.S.**
Education: B.S., Mechanical Engineering, Portland State University - Honors College
gabriele@ohsu.edu

**Juan Carlos Martinez Zegarra, M.D., Ms.C.**
Education: M.D., Universidad Nacional de San Agustin, Arequipa-Peru; Ms.C., Universidad Peruana Cayetano Heredia, Lima-Peru; Visiting Researcher, Dr. Joe Gray Laboratory, OHSU
martijua@ohsu.edu

**Team 2**

**Jenya Zilberman-Rudenko, B.S., M.D./Ph.D.**
Education: B.S., Chemical Biology, UC Berkeley; IRTA fellow, Immunology, National Institute of Health; M.D./Ph.D., Biomedical Engineering, Thrombosis & Hemostasis, OHSU
zilberma@ohsu.edu

**Ganesh Keshav, M.B.B.S.**
Education: Bachelor of Medicine and Bachelor of Surgery (M.B.B.S) graduate from Chengalpattu Govt. Medical College, India
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**Team 3**

**Matt Hagen, B.A., Ph.D.**
Education: B.A., Biology, Reed College; Ph.D., Biomedical Engineering, OHSU
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**Maksuda Hossain, M.B.B.S., M.D.**
Education: M.B.B.S., Mymensingh Medical College, University of Dhaka, Bangladesh; M.D., Educational Commission for Foreign Medical Graduate
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It was a 6:30 a.m. Friday breakfast meeting with our Surgery Chief Residents in 2010, when they described the somewhat cumbersome and repetitive tasks required in preparing for our weekly Morbidity and Mortality Conference (MMC). This was a story that was familiar to me, since my generation of residents had performed the same tasks in the 1980s and 1990s (except that we used overheads and transparencies, instead of PowerPoint slides). The MMC is a critical activity for all healthcare providers, a venue for discussing and learning from medical errors and suboptimal patient outcomes. The MMC also is a requirement for all ACGME-approved residency programs. After that meeting with the surgical residents and further discussions with Dr. John Hunter (our Chairman of Surgery), our department IT Manager Ed Wolf and I began development of a morbidity and mortality data-entry system, with lots of feedback from numerous resident and attending surgeons. The platform creates a repository for our physicians to disseminate practice guidelines, standardizes the methods by which morbidity and mortality data is being reported in our department, and improves our HIPAA compliance. It also helps our Quality Specialists to link our surgical outcomes data with individual patient level data. The prototype was launched in the Department of Surgery in 2014 and we added surgical divisions one-by-one.

At the suggestion of several surgeons, we disclosed this application to OHSU Tech Transfer. After several months of indecision on our part about what to do with the technology, Arvin Paranjpe (Senior Technology Development Manager) introduced us to dueNorth Innovation, a serial entrepreneur group with a vast experience in health information technology ventures. They performed due diligence and found the same “unmet need” at numerous other institutions around the country. This led to the creation of a corporation, an exclusive licensing agreement, and the hiring of three software engineers to convert our prototype into a commercial version with a multitude of additional features. We’re also working with a Boston-based software engineering firm to develop some of the software as well. At present, we are working with OHSU Administration to standardize morbidity and mortality reporting and peer-review across numerous departments, and a University of California hospital is on our schedule for implementation in the next quarter. We’re hoping to disseminate this software nationally and internationally.

- **Dr. Timothy Liem** is Professor of Surgery at OHSU within the Division of Vascular Surgery and Vice-Chair for Quality within the OHSU Knight Cardiovascular Institute
GE Healthcare

GE Healthcare has long entered into partnerships with universities around the globe.

And Oregon Health & Science University is high on that list. GE and OHSU signed a Memorandum of Understanding to collaborate on a variety of health care projects, which the two are in the process of narrowing down as they finalize a “large master agreement” by July.

“Being responsible for all our research partnerships around world, I know it’s hard to find partner that has same culture and ability to bring in different areas of expertise quickly,” said Bram Stolk, general manager of Global Research at GE, who was in Portland Thursday from Milwaukie to meet with OHSU officials.

What I saw is that the culture of collaboration and having multiple disciplines working on the same question is uniquely advanced here,” Stolk said.

This isn’t the first collaboration for OHSU with a corporate partner. It has worked with Intel Corp. for the past three years on a Collaborative Cancer Cloud to amass genomic data and advance custom-tailored treatments for various cancers. And it has a relationship with medical device maker Welch Allyn for rapid prototyping of potential products.

John Flannery, president and CEO of GE Healthcare, visited the OHSU’s Oregon National Primate Research Center last summer. He was back in Portland on Thursday to deliver the keynote address at the OHSU Startup Symposium.

“We don’t feel capable of evolving and innovating by ourselves,” Flannery said. “We see a lot of things we can do with you in life sciences, molecular medicine, cardiology and analytics.”

A main focus is likely to be neuro-muscular and cardiovascular imaging, Stolk said. OHSU has developed a standout reputation in cardiovascular imaging, thanks to the work of Dr. Sanjiv Kaul, whose lab developed the world’s fastest camera.

Scientists from both GE and OHSU recently came together for a workshop to explore projects that go beyond ultrasound, “looking for opportunities to leverage each other’s strengths in a more thematic way,” Stolk said. “We’re looking at what our interests are and what OHSU’s are and seeing where we have overlaps and can develop more programmatic approaches.”

Dan Dorsa, Ph.D., senior vice president for research at OHSU, said with OHSU’s commitment to imaging, it is looking for “the right entities to help us understand the technical frontiers.”

“It’s also about putting it in the context of how that improves patient care and costs,” Dorsa said. “It requires a much closer working relationship with a company like GE and a clinical enterprise like OHSU.”

The partnership will likely seek grant funding together and GE will likely help OHSU with its commercialization efforts.
The ‘big data’ revolution in healthcare

Accelerating value and innovation

Introduction

An era of open information in healthcare is now under way. We have already experienced a decade of progress in digitizing medical records, as pharmaceutical companies and other organizations aggregate years of research and development data in electronic databases. The federal government and other public stakeholders have also accelerated the move toward transparency by making decades of stored data usable, searchable, and actionable by the healthcare sector as a whole. Together, these increases in data liquidity have brought the industry to the tipping point.

Healthcare stakeholders now have access to promising new threads of knowledge. This information is a form of “big data,” so called not only for its sheer volume but for its complexity, diversity, and timeliness. Pharmaceutical-industry experts, payors, and providers are now beginning to analyze big data to obtain insights. Although these efforts are still in their early stages, they could collectively help the industry address problems related to variability in healthcare quality and escalating healthcare spend.

For instance, researchers can mine the data to see what treatments are most effective for particular conditions, identify patterns related to drug side effects or hospital readmissions, and gain other important information that can help patients and reduce costs. Fortunately, recent technologic advances in the industry have improved their ability to work with such data, even though the files are enormous and often have different database structures and technical characteristics.

Many innovative companies in the private sector—both established players and new entrants—are building applications and analytical tools that help patients, physicians, and other healthcare stakeholders identify value and opportunities. Our recent evaluation of the
marketplace revealed that over 200 businesses created since 2010 are developing a diverse set of innovative tools to make better use of available healthcare information. As their technological capabilities and understanding advance, we expect that innovators will develop even more interesting ideas for using big data—some of which could help substantially reduce the soaring cost of healthcare in the United States.

For big-data initiatives to succeed, the healthcare system must undergo some fundamental changes. For instance, the old levers for capturing value, such as unit-price discounts based on contracting and negotiating leverage, do not take full advantage of the insights that big data provides and thus need to be supplemented or replaced with other measures. Stakeholders across the industry also need to protect patient privacy as more information becomes public, and ensure that safeguards are in place to protect organizations that release information.

The big-data revolution is in its early days, and most of the potential for value creation is still unclaimed. But it has set the industry on a path of rapid change and new discoveries; stakeholders that are committed to innovation will likely be the first to reap the rewards. This paper will help payors, pharmaceutical companies, and providers develop proactive strategies for winning in the new environment. It first explains the changes that are making this big data's moment, and then describes the new “value pathways” that could shift profit pools and reduce overall cost in the near future. The paper also discusses the analytical capabilities that will be required to capture big data's full potential, ranging from reporting and monitoring activities that are already occurring to predictive modeling and simulation techniques that have not yet been used at scale. The conclusion contains a call to action for all stakeholders, focusing on strategies required to sustain and build on the momentum, as well as key priorities for leaders.

Continued on next page
Reaching the tipping point: A new view of big data in the healthcare industry

From banking to retail, many sectors have already embraced big data—regardless of whether the information comes from private or public sources. Grocery stores, for instance, examine customer loyalty card data to identify sales trends, optimize their product mix, and develop special offers. Not only do they improve profits, but they increase customer satisfaction.

Traditionally, the healthcare industry has lagged behind other industries in the use of big data. Part of the problem stems from resistance to change—providers are accustomed to making treatment decisions independently, using their own clinical judgment, rather than relying on protocols based on big data. Other obstacles are more structural in nature. Many healthcare stakeholders have underinvested in information technology because of uncertain returns—although their older systems are functional, they have a limited ability to standardize and consolidate data. The nature of the healthcare industry itself also creates challenges: while there are many players, there is no way to easily share data among different providers or facilities, partly because of privacy concerns. And even within a single hospital, payor, or pharmaceutical company, important information often remains siloed within one group or department because organizations lack procedures for integrating data and communicating findings.

A series of converging trends is now bringing the healthcare industry to a tipping point at which big data can play a major role, as described in Exhibit 1.

**Exhibit 1: The convergence of multiple positive changes has created a tipping point for innovation**

- **Demand for better data, for example:**
  - Huge cost pressure in the context of reform, economic climate, payment innovation
  - First movers showing impact, risk of being “beaten to the punch”

- **Supply of relevant data at scale, for example:**
  - Clinical data will become “liquid” thanks to EMRs and information exchanges
  - Non-healthcare consumer data are increasingly aggregated and accessible

- **Technical capability, for example:**
  - Significant advances in the ability to combine claims and clinical data and protect patient privacy
  - Analytical tools now prevalent in front line across all functions

- **Government catalyzing market change, for example:**
  - Continued commitment to making data publicly available
  - Government is enabling private sector participants to create interoperable standards

Source: McKinsey analysis
A rising demand for insights—and a turn to big data

Several forces are stimulating demand for big data, especially escalating costs and the consequent shifts in provider reimbursement trends, as well as shifts in the clinical landscape.

The cost pressure in the U.S. system is not a new phenomenon, since healthcare expenses have been rising rapidly over the last two decades. By 2009, they represented 17.6 percent of GDP—nearly $600 billion more than the expected benchmark for a nation of the United States' size and wealth. While some metrics indicate the rate of growth is slowing, both payors and providers continue to focus on lowering the cost of care.

These cost pressures are beginning to alter provider reimbursement trends. For many years, most physicians have been compensated under a fee-for-service system that only considers treatment volume, not outcomes. As such, neither physicians nor payors consistently review outcomes data that shows how patients respond to treatment. But over the last decade, risk-sharing models have started to replace many fee-for-service plans in an effort to curb expenses and encourage judicious use of resources. Under these new arrangements, physicians are compensated based on patient outcomes or total cost control. Similarly, many payors are now entering risk-sharing agreements with pharmaceutical companies and only providing reimbursement for drugs that produce measurable improvements in patient health. With these emerging shifts in the reimbursement landscape, healthcare stakeholders have an incentive to compile and exchange big data more readily. If payors do not have access to outcomes information, for instance, they will not be able to determine the appropriate reimbursement levels. And if providers are not able to demonstrate effective outcomes, they may see shrinking levels of reimbursement and volume.

In the clinical sphere, more stakeholders are starting to embrace the concept of evidence-based medicine, a system in which treatment decisions for individual patients are made based on the best scientific evidence available. In many cases, aggregating individual data sets into big-data algorithms is the best source for evidence, as nuances in subpopulations (such as the presence of patients with gluten allergies) may be rare enough that individual smaller data sets do not provide enough evidence to determine that statistical differences are present.

First movers in the data sphere are already achieving positive results. This is prompting other stakeholders to take action, since they do not want to be left behind.

Supply at scale: A new wealth of knowledge

Fortunately, we now have a better supply of information to satisfy the increased demand. In the clinical sphere, the amount of patient data has grown exponentially because of new computer-based information systems. In 2005, only about 30 percent of office-based physicians and hospitals used even basic electronic medical records (EMRs). By the end of 2011, this figure rose to more than 50 percent for physicians and nearly 75 percent for hospitals. Furthermore, around 45 percent of US hospitals are now either participating in local or regional health-information exchanges (HIEs) or are planning to do so in the near future. These developments allow stakeholders access to a broader range of information. For instance, customers who use tools offered by Epic, an EMR provider, can access the benchmark and reference information from the clinical records of all other Epic customers. As another example, the HIE in the state of Indiana now connects over 80 hospitals and has information on more than ten million patients. Over 18,000 physicians can take advantage of the data.

Continued on next page
In addition to clinical data, several other sources are fueling the big-data revolution, including:

- Claims and cost data that describe what services were provided and how they were reimbursed
- Pharmaceutical R&D data that describe drugs’ therapeutic mechanism of action, target behavior in the body, and side effects and toxicity
- Patient behavior and sentiment data that describe patient activities and preferences, both inside and outside the healthcare context; for instance, payors can learn about patients’ finances, buying preferences, and other characteristics through companies that aggregate and sell consumer information, such as Acxiom and Accurint

Exhibit 2 summarizes the primary data pools available.

**Exhibit 2: Primary data pools are at the heart of the big-data revolution in healthcare.**

**Activity (claims) and cost data**
- Owners: payors, providers
- Example data sets: utilization of care, cost estimates

**Clinical data**
- Owners: providers
- Example data sets: electronic medical records, medical images

**Pharmaceutical R&D data**
- Owner: pharmaceutical companies, academia
- Example data sets: clinical trials, high-throughput-screening libraries

**Patient behavior and sentiment data**
- Owners: consumers and stakeholders outside healthcare (e.g., retail, apparel)
- Example data sets: patient behaviors and preferences, retail purchase history, exercise data captured in running shoes

**Integration of data pools required for major opportunities**

Source: McKinsey Global Institute analysis

**Industry efforts to increase supply:** Some firms and institutions with privileged access to big data are collaborating or commercializing their capabilities to extend access to others. For instance:

- Premier is a group-purchasing organization and an aggregator of hospital information. It offers a membership-based service to providers of all types, which contribute their information. Premier then provides data-driven informatics derived from integrated data sets.
- The large private payors operate stand-alone analytics divisions, such as OptumInsight for United Health, ActiveHealth for Aetna, and HealthCore for WellPoint. These divisions provide services to other payors that include support on data-driven issues like cost and performance benchmarking. Their data are much more extensive than those of smaller companies and thus offer a richer source from which to derive better insights.
Ten global pharmaceutical companies have recently joined forces to form the “TransCelerate Biopharma” collaboration, which is intended to simplify and accelerate drug development. Initially, companies will combine resources, including funding and personnel, to streamline clinical execution. The collaboration will involve a shared user interface for the collaboration's investigator site portal; mutual recognition of companies' approaches to qualify study sites and training; and development of a risk-based site-monitoring approach, clinical data standards, and comparator drug-supply model.

Technological advances that facilitate information sharing

Technological advances are overcoming many of the traditional obstacles to compiling, storing, and sharing information securely. For instance, EMR systems are now more affordable than in the past, even for large operations, and allow data to be exchanged more easily. In addition to facilitating longitudinal studies and other research, technological advances have made it easier to “clean” data and preserve patient privacy. The new programs can readily remove names and other personal information from records being transported into large databases, complying with all Health Insurance Portability and Accountability Act (HIPAA) patient-confidentiality standards.

Some computer systems can even examine information across all data pools—an important feature since there are special combinations that can provide more insights than any individual data set. For example, claims data may show that a patient has tried three treatments for cancer, but only the clinical data show us which was effective in shrinking the tumor. As another example, personal behavior information may show that a patient is taking fewer trips outside the house or looking up information on side effects online, both of which could suggest physical problems or be early indicators of an illness requiring early intervention to prevent a more serious medical episode. But only clinical data will confirm whether the behaviors are truly linked to illness.

With new data becoming available, innovators have taken the opportunity to build applications that make it easier to share and analyze information. As discussed later in this paper, these advances are starting to improve healthcare quality and reduce costs.

Government agencies providing both incentives and raw material for the revolution

Government-sponsored big-data initiatives within healthcare are encouraging—they will not only increase transparency but also have the potential to help patients. Not surprisingly, recent years have seen a flurry of activity in this sector in many countries. For example, the Italian Medicines Agency collects and analyzes clinical data on expensive new drugs as part of a national cost-effectiveness program; based on the results, it may re-evaluate prices and market-access conditions.

Within the United States, the federal government has been encouraging the use of its healthcare data, through various policies and initiatives. These efforts, which government leaders hope will directly improve cost, quality, and the overall healthcare ecosystem, generally fall into the following areas:

Legislation and incentives to promote data release and accessibility: Several pieces of legislation on healthcare will make it easier to access public data on patients, clinical trials, health insurance, and medical advances in the future. Recent policy directives at the federal level include the following:
• The 2009 Open Government Directive, as well as the consequent actions of the Department of Health and Human Services (HHS) under the Health Data Initiative (HDI), are starting to liberate data from agencies like the Centers for Medicare and Medicaid Services (CMS), the Food and Drug Administration (FDA), and the Centers for Disease Control (CDC).

• The wide-ranging Affordable Care Act, enacted in March 2010, included a provision that authorized HHS to release data that promote transparency in the markets for healthcare and health insurance.

• The Health Information Technology for Economic and Clinical Health (HITECH) Act, which was part of the 2009 American Recovery and Reinvestment Act, authorized up to about $40 billion in incentive payments for providers to use EMRs, with the overall goal of driving adoption to 70 to 90 percent of all providers by 2019; the HITECH Act also authorized $2 billion for EMR-related workforce training and infrastructure improvements.

To facilitate the exchange of information and the acceleration of user sophistication, CMS created the Office of Information Products and Data Analytics to oversee its portfolio of data stores and help collaborate with the private sector. The federal government is also sponsoring big-data initiatives at the state level. HHS, for instance, recently provided over $550 million in funding for the State Health Information Exchange Cooperative Agreement Program, which is designed to promote the creation of information exchanges. These data clearinghouses are run by state governments and consolidate information from providers under their jurisdiction. They allow clinicians to receive basic information about the treatment that a patient received from any provider listed in the system. (Some private companies also run similar information exchanges).

**Data standardization and ease of use:** With more data being released, the federal government is trying to ensure that all appropriate stakeholders, including those in private industry, can access the information in standard formats. For instance, the administration’s Big Data Research & Development Initiative, announced in March 2012 by the Office of Science and Technology Policy, made $200 million in funding available to support the release and usability of data stores from agencies in every branch of government.

As another example, the HDI facilitates release of information from HHS through its HealthData.gov Web site. The portal includes federal databases with information on the quality of clinical providers, the latest medical and scientific knowledge, consumer product data, community health performance, government spending data, and many other topics. In addition to publishing information, the HDI aims to make data easier for developers to use by ensuring that they are machine-readable, downloadable, and accessible via application programming interfaces. While more will need to be done, the HDI data are already being used by a variety of new entrepreneurs, as well as existing participants in the healthcare ecosystem.

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- McKinsey & Company’s mission is to help leaders in the commercial, public, and social sectors develop a deeper understanding of the evolution of the global economy and to provide a fact base that contributes to decision making on critical management and policy issues.
The Oregon Bioscience Association’s Board of Directors announced today the selection of Oregon Bio’s new Executive Director, Denise McCarty, who will take over leadership from Dennis McNannay on March 31, 2016.

“I am thrilled to have the opportunity to build upon the solid foundation that Dennis McNannay has put in place to further cultivate the bioscience ecosystem in Oregon.”

McCarty is joining the association after a successful legislative session impressive gains in employment and the number of firms; an increase in investor engagement; and the recent announcement about the 74 percent success rate in job placements for successful graduates of the public/private BioCatalyst program. These grads earn an average of $87,780, twice the Oregon average annual wage.

“I am thrilled to have the opportunity to build upon the solid foundation that Dennis McNannay has put in place to further cultivate the bioscience ecosystem in Oregon,” said McCarty. In collaboration with the Port of Vancouver, she also managed the strategic planning and initial implementation of the new Columbia River Life Sciences Building at the former Red Lion in Vancouver.

Before joining CREDC, McCarty worked for 16 years at Avnet Electronics marketing. She directed global business management, overseeing two multi-national corporations with 60 operating sites. Her education comprises a Bachelor of Science from Portland State University and from Texas A&M, an Industry Distribution, Sales and Operations Certificate. McCarty also comes at a time when growth in economic impact has shown Oregon is home to 13,556 direct jobs in the bioscience industry and, including the economic multiplier, as many as 56,552 total jobs aligned with bioscience. Today’s average annual wage for bio-workers in Oregon is $62,538. Oregon Bio’s Board Chair Matt Smits said, “Oregon Bio’s efforts to advocate, educate and cultivate a thriving bioscience community in Oregon continue to influence our industry's potential among our existing and future members. By playing to Oregon's strengths and aligning our partners, we foresee continuing our trajectory. Denise McCarty brings to us a track record of regional economic development success, executive leadership experience, and a gift for cultivating key relationships and influence among a wide variety of stakeholders. Within Washington’s bioscience community, her most recent success involved securing state influence and funds to create lab space and economic development were there were none.”

“While we are sad Dennis is stepping away from his current role, we are excited for him as he returns to the startup community with his new company and stays local within Oregon's growing bioscience community,” said Smits. McNannay has mixed emotions leaving an organization he led for five and a half years. He noted in the December search announcement, “I feel fortunate to have been part of such a vibrant organization. Strategically, Oregon Bio is perfectly positioned to continue building on our twelve-year growth trend.”
Upcoming Events

**Biomedical Engineering Seminar** | “CRISPR for genetic screens: a new hope in functional genomics”
*Thursday, May 19* | 3 – 4 p.m. | Center for Health and Healing, 3rd Floor Conference Room 1

**2016 TechConnect World Innovation Conference** | Innovation Showcase and Accelerator

**OEN Workshop** | “How to win customers and capital by crafting your story”
*Wednesday, May 25* | 3 - 5 p.m. | NXT Industries Lab | [www.oen.org](http://www.oen.org)

**Oregon Technology Business Center** | Pitch for Cash
*Wednesday, May 25* | 5 - 7 p.m. | Golden Valley Brewery | [otbc.org/event/pitch-for-cash](http://otbc.org/event/pitch-for-cash)

**OEN & OTBC Workshop** | “Startup 411 - How to start your startup”
*Thursday, May 26* | 2:30 – 5 p.m. | DeskHub | [www.oen.org](http://www.oen.org)

**Biomedical Engineering Seminar** | “Negative chronotropic effect induced by transthoracic pulsed ultrasound”
*Thursday, May 26* | 3 – 4 p.m. | Center for Health and Healing, 3rd Floor Conference Room 1

**BioForum** | ISPE and Oregon Bio
*Thursday, June 9* | 5:30 - 8:30 p.m. | Genentech | [www.oregonbio.org](http://www.oregonbio.org)

**National Aeronautics and Space Administration** | NASA Technology Transfer Program
*Wednesday, June 15* | 10 a.m. | OSU LaSells Stewart Center | [technology.nasa.gov](http://technology.nasa.gov)

**Oregon BioScience** | Bio on Tap 2016
*Thursday, July 14* | 6 - 9 p.m. | BridgePort Brewing Co. | [www.oregonbio.org](http://www.oregonbio.org)

**Keiretsu Forum** | Portland Chapter Meeting
*Friday, July 15* | 12:30 - 4 p.m. | Wells Fargo Tower | [www.keiretsuforum.com](http://www.keiretsuforum.com)

**Innovation Advisory Committee Meeting**
*Monday, August 29* | 12 - 1:15 p.m. | Location TBA

“Novel Right Angle Inline Vascular Clamp,” presented by James Dolan, M.D., with Surgical Innovation Interns Shalini Gautam, Ph.D., and Maksuda Hossain, M.D.

“Device Regulatory Pathway,” presented by Innovation Partner Thomas Richards, Ph.D., OregonHeart Regulatory Consultant