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Hype Cycle for Consumer Engagement With Healthcare and Wellness, 2014

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This Hype Cycle tracks the key technologies related to the engagement between healthcare organizations and healthcare consumers. Healthcare IT leaders need a holistic view of consumer experience to make sound strategic technology decisions in an environment that is increasingly consumer-centric.

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What You Need to Know

This Hype Cycle is one of six focused on technologies of direct interest to CIOs of healthcare delivery organizations, healthcare payers and life science organizations. The focus of this research is to identify, describe and analyze the consumer-facing healthcare technologies and applications supporting people actively engaged in their own healthcare. Our perspective in this research will be to place the technologies in context of a total consumer experience that transcends both the industry participants and the world of the consumer. This Hype Cycle reflects an increasing interest in a consumer-centric view of healthcare, the more active role of the consumer in healthcare, and the blurring and interwoven role of healthcare organizations in engaging the consumer. CIOs and technology leaders responsible for consumer engagement, consumer experience, telemedicine and related initiatives can use this research for understanding the key technologies, standards, applications and systems that are emerging and in play that will enable and shape the future consumer healthcare relationship.

Consider four take-aways from this Hype Cycle:

1. Consumer healthcare activities across all sectors of health and wellness, involving technology increasingly under the consumer's control, will influence healthcare organizations' strategies and processes for consumer engagement.
2. There is a convergence of roles, strategies and technologies that are expected to create new opportunities that lead to consumer- facing services not under the control of traditional healthcare delivery organizations (HDOs), payers or life science organizations.
3. Each healthcare player needs to develop new competencies for engaging consumers in the healthcare process.
4. The total consumer experience of healthcare and wellness will need to be explicitly evaluated as a use case in every healthcare technology decision that touches the consumer.

This Hype Cycle provides a collective view of industry sectors that are engaging with and defining the consumer experience in some fashion. Note that individual profiles may relate to only a single sector, such as healthcare provider, payer or life sciences, and the specific regional market or sector will be in the context of the individual profile.

The Hype Cycle

Taking a consumer perspective provides a natural point of integration that Gartner believes will reshape how the healthcare industry engages with them. In the current industry state, each healthcare industry participant generally engages consumers independently and with little visibility

into the overall experience of the consumer. In fact, even within a single enterprise, many initiatives or products today that bear the name "experience" or "engagement" largely focus on synchronizing efforts between departments of that enterprise, and fundamentally fail to understand and account for the total consumer experience of healthcare across all enterprises and all sectors. The perspective of these initiatives or products is one of moments — in setting an appointment, treating the patient, writing a prescription, making a claim or billing, enrolling in insurance, and so on. In other words, a healthcare provider engages the consumer in the context of a specific service and has referrals to other providers who engage independently. The payer interacts independently with the consumer on billing and enrollment, with pharmacy and life sciences engaging independently as well. To the consumer it is a complex labyrinth of processes to navigate. Inverting this view to one of the consumer helps reveal the discontinuity in the healthcare process overall and enables each industry participant to see the broader context of their actions.

One indication of the novelty of taking a cross-industry, consumer view of healthcare is the awkwardness in terminology we face in writing about it. The healthcare industry overall has applied many labels to its customers, and many believe the word "customer" is inappropriate in a healthcare context. We disagree with the latter point. Health providers refer to people as patients, healthcare payers as members, life science organizations as subjects, and governments as citizens. Each inspires a certain set of characteristics that we want to set aside for the purpose of this research and simply refer to people as consumers.

The consumer-centric view of healthcare is being shaped by a convergence of technology and business models that are enabling new ways of fostering wellness and delivering and receiving healthcare. While the discussion of consumer-centric healthcare is not new, CIOs should take note of the following developments that are leading to changes that have significant implications for IT:

- **The Internet of Things Is Building the Personal Health Network:** As the infrastructure for the Internet of Things (IoT) grows, sensors and devices will proliferate that are carriable, attachable, wearable, in clothing, and implantable so they will create a network on the body, around the body, in the home, and wherever people move in their lifestyles at work and play. CIOs need to consider how their technology will interact with this personal health network, with all of its attendant data coordination, security, and privacy issues. **Technology profiles include:** Home Health Monitoring, Mobile Sports and Fitness, Consent Management, In-Vehicle Occupants Health Monitoring, Wearable User Interfaces, and Continua 2014.
- **Consumer Technology Drives Health Activation:** Many consumers are adopting a rich variety of health-related websites, tools and technologies, riding a wave of innovation that has opened promising healthcare possibilities. These consumers have the unprecedented ability to take an active role in their health and wellness by monitoring their physiology, educating themselves on their health, accessing and managing their healthcare data, diagnosing symptoms, determining a course of treatment, procuring treatment, and evaluating their outcomes. CIOs need to consider that consumer activation will carry with it new expectations for enterprise technology and a new agility in accommodating consumer preference. **Technology profiles include:** Online Consumer Medical Education and Advice, Personal Wellness Records, Personal Health Record, Quantified Self, and Citizen Data Vaults.

- **Healthcare Enterprises Invest in Engagement:** Healthcare organizations are making IT investments in finding, attracting, engaging and retaining consumers. Consumer satisfaction is increasingly acknowledged as a critical factor of business survival and success. The core purpose of these consumer-facing applications is to create a more consumer-centered experience model: sustaining effective engagement, enhancing the care experience, solidifying brand loyalty, and uncovering innovative ways for the consumer to be a more effective player on the health and care management team. This is true for both healthcare providers and payers. CIOs need to consider that their technology investments increasingly will be in consumer-facing arenas, and will need to coexist with other consumer-facing engagement capabilities in the healthcare ecosystem that they do not control. This will drive the need for greater, more flexible interoperability with nonconventional partners as a third-party ecosystem of patient-centric tools developed for scheduling, registration, HIPAA compliance, consent forms, medical history capture and so on that enable the patient to work across the entities of healthcare seamlessly. **Technology profiles include:** Medical Shopping Transparency Tools, OpenNotes, Health Insurance Marketplaces, Member Incentives for Wellness, Health and Wellness Systems, Interactive Patient Care Systems, Patient Portals, Blue Button+, Patient Engagement and Persuasion Analytics, and Medication Compliance Management.

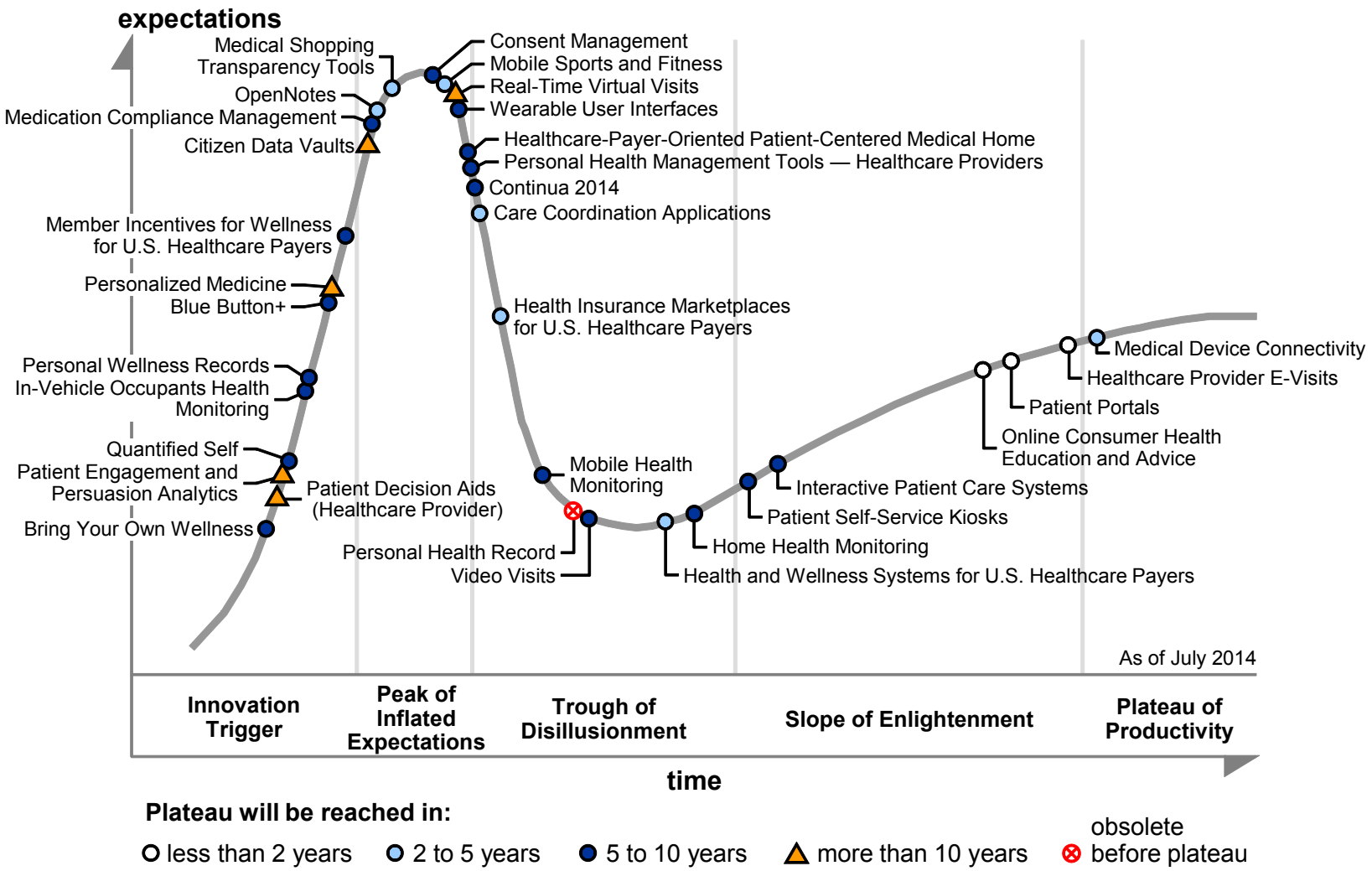
- **Information Technology Drives Innovation in Care Delivery:** Innovation in healthcare delivery has largely taken the path of incremental improvements in pharmacology, diagnostic equipment, surgical techniques and so on, and proceeded at the pace that clinical trials would allow. The advancement of healthcare information technology in the past decade, particularly in the areas of analytics and communications, is combining with traditional mechanisms to drive innovation at an increased pace. Telemedicine is one example. Where barriers of reimbursement, consumer concerns for privacy, and coordination with facility-based care have challenged telemedicine, new demands for access to care, cost efficiency and accommodation of consumer preference is reigniting interest and adoption. Payer and provider CIOs need to consider telemedicine-enabling business and IT infrastructure architectures in the areas of mobility, external consumer devices, data capture and cloud-based services. **Technology profiles include:** Mobile Health Monitoring, Care Coordination Applications, Healthcare-Payer-Oriented Patient-Centered Medical Home, Personal Health Management Tools — Healthcare Providers, Healthcare Provider E-Visits, Video Visits and Real-Time Virtual Visits.

- **Information Technology is Making Medical Treatment Personal:** Another area of rapid innovation are life science organizations that are developing personalized medicines/treatments and devices such as pill-based cameras, smart drug infusion pumps, implantable dosimeters, glucose sensors and implanted EKGs that capture, send, and act on the data. Many therapies are increasingly combining drugs, digital monitoring technology, compliance reinforcement, incentives and communications technology in ways that target the treatment to the individual needs of the patient to achieve the best outcome. Life science R&D is increasingly examining more unique patient factors, including biomarkers and patient behavior, leading to more personalized medicine where treatments are tailored to individual patients (or cohorts), based on genomics. Leveraging personal biological diagnostics are a growing segment of therapy. Life sciences companies are also taking to market value models inclusive of a more holistic view of the consumer that requires new coordination with the entire healthcare ecosystem — for visibility, safety monitoring, efficacy and adherence. Life science CIOs will need to contend with

a greater degree of information in domains they do not have deep expertise in, understand the individual (deidentified) patient information in real-world medical settings, and reach into the healthcare operational ecosystem for essential intelligence about their products in use. CIOs in HDOs and payer organizations need to prepare for the unique data and integration requirements that these innovations bring. **Technology profiles include:** Patient Decision Aids (Healthcare Provider) and Personalized Medicine.

It is clear that healthcare consumers are evolving in their view of their healthcare and wellness and in their expectations of each of the technologies and businesses they encounter in their health and wellness journey. It is further clear, in every industry publication and in industry conference exhibits, that all healthcare constituencies have, to varying degrees, sensed the opportunities and threats this presents, and are scrambling to respond. What is unclear is whether the collective set of actions, which are being taken with little thought to coordination or long-term effect, will amount to a better environment for the consumer. In the end, the consumer may in fact be the only moderating force that reconciles and integrates the approaches in a manner that supports common sense and efficiency. This Hype Cycle will tell this story as it unfolds, and will give insight to CIOs and technology leaders from across the healthcare ecosystem into the rapidly changing consumer experience of healthcare and wellness.

Figure 1. Hype Cycle for Consumer Engagement With Healthcare and Wellness, 2014



Source: Gartner (July 2014)

The Priority Matrix

The Priority Matrix is a companion to the Hype Cycle graphic. It maps a technology's benefit to its time to maturity. The graphic is generated from the benefit rating and the time-to-plateau values for each Hype Cycle entry. The Priority Matrix provides an easy-to-read format that answers two key questions: How much value will an enterprise get from a particular application area, and when will it be mature enough to deliver that value? As a rule of thumb, if it's red, it's hot — if it's gray, it's not. High-priority investments are in the top left of the Priority Matrix, where the technologies will potentially have a high impact and have reached a reasonable level of maturity.

Companies that are conservative in their technology adoption (Type C organizations) may limit their focus to this area. Companies that are more aggressive technology adopters (Type A and Type B organizations) are likely already using technologies that will mature in less than two years. Therefore, they will probably want to evaluate technologies farther to the right or lower on the Priority Matrix — for example, technologies that will not be in widespread use for at least five years, but that may provide a competitive edge in the interim.

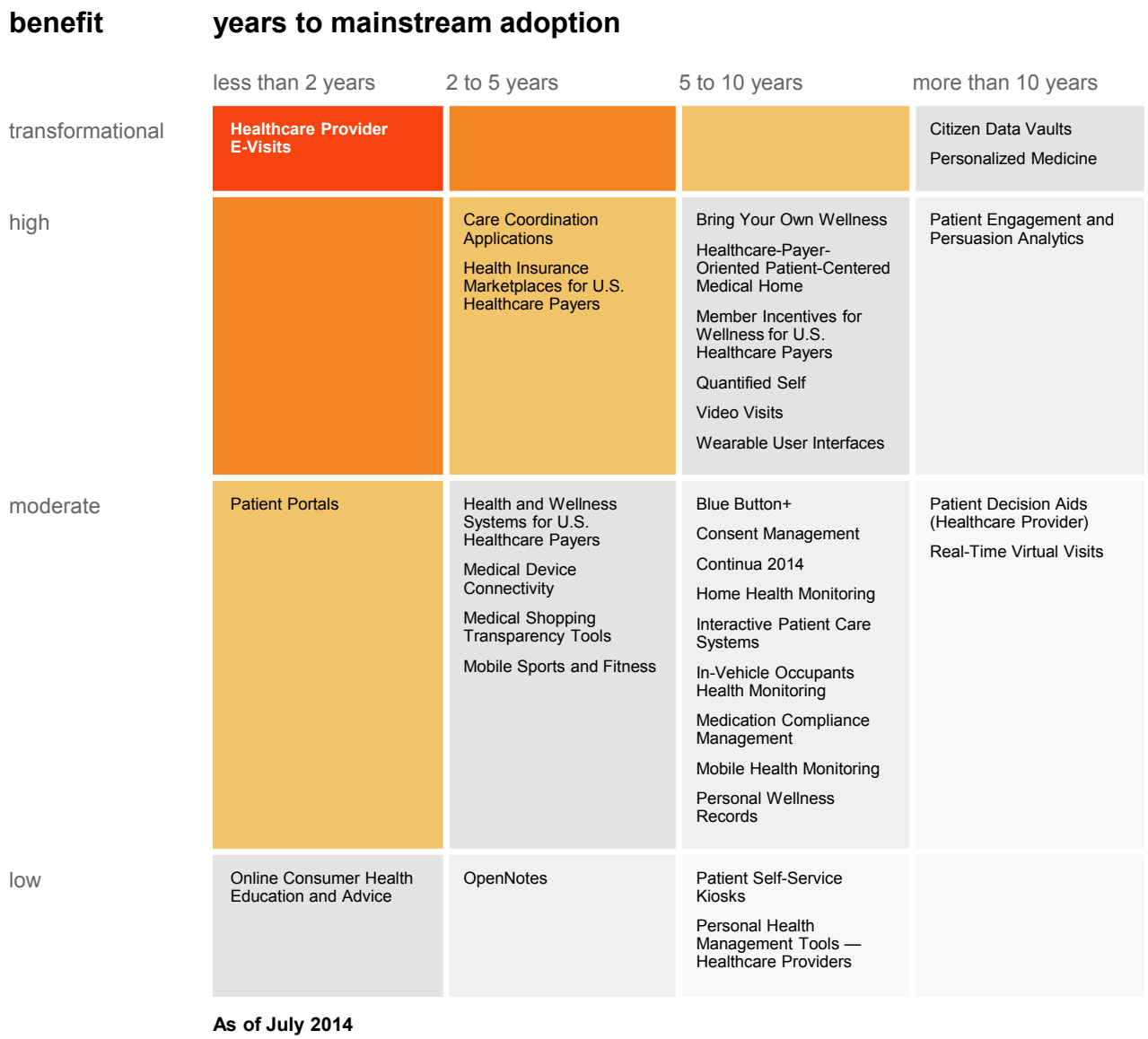
The environment for investment is one of caution depending on need. While there is certainty in the move to more consumer-centric healthcare services, it is highly uncertain how consumer technologies will be leveraged or even replaced by technologies sponsored under a care protocol. For example, a diabetic consumer/patient may have a wearable device that captures, monitors, and communicates blood glucose levels continuously; however, the data from that device may not be compatible with or acceptable to the treating HDO, and therefore the HDO may require that its own device be utilized by the patient. The healthcare payer may also decide that it will not reimburse for the device but would reimburse for use of manual test strips. The situation creates the conundrum that the patient has great technology that cannot be used in treatment, and the HDO will not be reimbursed for replacing the device and either has to absorb the costs or use manual test strip results. The patient, HDO and payer are all dissatisfied with the outcome, as this suboptimizes care or creates unnecessary inefficiencies.

Our investment advice in this area will vary by technology profile and industry sector; those details are embedded in the technology profiles; however, we have identified the following considerations for investing in technologies at the intersection of the healthcare organizations and healthcare consumers:

- Explore and evaluate the technologies and initiatives that other healthcare industry participants are pursuing to broaden your perspective of its impact on your sector.
- Establish an adaptive strategy of pursuing specific and tangible efforts while maintaining a longer-term eye on interoperability in the consumer-centric environment.
- Establish a holistic view of the consumer experience across healthcare and consider participating in industrywide initiatives for integrating the healthcare experience for consumers.
- Evaluate the total consumer experience of healthcare and wellness as a use case in every healthcare technology decision that touches the consumer.
- Prepare for an environment with greater interoperability and sharing of information by supporting third-party innovation through pilots or partnerships.

- Do not delay efforts to solve known issues in consumer satisfaction and engagement because of a lack of industrywide vision or standards.

Figure 2. Priority Matrix for Consumer Engagement With Healthcare and Wellness, 2014



Source: Gartner (July 2014)

Off the Hype Cycle

Because this is a new Hype Cycle, no technologies have moved off the Hype Cycle.

On the Rise

Bring Your Own Wellness

Analysis By: Mike Gotta

Definition: Bring your own wellness (BYOW) is part of a digital workplace strategy that encourages employee well-being through behavior, relationship and lifestyle change — thereby benefiting the sponsoring employer. BYOW helps employees achieve personal wellness goals through the use of "quantified self" applications (see "Technology Overview: Quantified Self") that leverage wearable and mobile devices, mobile apps, personalized sensors, communities and social networking (for advice, personal support and coaching).

Position and Adoption Speed Justification: BYOW within the enterprise is being influenced by the growing consumer adoption of quantified self, which allows people to be better informed and to make better decisions regarding their personal fitness and health goals. Components of BYOW include mobile apps, wearable devices, cloud-based services, and an analytics dashboard to track status, goal progress, challenges and rewards, for example. Application components include an app store, communities and social networking capabilities, and gamification services (such as leaderboards and challenges). Many different entities — including device manufacturers, brands, software vendors, developers of virtual personal assistant smart machines or simpler precursors, and healthcare related organizations — will provide these applications.

User Advice: BYOW can be initiated by anyone in the organization. It can start as a grassroots effort to reduce stress, become more active or create a greater team spirit. Activities can include walking meetings, individual competitions and even team challenges. Wellness coaches can play a key role in encouraging participation and building community. At a more advanced stage, BYOW can be connected to formal wellness programs and HR processes and include the involvement of senior leadership.

Business Impact: The traditional rationale for wellness programs has been to reduce the health costs borne by the employer. However, an emerging viewpoint is that organizations need to look beyond the cost argument and examine how a consumer-driven wellness scenario can positively influence employee engagement and an organization's cultural and business productivity. Business and IT leaders that encourage their workforce to come together in voluntary group activities and contribute toward something that has personal as well as work-related value, helps promote shared behaviors, a greater sense of community, and a culture of well-being that reflects positively on employees and employer alike.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Fitbit; Fitlinxx; Jiff; Keas; Limeade; Welltok

Recommended Reading: "Cool Vendors in Social Software and Collaboration, 2014"

"Technology Overview: Quantified Self"

Patient Decision Aids (Healthcare Provider)

Analysis By: Thomas J. Handler, M.D.

Definition: Patient decision aids are complex interactive systems based on decision rules that enable patients to evaluate their diagnostic and treatment options. Disease management applications or personal health management tools do not fit this definition, nor do sites providing patients with access to educational content without decision rules.

Position and Adoption Speed Justification: It is becoming evident that individuals need to become more involved in their own care decisions, because many of those decisions are more complicated than ever. In fact, healthcare reform in the U.S. stipulates an environment that promotes shared decision making. While patient decision aids are not equivalent to shared decision making, they are likely to contribute to the shared decision-making process. There has been minimal progress along the Hype Cycle — on the one hand, there has been increased interest in the concept, but on the other, barriers include relatively immature products, healthcare providers' competing priorities, reimbursement issues and legal concerns. The systems still remain more of a research interest rather than a commercial interest.

Patients don't always understand all their options, and might not have considered (in a structured way) how their personal preferences and situations might or should affect their medical decisions. For example, an individual with coronary artery disease may have to choose between minimally invasive stent placement and major surgery for coronary artery bypass grafts. Patients need to understand the risk of premature stent blockage versus the risks of major surgery, but also should consider how important it is to get back to "normal" activity sooner rather than later, and even whether or not cosmetic results are important. Lower back pain is another example. Many individuals endure years of pain and try all the nonsurgical options available to them, while others opt for surgery when it's first offered. However, few consider that, if they initially seek help from a surgeon, they're more likely to get a surgical solution.

At the same time that diagnostic and therapeutic options are becoming more complex, physicians are more time-constrained than ever and rarely have the time to comprehensively review options with their patients. One clear tipping point is the availability of genetic information — there is simply not enough time or specialists to fully counsel patients about genetic implications. The trend toward more-collaborative care and "team medicine" may actually make this situation worse. What once might have been a narrowly focused clinical encounter is becoming more holistic in nature, and therefore, clinicians have less time to talk about options.

As a result, patients and their families need tools to help them make better decisions, especially for conditions in which there isn't a single evidence-based definitive option, and therefore, the patient's personal preference is an important factor in the decision-making process. These tools should be available during the diagnostic and therapeutic phases of care.

It is still the case that only very progressive organizations are taking steps to leverage technology to improve patient decisions, and most are doing so as part of academic research. Factors that are inhibiting this market include questions regarding the content and its delivery. Is there enough evidence to help patients make these complex decisions? Will clinicians accept content from other sources, or will they demand the ability to vet that content? The tools will need ready access to clinical data, which means that the current technical limitation of interoperability is hindering advancement of these tools. There is also uncertainty regarding whether patients will accept and use these systems. Although this technology has potential, and there is more talk about its importance, essentially, no forward movement of patient decision aids has occurred during the past 12 months.

User Advice: Early adopters might consider small pilots of this technology. However, they must recognize the risks involved (including the possibility of medical or legal ramifications), because these tools remain unproven. Mainstream and late adopters are best advised to wait for these products to mature. Although patient decision aids may start as stand-alone systems, we believe that physicians ultimately are unlikely to support these systems until they are part of an enterprise electronic healthcare record system — in part because they will not want to interact with multiple systems, but most importantly, because they seek access to information within the context of a specific patient.

Business Impact: Successful rollout of patient decision aids is likely to help with branding and patient loyalty, and should reduce variability in care and improve outcomes. For these reasons, we have increased the benefit rating from low to moderate. However, it should be noted that it's too early to determine more-concrete business effects.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Sample Vendors: Health Dialog; myOptumHealth

Recommended Reading: "A Superior Patient Experience Is a Meaningful Measure of Care Quality"

"Market Trends: Healthcare Provider IT Solution Map, the Framework for IT Market Analysis, 2013"

"Top Actions for Healthcare Delivery Organization CIOs, 2014: Patients Are Your Most Important Stakeholders — Treat Them That Way"

Patient Engagement and Persuasion Analytics

Analysis By: Vi Shaffer

Definition: This new category is defined as the study of the social and behavioral determinants of health and healthcare effectiveness combined with analyzing what and how well health-related "engagement and persuasion" interventions work with segments of consumers. It includes, but is not limited to, analyzing patient reactions to portals and other patient-facing IT. It acknowledges

social network and "quantified self" trends that are surfacing data never before available that help make this type of analytics important.

Position and Adoption Speed Justification: This is largely a new area of advanced analytics for providers of care. We are not benchmarking it against U.S. healthcare delivery organizations (HDOs) alone. Rather, at this early stage of the Hype Cycle, we are looking at vendor and HDO activity anywhere where an HDO is taking on a serious population health management endeavor under payer contract (public and private). The current work in this field is largely coming out of academia and public health agencies. A vendor marketplace has yet to emerge that is heavily focused on this capability for healthcare providers. The eclectic sample vendors displayed are a speculative list of vendors with useful technical capabilities, focus and/or consumer behavior content or predictive models that could be leveraged into persuasion analytics. We predict the landscape will include a combination of today's emerging population health analytics players, evidence-based medicine content leaders and companies that have capabilities relative to predictive consumer behavior models and geospatial mapping and analysis tools. Consumer behavior models will be complemented with healthcare data, as they have been in the past in forecasting consumer demand and determining desired placement of physician healthcare facilities.

Many HDOs have for years tracked patient satisfaction measures and have used consumer behavior models for demand forecasting and placement of their services and facilities. This is not that. Nor is it capturing mandated patient engagement metrics (such as those included in U.S. federal government later-stage electronic health record [EHR]) Meaningful Use and Medicare Shared Savings programs.

In 2014, most provider-led population health analytics efforts are focused on a medical/clinical process view, analyzing performance, identifying gaps in care and triggering clinician or care coordinator actions with cohorts of patients and individuals. More-savvy HDOs are also taking a closer look at the business issues and analytics of population risk — understanding underlying cost and quantifying business risk of various contract types and population segments. HDOs will have to "learn to walk" in using this data before most of them will take on further social/behavioral analytics and persuasion efforts. By our estimates, more than two-thirds of U.S. health systems also have a long way to go in even persuading their physicians that they want to engage more with patients and overcoming their resistance to new accountable care-type models. Physician buy-in is an essential precursor to a successful population health management operation. Solution development and market penetration to hit the Plateau of Productivity through HDO self-development and commercial offerings is very likely to take more than a decade.

All these factors cause us to conclude that persuasion analytics is likely to be the purview of research centers and the most advanced HDOs for the next five years.

User Advice: To be a leader in population health management, an HDO will need to fund epidemiologists as their data scientists who will both regularly scan the external universe of population/public health efforts and perform innovative internal data discovery.

- HDO population health management leaders and chief medical information officers (CMIOs) should begin collaborations with officials in emerging public health medical informatics officers (PHMIOs) for strategies to leverage and share new types of data and pilot interventions.
- Population health executives should keep their radars tuned on academic studies for early clues to effective targeted actions.
- Population health management vendors and HDO analytics self-developers will want to insert new investments in this arena at the far end of their typical three- to five-year strategic plan windows.
- Early career epidemiologists/biostatisticians should consider targeting this as a career direction, and education institutions should sponsor this as a domain for masters and PhD programs. HDO leaders and HR departments should consider resource development partnerships with academic research center leaders focused on population health.
- CIOs and population analytics leaders will increasingly team with marketing staff on education and influence campaigns, so establishing closer relationships now and conducting joint planning efforts are recommended.

Business Impact: Eventually, if they are to be responsible for pushing health and risk management, and tackling problems like obesity and diabetes, HDOs (and public health agencies) will have to become at least as sophisticated as other consumer/retail industries in analyzing a variety of data that helps uncover root causes of human behavior. They should try to have great influence on patient motivation once the "low-hanging fruit" opportunities have been captured.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Sample Vendors: Altimetrik; Amazon; Eliza; Esri; Facebook; Google; Johns Hopkins Bloomberg School of Public Health; Medseek; Nielson; Saama; SeeWhy; Thomas Jefferson University School of Population Health

Recommended Reading: "Eight Steps to a Compelling Business Case for a Collaboration and Social Software Initiative"

"Use the Business Value Model to Determine the Value of Engagement"

For more readings on population health research and adaptive positive deviance examples, see the "Population Health Matters" newsletter of the Thomas Jefferson University/Jefferson School of Population Health, "Discovering Solutions Hiding in Plain Sight," Winter 2014, Vol. 27, No. 1, Jefferson School of Public Health, Philadelphia, Pennsylvania.

See also the blog from Improving Population Health.

In the U.S., Kaiser Permanente and its Center for Total Health have been leading efforts to increase visibility on behavior change. See information from the 2013 Forum for Health Behavior Change, co-

sponsored by the American Heart Association and the National Business Group on Health (centerfortotalhealth.org).

Globally, the World Health Organization has been leading efforts on social determinants of health.

Quantified Self

Analysis By: Mike Gotta; Whit Andrews; Frank Buytendijk

Definition: Quantified self is a movement promoting the use of self-monitoring through a wide variety of sensors and devices. Applications or services based on user data about activities, biometrics, environment and experiences provide a higher level of value from wearable and mobile devices, mobile apps, sensors and other "things" that offer self-tracking analytics, cross-sensor aggregation, social facilitation, observational learning and individualized coaching. Many different entities will provide these applications.

Position and Adoption Speed Justification: Analysis of this data allows individuals to gain a better understanding of their experiences and improve their wellbeing. Integration with social media allows users to connect with peers, share information, gain community support and learn from others. The quantified-self movement has become a catalyst for the socialization of new types of technology and behavior. However, we now believe it will take five to 10 years before these are adopted by the mainstream due to cultural concerns (surveillance), societal acceptance (etiquettes), and business model fluctuations.

Although there are multiple types of applications, the most successful commercial implementations can be found in sports, fitness and health. There are thousands of fitness and health-related apps in smartphone app stores. Although application scenarios are broad, the dominant use case focuses on motion trackers and vital-sign monitoring (blood pressure and heart rate). However, application scenarios are expanding into areas such as mood monitoring and food/nutrition.

The breadth of devices itself is evolving rapidly as well. Many objects are being turned into sensor-based devices, including helmets, sneakers, glasses, watches, clothing and jewelry. The popularity of these devices and the immaturity of the technology can sometimes cause privacy, stability and quality issues. Proliferation of devices and apps without standards-based interoperability has created a market opportunity for new entrants to focus on data aggregation and normalization. Quantified self is also beginning to move into the workplace. For example, the inclusion of wearable devices and self-tracking apps as part of corporate wellness programs is becoming an aspect of employee engagement and digital workplace initiatives. Strategists are also looking at the potential of quantified self to improve personal and business productivity.

User Advice: The number and variety of personal devices and self-tracking mobile apps that collect data and provide feedback to users is increasing. Many different entities such as device makers, brands, software vendors, health-related firms, and developers of virtual personal assistants and smart machines will provide these applications.

While a dedicated community of people are interested in quantified self as a life philosophy to improve their own well-being, there are other populations interested in it to obtain medical insight or improve more serious health conditions — for themselves or in their caregiver role.

Marketers, innovation teams and community strategies should examine quantified self to help create a more social and collaborative brand experience, while leveraging personal analytics to establish greater customer intimacy.

Business Impact: Business strategists should ensure that proper policies and controls are in place to address user privacy concerns related to sharing personal data gathered via wearable devices, sensors and mobile apps. Organizations also need to invest in community management processes, and ensure that the personal participation needs and goals of community members are addressed. As people connect with peers, build relationships and interact with each other through the use of wearable devices, sensors and mobile apps, there may be a need for customized applications and unanticipated integration with other sites or internal systems. There are also behavioral, cultural and societal factors that come into play that strategists need to address early during design activities.

As more people use mobile and social technologies to collect and assemble data about themselves and their immediate surroundings, business opportunities emerge to apply insights gained from personal analytics and community participation to improve brand/customer relationships and product/service innovation. Within the workplace, organizations can create quantified self-incentives or requirements for employees to apply such analytics to measure performance or well-being, or to track employees in hazardous environments for health and safety reasons.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Fitbit; Jawbone; Nike

Recommended Reading: "Technology Overview: Quantified Self"

In-Vehicle Occupants Health Monitoring

Analysis By: Thilo Koslowski

Definition: In-vehicle health monitoring refers to sensors, applications and algorithms that can measure biophysical attributes of drivers and other vehicle occupants with technology embedded in the vehicle. For example, seats can measure heart rates, and steering wheels can analyze perspiration levels to determine dehydration levels. These findings can then be communicated wirelessly to healthcare providers, family members and others.

Position and Adoption Speed Justification: Measuring health attributes in vehicles is a relatively new technology area for the automotive industry that is primarily led by academic institutions and automotive companies' R&D departments. The combination of new sensor technologies, data analytics and wireless data communications enables new application scenarios focused on driver

health and well-being. More work is being done in this area by automakers, suppliers and technology companies, although privacy and legal implications will need to be considered to achieve broad market adoption. For example, a too-low blood sugar level could be detected by a vehicle and used as evidence in a potential car accident. On the other side, a vehicle could automatically notify emergency crews or nearby drivers of an occupant's health emergency. No actual market-ready solutions are available today.

User Advice: Automotive companies should partner with healthcare and life science organizations, government bodies and legal advisors to explore use cases for in-vehicle health-monitoring applications. Insurance providers may also be interested in partnering with automotive companies to embrace this technology. Companies must carefully balance privacy concerns and legal ramifications of potential misdiagnosis with user benefits to avoid market rejection.

Business Impact: In-vehicle health monitoring can expand the functionality and value proposition of an automaker's products. The technology will also address an aging driver population that will need to feel comfortable operating vehicles in the future. Healthcare delivery organizations can leverage the automobile as a personal sensor for identifying members' health issues early on and can prepare for treatment options.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Medtronic; OnStar; Recaro; WellDoc

Recommended Reading: "Predicts 2014: Automotive Companies' Technology Leadership Will Determine the Industry's Future"

"U.S. Consumer Vehicle ICT Study: Web-Based Features Continue to Rise"

"German Consumer Vehicle ICT Study: Demand for In-Vehicle Technologies Continues to Evolve"

Personal Wellness Records

Analysis By: Jeff Cribbs; Thomas J. Handler, M.D.

Definition: Personal wellness records (PWRs) are applications that allow consumers to aggregate data from different wellness apps and devices and, sometimes, share the data with other apps, devices, enterprise applications, caregivers or clinicians. As with personal health records (PHRs), consumers control a full history of health-related data. However, where PHRs emphasize capture of data generated in the course of receiving care for future use by a clinician, PWRs emphasize data captured from wellness activities for use by the consumer.

Position and Adoption Speed Justification: PWRs made a lot of headlines from late 2013 to early 2014, with announcements of new platforms from vendors such as Aetna (CarePass), Samsung

(S.A.M.I.), Apple (HealthKit), and Google (Google Fit). However, many of these offerings are in beta or have sparse capabilities relative to the scope of their announced intentions.

There is little data available on user adoption, but it is clearly limited to a small set of tech-forward consumers whose curiosity can outlast the gaps in current functionality. While there have been rapid increases in consumer tracking of health- and wellness- related activities using apps and devices, current needs for viewing and managing that data are largely being met within the app itself, directly on the device interface or in an accompanying registered website.

For consumers, the potential value of PWRs emerges when: (1) a consumer tracks using multiple apps and devices; (2) the data from the apps and devices is especially convenient and insightful when viewed together; and/or (3) there is a need to share the aggregated wellness data with another set of apps, devices or enterprise applications. For example, a competitive runner might track steps, GPS location, sleep, heart rate and nutrition on apps or devices from separate vendors, use a PWR to collect and view the data, then share the aggregated data with an app that provides electronic coaching to prepare for a marathon, or with an employer who provides an incentive for wellness activities. In a more clinical context, such aggregated data could be shared with a healthcare provider, who might use it to automatically populate a PHR or to remotely monitor for indications of adverse medical events or noncompliance with postdischarge instructions. The latter use case is expected to emerge from the partnership between Mayo Clinic and Apple that was announced in May 2014.

It is unlikely that PWRs will persist as a distinct space. Vendors will partner, acquire or expand functionality to aggregate data more broadly, though it is difficult to predict which direction. The current enthusiasm for PWRs may, for example, breathe new life into the adoption of PHRs, which have been all but stalled for a decade or more. They have largely been undone because of the reluctance of entities with clinical data and claims data (for example, EHRs, FDA-regulated devices and claims clearinghouses) to make their data available to passively populate a consumer's PHR. In contrast, many competitive wellness devices and apps offer APIs and consent procedures that can be used by PWRs to automatically populate. Along these lines, Microsoft's HealthVault (one of the original PHR vendors) already has a number of integrations with fitness and wellness apps and devices.

In the longer term, PWRs may be subsumed by the broader category of life tracking by vendors such as Tictrac, which, in addition to wellness data, intends to aggregate data from every aspect of a consumer's life, including social media activity, news feeds, calendar and task applications, and financial transactions.

Barriers to adoption include concerns over privacy, unclear regulation of the space, and a diffuse and amorphous vendor space, where any individual vendor will have difficulty achieving the critical mass of users needed to trigger the network effect.

User Advice: Payer and provider CIOs from Type A organizations should look for opportunities to enable interfacing EHR, care management and patient/member engagement applications with select data from leading PWRs. Pilots should be measured carefully to establish the effectiveness and value.

Payer and provider CIOs from Type B and Type C organizations should monitor the market, waiting for it to mature, fundamentally change or disappear prior to making investments.

Business Impact: The flurry of recent attention by influential vendors suggests that there is great perceived value in being the aggregator and distributor of wellness data. It is less clear how large the consumer appetite is for such technology, and less clear still whether it will ultimately deliver value to the consumer through convenience or improved clinical, utilization and financial outcomes. In the short term, PWRs will largely be a means of selling technology or advertising to a tech-forward, high-means market segment. In the longer term, they might improve individual engagement in health and wellness, reduce operational overhead for enterprises in collecting data or monitoring health, and add new dimensions to analytic datasets used in research.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Aetna; Apple; Google; Microsoft; Samsung Electronics; Tictrac

Blue Button+

Analysis By: Barry Runyon

Definition: Blue Button+ is an implementation guide, created by the U.S. Office of the National Coordinator for Health Information Technology, that provides standards for the consumer-initiated exchange of structured data among electronic health records (EHRs), claims systems and personal health records.

Position and Adoption Speed Justification: Blue Button+ is often referred to as the Automate Blue Button Initiative. It is an extension of basic Blue Button, which is nothing more than a standard icon that a consumer can click to download his or her personal health information from smart device apps or portals that support EHRs, payers' member records and personal health records. Blue Button is a service mark registered by the U.S. Department of Veterans Affairs (VA).

Systems that use the Blue Button icon should respond to a click by downloading an ASCII file containing human-readable text that provides a summary of information in context. For example, it might download a patient summary, a visit summary, some patient information from a personal health record, or a summary of claims for a member, perhaps with an explanation of benefits. The manner in which the consumer accesses and uses the file is outside the scope of the specifications for basic Blue Button.

Several U.S. federal agencies, including the Department of Defense, Centers for Medicare & Medicaid Services (CMS), and the VA, have implemented basic Blue Button. Numerous health plans have pledged support for Blue Button in response to a request for support from the U.S. Office of Personnel Management, which administrates the Federal Employees Health Benefits Program.

Numerous vendors of EHRs and personal health records have begun using, or at least expressed support for, basic Blue Button.

The VA reports hundreds of thousands of Blue Button downloads, indicating veterans' interest in using hand-carried printouts to provide some basic coordination of care where interoperability among EHRs is lacking. The underlying spirit of the Blue Button initiative was to put *something* in the hands of consumers long before progress could be achieved on true interoperability among healthcare delivery organizations (HDOs).

The Blue Button+ Implementation Guide describes implementation standards, tools and services that go beyond downloading human-readable text files. It includes the following:

- The use of the Health Level Seven (HL7) Consolidated Clinical Document Architecture (C-CDA) for EHR data to standardize the format of EHR-sourced structured data.
- Some loose interim recommendations to create a structured specification for claims data.
- Automated push, by which the user of the patient/member portal of an HDO or health plan could direct the current snapshot of his or her records to be sent to another application (perhaps his or her personal health record). The user can also request that updates be sent as they become available, until the request is canceled. In theory, the consumer could even request the transfer of information from one EHR to another.
- Automated pull, by which a consumer could initiate such a transfer from the receiving system, rather than the sender.
- Secure mechanisms for transport, identifying and credentialing the corresponding systems for pushing and pulling.

As of June 2013, the only Blue Button+ Implementation Guide content that is relatively firm is what's included for pushing C-CDA structured documents using the Direct protocol. As it happens, those particular parts of the implementation guide will provide a technical solution to meet the "view, download and transmit" requirements associated with Stage 2 of the "Medicare and Medicaid Electronic Health Record Incentive Programs." Although these Meaningful Use regulations do not actually require the use of the standards in the implementation guide, it is hard to achieve interoperability without some common specification. This implementation guide has the benefit of using standards that are necessary to meet other Stage 2 requirements.

Because Blue Button+ is new, we have placed it on a path to the Peak of Inflated Expectations. We expect significant progress from 2014 to 2017, which is the rollout period for Stage 2 requirements for Meaningful Use. As with any mandate for something new, users will initially target nominal use for compliance.

Fuller acceptance of Blue Button+ will depend on consumers' reactions. Some drivers that would lead the U.S. healthcare industry to expand the use of Blue Button+ beyond nominal compliance include the following:

- Healthcare consumers' increasing awareness of the need to coordinate their own care, combined with systemic failure among healthcare organizations to provide care coordination

- Reduced physician resistance to accepting data that has been touched by patients, presumably through good experience during the time of nominal compliance
- A failure to substantially increase inter-EHR interoperability in pulling patient information, due to HDOs' reluctance to share data or privacy policies
- A digital signature in the standards that assures clinicians that data from other HDOs was not altered as it passed through patients' hands

User Advice: CIOs, chief medical information officers and EHR application managers in U.S. HDOs should press EHR vendors for Blue Button+ functions that are sufficient to meet Stage 2 view, download and transmit requirements.

After achieving nominal compliance, people in those roles in some HDOs should work with clinicians to find support for using patient-carried data when working with patients who regularly cross HDO boundaries. The HDOs with the most to benefit from leading-edge adoption of Blue Button+ are those that: (1) are in markets where inter-HDO interoperability is not working well; (2) have lines of business where patients are likely to cross HDO boundaries; (3) have heavy concentrations of federal employees; or (4) require a leading-edge posture for raising donation-based funds.

Business Impact: Minimal adoption of Blue Button+ has a high business impact for HDOs that need to meet the requirements for Stage 2 of Meaningful Use. Farther into the future, Blue Button+ could be instrumental in improving the safety and efficiency of interorganizational transitions of care, although this benefit will not be clear for several years.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Sample Vendors: GenieMD; Get Real Health; Humetrix; Medfusion

Recommended Reading: "Top 10 Strategic Technology Trends for Smart Government, 2013"

Personalized Medicine

Analysis By: Michael Shanler

Definition: Personalized medicine is a medical approach to using an individual patient's genetic profile and biomarkers identified through diagnostic testing to select the most effective treatment regimen and to target the genetic signature of the disease. Genetic information and IT systems play a major role in collecting, de-identifying, sharing, analyzing and repurposing medical and life science information used for personalized therapies.

Position and Adoption Speed Justification: With the advent of increasingly sophisticated methods for handling large amounts of genomic patient data, personalized medicine has become a

hot topic within the medical and life science community. There has been some success in reducing practice variations, but rarely does a medicine or therapy work predictably for every patient. There is still a fair bit of trial and error when doctors attempt to get correct dosages, formulations, and regimens for individual patients. The level of efficacy and safety for certain populations is wildly different based on the patients' genetic makeup. Drugs are often prescribed based on statistical effects in large populations; however, a drug's effects vary from individual to individual. There are a significant number of factors that must be considered for approved drugs to be safer and more effective for individuals. Pockets of the medical community are just beginning to leverage detailed genetic information from individual patients to help prevent adverse events, improve appropriate dosages and create maximum efficacy. In addition to specific and targeted treatment, personalized medicine can assist with preventive care approaches. For example, knowledge of the genetic makeup of a patient's breast cancer can indicate whether or not a particular chemotherapeutic regimen will be curative. Many people are already being genotyped for certain mutations in the BRCA1 and BRCA2 gene when predisposed to breast or ovarian cancer based on family history.

In 2012, the FDA approved Ivacaftor (Kalydeco, Vertex Pharmaceuticals), the first-ever drug to address the underlying cause of cystic fibrosis among patients with a specific gene mutation. In 2013, the FDA's report "Paving the Way for Personalized Medicine: FDA's Role in a New Era of Medical Product Development" outlines the fundamental ways in which the FDA has modified its traditional approaches to drug and device regulation in the new era of products that are tailored toward specific patient subtypes, rather than broad diagnostic groups. The FDA has created some additional definition clarification (see "Personalized Medicine: A Biological Approach to Patient Treatment").

With advances in genomics and sequencing platforms and new diagnostic assays, more data is being collected in conjunction with clinical trials to help improve the odds of clinical trial success. Having an individual's genomic information can be significant in the process of developing drugs as they await approval from the FDA for public use. Having a detailed account of an individual's genetic makeup can be a major asset in deciding whether a patient can be chosen for inclusion or exclusion in the final stages of a clinical trial. In addition, drugs that are deemed ineffective for the larger population can gain approval by the FDA by using personal genomes to qualify the effectiveness and need for that specific drug or therapy for even a small percentage of the population. Also, advances in personalized medicine will create a more unified treatment approach specific to the individual and his or her genome. Personalized medicine offers the hope of better diagnoses with earlier intervention, and more efficient drug development and therapy. Currently, academic research institutions and medical centers are developing new assays and informatic approaches for interrogating the data. Pharmaceutical companies are interested, but are in the nascent stages in building in groups and infrastructures, and are currently relying on partnerships with CROs, payers and providers, hospital networks, and biotechnology companies.

As personalized medicine is practiced more widely, a number of challenges are coming to the surface, which are creating barriers. Many organizations do not understand the impacts of the U.S. Genetics Information Nondiscrimination Act (GINA), which ensures that genetic information will not be misused by employers or insurers. The current approaches to intellectual property rights, reimbursement policies, patient privacy and confidentiality, as well as regulatory oversight, have not been redefined and restructured to accommodate the changes personalized medicine is bringing to

healthcare. Furthermore, while pharmacogenetics hold great promise, careful trials need to be conducted to ensure effectiveness. For example, when two genes are found to influence warfarin (a blood thinner) effectiveness, it makes sense to do genetic testing before prescribing the medication. However, a 2013 study published in The New England Journal of Medicine showed that there may be little benefit from genetic testing.

User Advice: Monitor advances in personalized medicine and determine if IT systems and business processes are in place to handle this type of medical model; focus specifically on electronic health record (EHR) data integration and analytics. Personalized medicine and customized therapies will require a tighter convergence of health and life science IT systems, and also require dialogue with quality, IT, security and legal groups to ensure that patient privacy, GINA controls, confidentiality and regulatory compliance requirements are met. Life science providers should evaluate how products and information can be used to add to the value stream and ultimately lead toward patient-centric healthy outcomes. Life science companies will need to mine the vast amounts of medical and life science IT, and leverage big data and visualization tools to make sense of the data. They will also need to ensure collaboration during product launches between diagnostic testing products and drug products. Healthcare providers need to evaluate processes for data handling, security, and billing and reimbursements to determine how to adopt personalized medicine approaches.

Business Impact: The business impacts of personalized medicine will be substantial. Healthcare payers and providers are entering an era that requires agility in how they deliver their respective value propositions and manage the business around them. Since monitoring and targeting of therapies will be tailored for individuals, a more comprehensive view of a patient's history and preferences will be necessary to give physicians the ability to create, evaluate and adjust a customized approach. Physicians will need access to platforms that expose clinical diagnostic data in addition to treatment results. For personalized medicine to become practiced on a wider scale, sweeping changes to platforms accessed by healthcare payers and providers will be necessary to expose more analytical tools, which can be leveraged to design better therapies and collaborate for improvements. It will also impact products under development at pharmaceutical companies, adverse event reporting and safety systems, and product development platforms.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Bina Technologies; Genomatix; GE; IBM; Illumina; Oracle; PerkinElmer; Thermo Fisher Scientific; Translational Software

Recommended Reading: "Agenda Overview for Healthcare, 2014"

"Business Drivers of Technology Decisions for Healthcare Providers"

"Translational Medicine Still Has Barriers for Connecting Life Science and Healthcare Environments"

Member Incentives for Wellness for U.S. Healthcare Payers

Analysis By: Jeff Cribbs

Definition: Member incentives for wellness are the techniques used to encourage wellness among healthcare plan members by providing direct monetary benefits, such as reduced employee contributions to premium, co-pays and co-insurance; surcharge removal; or contribution to a health savings account. Incentives can be tied to participation in wellness programs (such as attending a webinar or speaking with a health coach) or to verifiable wellness outcomes (such as biometric measures or physical activity levels).

Position and Adoption Speed Justification: Under the U.S. Affordable Care Act (ACA), an employer may offer monetary incentives up to 30% of the overall cost of the policy to promote participation in wellness programs and achievement of wellness outcomes. For these amounts to be put in perspective, in 2014, an employee who achieves "compliance" could save about $1,765 on an employee-only policy, or $4,905 on a family policy, relative to their "noncompliant" peers (using average 2013 policy costs). Surveys indicate that only a minority of employers use these types of wellness incentives today, and those that do almost always keep the monetary amounts well below the levels allowed by current legislation. There are challenging business impediments, including concern over employee satisfaction with benefits, fairness to employees for whom compliance would be unequally burdensome and lack of evidence for best practices in the design of these incentives. There have been substantial technical barriers as well — including the difficulty of defining and verifying participation in wellness systems, the ability of core administrative systems to reliably implement modifications in cost sharing, and the complexity and cost of verifying compliance with wellness outcomes (with biometric screenings or tracking physical activity, for example).

Advancement will proceed along several dimensions. The breadth of the population with wellness incentives will expand through increased employer adoption and through the opening of new lines of business, for example through a 10-state pilot project (mandated by the ACA to start in July 2014) using incentives in the individual market, where they are otherwise prohibited. Employers that have incentives will continue to increase the amount of money at stake, shift from participatory to outcomes-based qualification, and increase the kinds of participation and outcomes that can earn an incentive and the various means by which compliance can be measured.

Taken together, these business and technical forces point to advancement — but with the potential of disruptive swings in regulations or consumer sentiment.

User Advice: Member incentives for wellness have great potential to benefit plan sponsors, members and innovative payers. Payer business and IT leaders should adopt an approach with clients that is flexible and consultative. On the one hand, they must ensure they have the technology and services in place to support a wide range of requirements for wellness programs and value-based plan designs, as plan sponsors think creatively to design incentives tailored to the unique needs of their membership. On the other hand, they must be intentional about analyzing these incentives, establishing best practices, learning quickly from both successes and failures, and presenting these findings to clients. In many cases, the payer brand will be as much exposed as the

employer's brand when these incentives are introduced, and it is essential that both parties avoid the perception and reality of nefarious motives or incompetent execution.

Business Impact: Payers that offer flexibility and consistent execution in supporting wellness incentives will be rewarded with more membership. In addition to increased premium revenue, plans that can show tight integration with wellness technology (mobile apps and monitors, for example) and service offerings (health coaching, for example) will create opportunities for additional revenue streams. Payers that wish to build a brand around concepts of wellness, personal choice, empowerment and accountability can use wellness incentives to put actual financial incentives behind these themes. Even at the current low rate of adoption, these incentives have spurred considerable debate — among employee populations and in the public sphere. Some see these practices as a fairer, merit-based way to distribute medical costs; others see them as ineffective, an infringement on privacy or, worse still, a means of discrimination. Payers that lead in bringing these offerings to market will undoubtedly find themselves in the thick of controversy, and will need to clearly and transparently communicate the opportunities, safeguards and success stories of their programs.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Fitbit; HealthEdge; Limeade; TriZetto; Virgin HealthMiles

Recommended Reading: "Five Industry Trends Create Opportunity for a Revolution in Care Management Engagement"

"Health Insurers Must Focus on Value-Based Incentive Programs"

At the Peak

Citizen Data Vaults

Analysis By: Jeff Vining; Jerry Mechling; Andrea Di Maio

Definition: Citizen data vaults are services that provide data subjects with the ability to access their data outside the context of a particular government transaction, allowing them much finer-grained control over when and how data can be accessed, and by whom, within the relevant legal framework to which they are subject. They need to interoperate with government, as well as with third-party systems that directly provide services to constituents.

Position and Adoption Speed Justification: Citizen data vaults remain at an early stage; however, the debate is moving from personal health records to other domains, such as citizen e-ID, taxation and social services based on open data-centric and cloud-based solutions strategies. For example, several years ago, the London borough of Brent launched Mydex to allow citizens to control their own information, followed by the U.S. Department of Veterans Affairs initiative Blue Button, allowing

veterans access to personal health data, and Australia's nationwide personally controlled electronic health record (PCEHR) system to store and share important health information with trusted healthcare practitioners. This demonstrates continued exploration by government and vendors to standardize before implementing digital social services, such as India's State of Uttarakhand.

Success along the Hype Cycle will be dependent upon supporting digital strategies that offer transparent control of individual privacy rights on electronic data, easing the task of integrating different government services and creating conditions for value-added services from commercial, nonprofit and peer-to-peer organizations (like social networks), such as Qiy for public and private sectors. For example, the U.K.'s Identity Assurance program is attempting to digitally transform more than 600 government services and the U.S. National Strategy for Trusted Identities in Cyberspace will encourage federated identity cloud services. Today, players remain quite small and widespread adoption will not start before 2016.

There are significant challenges to overcome, such as interoperability, latency issues (which will become less problematic only with the deployment of much faster communication infrastructures), data availability, security issues, and the size and complexity of targeted domains. In addition, risk of actual or perceived liabilities for government agencies may fail to deliver services due to the unavailability of data vault services. As a consequence, the adoption of user-managed data vaults will be limited at first to low-assurance government applications and will only grow to meet higher-assurance needs when data integrity and other controls are proven. Adoption may be accelerated by national programs that may, at some point, mandate — via legal and technical agreements — personal control over their own data, but this concept is currently too complex and is hardly affordable given increasing budgetary constraints.

User Advice: Although the concept of citizen data vaults will still take a few more years to solidify, government program managers and strategic planners should start examining the potential impact of their emergence toward the end of the planning horizon. They should also carefully monitor the evolution of personal health records in the healthcare industry, as well as concrete examples of opportunities and risks created by the mashup of public government information with third-party information. This will help them to better determine areas where citizen data vaults may have the most impact.

Business Impact: The consequences of government organizations accepting citizen data vaults are far-reaching. As the personal health record examples already show, there is no reason why these vaults should be managed or hosted by the government. Other citizen data sources — such as tax records, Social Security information and even criminal records — are candidates for a data vault approach. Of course, a data vault solution would be acceptable only if there is sufficient assurance that legal boundaries for data access and editing will be respected. The widespread adoption and expected continuous growth of mobile devices worldwide, together with the increased adoption of personal cloud services and the increasing reliance on social media platforms to store personal information, will raise the viability of such services for a broad audience of citizens.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Sample Vendors: Facebook; Google; Microsoft; Mydex Data Services; PayPal; Qiy

Recommended Reading: "Hype Cycle for Smart Government, 2013"

"Moving Toward Data-Centric Government"

Medication Compliance Management

Analysis By: Thomas J. Handler, M.D.

Definition: Medication compliance management systems are designed to remind patients to take their medications and to monitor that they have done so. They also send alerts to patients, clinicians or family members in the event of noncompliance.

Position and Adoption Speed Justification: Medication compliance management systems can be used by provider organizations, retail pharmacies or healthcare payers. In fact, the slow adoption is in part due to confusion as to who should be responsible for these systems. Positioning on this Hype Cycle uses rollout by healthcare delivery organizations (HDOs) as a proxy for the market. There has been little movement since last year, because there are still few incentives for providers to work with patients to increase compliance with their medications. This is expected to change as more providers become part of accountable care organizations.

Patients often do not take their medications appropriately, and the problem will get only worse. Patients will be living longer with chronic diseases (often multiple diseases simultaneously); more medications will come onto the market; and complex treatment regimens for patients will increase (survey results in leading peer-reviewed medical journals range from 30% to 80% of patients not taking their medication as prescribed or not at all). Therefore, there is a growing interest in systems that have the potential to help patients take their medications in the right way. The spread of e-prescribing networks is helping by facilitating notification of physicians (and potentially healthcare payers) when patients fail to request and pick up needed refills. However, even when they have medication in hand, patients still may not actually take the medication. This is where medication management systems can help.

Medication management systems can take several forms. Mobile phone applications send SMS reminders to patients to take their pills and allow patients to confirm that they have done so. Smart medication dispensers are devices that can be programmed with the patient's medication schedule and can detect when the patient has removed his or her medication. Typically, the dispensers communicate with servers via the patient's mobile phone to generate SMS or email messages to remind the patient to take the medication, alert family members or caregivers that the patient has failed to take the medication, or notify the pharmacy that the patient needs a refill.

Another form of medication compliance can be smart pills, which are essentially ingestible sensors that can record various physiological measures and can be used to confirm that a patient has taken his or her prescribed medication, and can even measure the effects of the medication. Examples of use cases include patients with complex medication regimens, situations where it is important to

society that patients take their medications (for example, a drug-resistant tuberculosis), medications that may cause dangerous changes in vital signs, and very expensive drugs that must be taken regularly to achieve their intended effect. Recently, some questions regarding ethics and privacy concerns have been raised about the use of smart pills.

Ultimately, medication compliance management systems will be viable only if they cost less than the value they deliver, which is as yet unproven and will be difficult to measure. Moreover, they will not be appropriate for all medications. A basic problem, which will continue to inhibit adoption, is that, with the exception of smart pills, no system can actually confirm that the patient has actually taken his or her medication.

User Advice: Payer, provider and life science CIOs:

- Assist the organization to investigate medication compliance management systems as useful tools to improve patient outcomes and resource utilization.
- Review your legal liability for supporting patients' mobile phones that are being used as part of medical treatment.

Provider CIOs:

- Prepare for an onrush of services generating data and decision support algorithms that will need to be integrated into electronic health record (EHR) systems and incorporated into treatment protocols.

Business Impact: An astonishing number of patients (sometimes reported at 80% and rarely, if ever, below 30%) do not take or use their prescribed medicines as recommended by their prescribers. This results in suboptimal health outcomes, wasted expenditures on medications and excess hospitalizations. The monetary impact of poor compliance can be staggering. In a recent report, Americans' failure to comply with medication prescriptions costs between $100 billion to $289 billion per year (M. Viswanathan and others, "Interventions to Improve Adherence to Self-Administered Medications for Chronic Diseases in the United States: A Systematic Review," Annals of Internal Medicine, 4 December 2012), and other comparable studies look at similar effects in other countries. Medication compliance management systems are designed to help patients take their medications correctly. This can result in more efficient and effective use of medications, improved patient outcomes, and fewer patient readmissions as poor medication compliance is a common reason for readmissions.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Independa; KSYOS TeleMedical Center; SIMpill; Vitaphone

OpenNotes

Analysis By: Jeff Cribbs; Thomas J. Handler, M.D.

Definition: OpenNotes is an initiative to give patients convenient access to the clinical notes in their electronic health records (EHRs). Healthcare delivery organizations (HDOs) that participate in OpenNotes enable patients to retrieve the visit notes written by their physicians.

Position and Adoption Speed Justification: For years, a small but vocal segment of patients has sought access to the medical documentation created and maintained by physicians. Although some forward-thinking physicians and provider organizations endeavored to fulfill these patients' wishes on a case-by-case basis, it was infeasible to support a policy of providing access to all patients. With the broad adoption of EHRs, the inclusion of patient portals in the Meaningful Use program and the legal compulsion to share records under the Health Insurance Portability and Accountability Act (HIPAA), both the enabling technologies and the legal incentives are in place to support broad access to most of the medical record. However, patient access to clinical notes (the portions of the medical record in which physicians document, often in free text, observations, concerns, potential diagnoses and courses of treatment) has been the subject of skepticism and controversy. Chief concerns were disruption to the provider's workflow, alarm to patients and lack of evidence of value to patients. The OpenNotes movement was formed to advocate for the value to patients and to quell the concerns of providers. A 2012 study of a pilot of OpenNotes yielded promising results. The conclusion, published in Annals of Internal Medicine, stated:

Patients accessed visit notes frequently, a large majority reported clinically relevant benefits and minimal concerns, and virtually all patients wanted the practice to continue. With doctors experiencing no more than a modest effect on their work lives, open notes seem worthy of widespread adoption.

Adoption accelerated thereafter. The HDOs that ran the pilot (Beth Israel Deaconess Medical Center, Geisinger Health System and Harborview Medical Center) deployed OpenNotes to more of their patients. In January of 2013, the U.S. Department of Veterans Affairs included OpenNotes functionality in a Blue Button (see "Hype Cycle for Healthcare Provider Applications, Analytics and Systems, 2014") enhancement, which gave patients access to both inpatient and ambulatory clinical notes. In April of 2014, nine HDOs in the Pacific Northwest committed to enabling OpenNotes for their patients, including 500,000 Kaiser Permanente members. About 3 million U.S. patients have access to the clinical notes in the EHR today, and that number will expand over the next two years as recent announcements come to fruition. The Office of the National Coordinator for Health Information Technology (ONC) is seeking comment on whether to make OpenNotes a part of the 2017 Meaningful Use requirements, in which case adoption could reach mainstream levels in just a few years. A perspective piece, written by the original authors of the 2012 study and published on 2 January 2014 in the New England Journal of Medicine further makes the case that giving patients access to clinical notes will become the standard of care.

OpenNotes has shown early indications of delivering value to patients by:

- Improving the quality of the medical record by correcting errors
- Validating patients' right to conveniently and securely access their medical records
- Improving outcomes by better communicating to patients and their caregivers physicians' observations and instructions

- Activating patients to take greater ownership of their health and treatment

There are challenges ahead as OpenNotes moves into early mainstream adoption. First, it is likely that the highly positive results from the pilot studies will be more mixed in mainstream adoption. The pilot studies largely included patients, physicians and HDOs that volunteered to participate. As volunteers, these participants were more inclined to see the value of OpenNotes and to downplay any complications in the rollout. Rolling out OpenNotes to a mainstream population will likely garner less participation and more concern from patients, more frustration and concern from physicians, and more public reports of incidents in which OpenNotes led to confusion or disruption in the course of care. Furthermore, the lessons of the early adopters have shown that OpenNotes will impact what and how clinical information is documented. Current documentation processes tend to be optimized more for billing than for communication with patients. In order for patients to correctly interpret and understand what is in their charts, HDOs will need to put much more effort into defining what constitutes a good clinical note. Clinicians have also expressed reservations about granting a patient access to particularly sensitive documentation, such as their valid, yet delicate, concerns about the patient's status. Examples include whether it would be appropriate to raise the possibility of cancer, or to express concerns about drug abuse, before obtaining further information. None of these obstacles are insurmountable, but it will take some time and analysis to establish best practices.

User Advice: Healthcare provider chief medical information officers (CMIOs) should weigh the benefits and risks of OpenNotes in the context of their physician culture, patient population, technology environment and broader patient engagement initiatives. Some assistance for this evaluation is available directly from the OpenNotes website. CMIOs contemplating a move toward implementing OpenNotes should immediately engage the technical teams supporting the electronic medical record (EMR) and/or patient portal to determine which OpenNotes policies can be accommodated and with what level of effort. For example, can a physician choose to exclude certain patients, or the notes from particular encounters, from online access? Will a physician be alerted when a patient views a note? Will patients be able to opt out of, or establish their preferences for, receiving notifications that notes are available for viewing?

Payer CIOs and medical management leaders should monitor the adoption of OpenNotes and consider adding content to care management programs that assists members and their caregivers in accessing and interpreting their clinical notes.

Business Impact: Although surveys of the OpenNotes pilot participants showed convincing patient and provider satisfaction, the impact to clinical, utilization and financial outcomes has not been evaluated. Those HDOs that voluntarily adopt OpenNotes in the short term will be able to use the announcement to underscore their commitment to enabling transparency through technology, providing patient access to records and fostering patient engagement.

Benefit Rating: Low

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Cerner; Epic; Siemens

Recommended Reading: "Hype Cycle for Healthcare Provider Applications, Analytics and Systems, 2014"

Medical Shopping Transparency Tools

Analysis By: Jeff Cribbs

Definition: Medical shopping transparency tools are applications that support the consumer practice of considering two or more alternatives for receiving a certain medical service. They provide comparisons of price at a minimum, but may also include measures of quality, convenience and consumer satisfaction. This is in contrast to the historical practice of obtaining services from the single provider or facility that was suggested by the health plan, referring provider, or others (such as family or friends) without considering alternatives.

Position and Adoption Speed Justification: From a consumer perspective, the practice of shopping for medical services is a marked departure from the historical norm, where prices were essentially invisible and had little financial impact to the consumer. Various mechanisms of increasing the consumer's stake in controlling their medical costs (for example, increased copays, high-deductible health plans and reference-based pricing) have created demand for tools that support informed and convenient shopping for services.

Cost transparency tools are at the peak of the Hype Cycle in 2014, which has seen enormous market hype and a number of significant announcements already. In April 2014, the U.S. Centers for Medicare & Medicaid Services (CMS) advanced its cost transparency efforts in the release of a consumer-facing interactive search tool for its 50 million Medicare fee-for-service beneficiaries. At the state level, a handful of all payer claims databases (APCDs) have made tools available to the public (for example, Massachusetts and New Hampshire). The eye-popping valuation of the Castlight Health initial public offering (IPO) in March 2014 indicated the exuberance of self-insured employers for transparency tools. Finally, the Health Care Cost Institute, an alliance of commercial plans including Aetna, United and Humana, announced the 2015 release of a publicly available transparency tool that would draw from the payment data of their collective 65 million members. These announcements indicate that cost comparison will be available to a majority of U.S. healthcare members in the next one to three years.

However, Gartner's position is that information availability is only one dimension to the value of transparency. The other is usability; and on that front, medical shopping transparency tools today have severe limitations. For example, the CMS tool, while significant in terms of direction and useful to policymakers, is essentially unusable to consumers. Its data cannot compare between services rendered in a hospital versus in an office, it uses administrative labels for services that will not be understood by most consumers, and it contains no measures of quality. Commercial vendors do somewhat better, but still fall short of providing what consumers expect in every other industry — a convenient shopping experience, with ample information about competing products, and a final price for each. However, the most fundamental problem from a consumer perspective is that these tools generally exist in isolation from the rest of the experience of healthcare — and most especially in those moments when it would be most relevant — in a primary care office deciding on a course

of treatment or a specialist referral, in an engagement with a care manager, or in shopping for a health plan on an exchange.

For this reason, we position this technology according to actual consumer use of these tools, rather than the availability of these tools to consumers (which, as stated, will reach 50% soon). We take as the target market the number of U.S. consumers with at least one shoppable medical service (well-defined, nonemergency medical services) in the prior 12 months, and the numerator, those that use a medical shopping transparency tool for at least one decision.

As these limitations come increasingly into focus, a cycle of negative press and diminished expectations will follow. The underlying value will emerge in the next generation of transparency tools, which will include committed, ad hoc prices from providers, scheduling and payment mechanisms (for example, Cambia Health Solutions' SpendWell or United Health Group's myEasyBook) and will be more intuitively integrated with consumer experiences of navigating the healthcare system.

User Advice: Healthcare payer CIOs and technology leaders should look beyond the current status quo and actively seek to incorporate cost transparency tools into the appropriate member touchpoints, focusing on the evolving usability of those tools toward a true consumer shopping experience.

Benefits managers at self-insured employers should rigorously evaluate vendor's tools, focusing on the accuracy of the cost estimations, how the tool will merge into the total employee experience of navigating benefits, and the vendor's product development road map.

Business Impact: Cost-transparency tools have shown some evidence of being effective in accomplishing what so many other current health initiatives do not do: removing medical costs from the system. Consumers with high deductibles can immediately realize the savings of choosing a lower-cost option. In the long term, to the extent it makes the provider market more competitive, it should result in lower premiums, benefiting employers and consumers. As the tools include other comparison points such as quality, satisfaction, and experience measures, consumers will also gain the empowerment that comes with informed choice. In the short term, however, using transparency tools will be a new step in an already bewildering process of navigating healthcare.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Castlight Health; Change Healthcare; Healthcare Bluebook; HealthSparq; SpendWell; Truven Health Analytics

Recommended Reading: "Enabling Transparency Is an Essential Strategy for Healthcare Payer CIOs"

"High-Value Castlight Health IPO Signals Challenging Trend for Payer CIOs"

Consent Management

Analysis By: Barry Runyon

Definition: Consent management is a system, process or set of policies for allowing consumers and patients to determine what health information they are willing to permit their care providers to access. It enables them to affirm their participation in e-health initiatives, such as patient portals, personal health records or health information exchanges (HIEs), and to establish privacy preferences to determine who will have access to their protected health information (PHI), for what purpose and under what circumstances.

Position and Adoption Speed Justification: In 2010, the U.S. Office of the National Coordinator for Health Information Technology (ONC) convened a Privacy and Security Tiger Team, and consent management was on the agenda. Like Gartner, the ONC Tiger Team recognized that fine-grained consent was still in its infancy, largely demonstration projects and with few production examples available for consideration. The ONC was motivated by its concern that without more granular consent approaches, large segments of patient healthcare information would not be included in HIEs, and would greatly diminish the usability of patient data and adoption of HIEs. Despite these concerns, the ONC proposed that patients should be able to decline to participate in HIEs altogether. This approach would address the concerns of patients who prefer not to have their information shared, while ensuring for those patients who do participate that healthcare providers will have access to the information necessary to provide quality care.

Consent management demonstrations at the Healthcare Information and Management Systems Society conferences, meant to depict real-world healthcare provider situations, included use cases like clinician-asserted rights, purpose-based access (for example, emergency access), patient-determined privacy preferences and consent directives, and flexible policy management. Examples of consent management are in production at a handful of healthcare delivery organizations (HDOs) in the U.S. (for example, Texas Department of State Health Services, Kaiser Permanente, U.S. Department of Veterans Affairs and Brooklyn Health Information Exchange). These implementations are typically based on simple role definitions, and request and push patient data based on rules associated with the definitions. Other consent management initiatives include a consent management service that supports approximately 5 million people in the greater Toronto area of Canada, appropriately called Connecting the Greater Toronto Area (where technology is powered by the consent vendor HIPAAT, combined with technologies from Apelon, Harris and Oracle, and integrated by Telus Health Solutions). Work is also underway through the U.S. Healthcare Information Technology Standards Panel and other standards bodies (Integrating the Healthcare Enterprise, Health Level Seven [HL7], Organization for the Advancement of Structured Information Standards and Workgroup for Electronic Data Interchange) to implement privacy consent and access control standards for the secure electronic exchange of PHI. In 2013, the Texas Health Services Authority, a public-private partnership formed to improve the Texas healthcare system, selected InterSystems to implement an HIE that will connect local Texas HIEs to the national eHealth Exchange (formerly known as the National Health Information Network or NHIN). Patient consent management was an important component of this implementation.

The privacy needs of HIEs, accountable care and patient-centered healthcare movements will continue to drive industry interest in consent management going forward. The sheer complexity of providing granular consent capabilities to consumers and patients across independent systems and the lack of agreed upon industry consent standards will conspire to ensure sluggish forward movement over the next several years.

User Advice: Consent management supports the dynamic creation, management and enforcement of consumer, organizational and jurisdictional privacy directives. CIOs, CMIOs and those involved in privacy, security and compliance within HDOs and HIEs should be thinking about what policies and technical controls are required to manage consent and limit the disclosure of PHI. They need to be asking what kind of consent management systems will be needed in the future to record, and enforce the preferences of their consumers and patients. HDO CIOs will also need to make their legacy systems more privacy-aware.

Consent management tools are still emerging, with few mature offerings available. Consent management projects will be driven by a strong collaboration between those concerned with policy and those concerned with the technological implications. Any participation in an HIE should be based on clear understanding of the policies for consent management and whether those policies will be enforced centrally by the HIE, or whether the enforcement is a requirement of the end subscriber.

Business Impact: Little has been done, to date, to prevent clinical system users from accessing PHI that is beyond their required need to know. Role-based access controls typically permit users to access PHI available to their roles, even when such access is unnecessary or inappropriate. Application log management tools detect access after it has occurred. Patients and consumers concerned about the confidentiality of their PHI are less likely to participate in an HIE. HDOs and HIEs should capture consumer preferences using consent management tools suitable for automation, and apply those preferences systemwide.

Most successful HIEs have implemented general opt-in or opt-out models without highly granular controls. Attempting to undertake an overly ambitious form of consent control could lead to technical and operational delays and failures. To implement fine-grained consent control, consumers are expected to take the time to define their consent directives concerning individuals and organizations.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Deloitte; Global Patient Identifiers; HealthUnity; HIPAAT; InterSystems; Jericho Systems; McKesson; Optum; PresiNET Healthcare; Private Access; Wellogic

Recommended Reading: "Agenda Overview for Healthcare, 2013"

"2014 Strategic Road Map for the Real-Time Healthcare System"

Mobile Sports and Fitness

Analysis By: Jessica Ekholm

Definition: Mobile ecosystems are used to track and monitor sports and health-related efforts. The ecosystem can include anything from mobile apps to stand-alone pulse readers that connect wirelessly to PCs. Advanced fitness apps use short-range wireless technology such as Bluetooth, Z-Wave or ZigBee to gather data including heart rate and running distance. Users wear sensors, either on the body or placed within a heart-rate monitor or step counter, that relay information to a mobile phone and its apps.

Position and Adoption Speed Justification: Interest in fitness- and sports-related ecosystems was at its peak of hype in 2013, and is slowly moving beyond the peak in 2014. Fitness ecosystems and particularly apps have been available for several years due to the proliferation of the Apple App Store and Google Play. Samsung and adidas were early pioneers in creating an ecosystem — rather than stand-alone apps — in 2008 with their miCoach app. Their ecosystem has grown rapidly with the adidas miCoach Speed_Cell, tracking speed, and the X_Cell which tracks acceleration, direction change and heart rate. In addition, miCoach has teamed up with U.K. health insurance company PruHealth and is offering a heart-rate monitor bundle for iPhone users, which can be linked to a PruHealth Vitality program.
One of the most talked about and seemingly popular fitness ecosystems is by Nike. The Nike+ ecosystem including the FuelBand seemed to have it all until April 2014, when Nike decided to shut down its 80-person FuelBand team to instead focus on software. Likely culprits are step and fitness tracker companies with mass-market focus, Fitbit and Jawbone. U.S. company Fitbit's Flex and One products display the number of steps taken, stairs climbed, calories burned and sleep patterns, and have seen strong uptake. Devices such as Fitbit Tracker, NikeFuel, the Up band (from Jawbone) and GPS watches are all currently driving this market with connections into apps and services. The Up band is an interesting example of a wristband designed to be worn continuously by users to track activity, mood, sleep and eating habits. Its value lies not in the wristband itself, but in its connection to the smartphone and the phone's connection to the back-end services that drive it.

Garmin has also now latched on to the trend of always-on connectivity with its 620 range, and has embraced big data for runners on its app/cloud service, from Race Predictor and Running Dynamics to maximal oxygen uptake estimates. We expect that, over the next five years, fitness and sports devices will become more cognizant and will always be worn, permanently capturing data and relaying it back to a cloud service contextually. Devices will ultimately become more lifestyle- than task-driven, as the ecosystem will sense when a user is working out and automatically start a device or app, and data will be exchanged when needed.

Regarding uptake, in the initial stages of the fitness ecosystem, generally sports and fitness devotees were first to sign up for and use their downloaded apps on a regular basis. However, as smartphones and app stores have become more common and fitness tracking in general a more accepted, everyday task for many gym-goers and casual joggers, access to sports and fitness apps has reached a wider, more casual audience.

User Advice:

- Software developers should design apps that are easy to use and create stickiness by motivating users and enabling them to monitor their progress. Users should also be able to store and share data across mobile devices and online, such as running or diet journals for tracking and monitoring purposes, progress charts and averages, and the ability for the user to share achievements on social networking sites. Additionally, teams should work on the longevity of the app and tie-in reminder functionality.
- Fitness equipment manufacturers should consider incorporating Wi-Fi and cellular chips and/or ZigBee and Bluetooth low-energy technologies into products aimed at gyms and individual consumers. They should also offer support for Bluetooth Smart technology, which consumes less power so has less need to recharge.
- Mobile handset manufacturers wanting to enter the health and fitness market should capitalize on their products' potential by integrating GPS technology and accelerometers and making good use of customers' vital information. They should also make themselves appealing to developers by giving access to sensors and features in the device, or by choosing a partner with sufficient appeal to drive stickiness.
- Health insurance companies, gyms, diet clubs, employers and governments should consider integrating mobile fitness apps into their policies and health programs to monitor activity levels, increase both health insurance and gym customers' satisfaction, and reduce churn with incentives and ecosystem stickiness.

Business Impact: Fitness equipment manufacturers, large health insurance companies (and their members), diet clubs and sports clubs could see an impact — in both usage and revenue benefits — from new software developments around interaction, reporting and tracking of users' fitness activities.

Mobile device manufacturers offering a full mobile fitness ecosystem could see results in terms of higher customer loyalty and, ultimately, some revenue impact from fitness enthusiasts. This ecosystem should include at least one app that can be linked with GPS, and an online tracking and monitoring site that can also be linked to social networking sites.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Apple; Fitbit; Nokia; Omron; Samsung; Wayfinder Systems

Recommended Reading: "Market Insight: Consumer Apps and Services Will Become More Aware and Less Visible"

"Emerging Technology Analysis: Mobile Health Monitoring"

"Market Insight: Mobile Fitness and Wellness Applications and the Prospects for an Ecosystem"

Real-Time Virtual Visits

Analysis By: Thomas J. Handler, M.D.

Definition: Real-time virtual visits enable healthcare consumers to obtain 24/7 nonemergency care, using mobile and stationary devices: telephone or audioconference, teleconferencing or video chat, and secure messaging or texting. A pre-established relationship between the patient and the clinician is often not required. This is distinct from e-visits, which are usually asynchronous interactions between a patient and a clinician (where the relationship is always formal and pre-established) and are often conducted using a patient portal tethered to an EHR.

Position and Adoption Speed Justification: Clinician shortages — a problem around the world — have combined with archaic scheduling systems, inflexible working practices and consumers' increasing expectations of rapid service to create frustration among consumers, clinicians, healthcare delivery organizations (HDOs) and healthcare payers. Real-time virtual visits have emerged as an option for healthcare payers and providers that want to offer more-convenient access to care and overcome the uneven distribution of clinicians. In the past year, there has been only a minimal change in adoption due to continued questions regarding reimbursement and legal issues.

Real-time virtual visits enable the possibility of immediate 24/7 access to clinicians. A brokering function matches patients' needs with clinicians' availability. The patient logs onto a secure website and chooses to have an immediate visit, schedule a future visit or wait for an available clinician. Decision support tools help the patient decide what type of clinician he or she should talk to. Alternatively, the patient can enter search criteria, such as gender, language spoken and specialty, and can browse a list of clinicians and their satisfaction ratings. Prior to accepting the consultation, the clinician can review the patient's complaint and, if available, any patient data (this could be drawn from a variety of sources, including insurance claims, pharmacy benefit management systems, personal health records or health information exchanges).

At any time, the remote clinician can decide to refer the patient for a face-to-face visit. If the patient wants to speak to the clinician by phone, the system can create a bridge between the clinician's phone and the patient's phone. After the consultation, patients provide a satisfaction rating. The system creates a continuity of care document that can be downloaded into electronic health record (EHR) systems. It can also generate electronic prescriptions. The system usually includes malpractice insurance for participating clinicians and handles all remunerations.

It is possible that HDOs may want to increase their reach through the use of real-time virtual visits, but it is more likely that services using real-time virtual visits will compete with the typical brick-and-mortar approach of HDOs. Inhibitors include limited access to the patient's full medical records and the fact that real-time virtual visit systems tend to exist outside of normal clinical workflow, making physician adoption slower. In addition, concerns have not been addressed about follow-up care and how this form of care will fit into accountable care and risk models.

Furthermore, to become widespread, real-time virtual visits will require significant cultural change. In some countries, such as the U.S. and Australia, government action is starting to stimulate the

necessary changes. Due to the long time necessary for such change, we continue to estimate that, in the global market, it will take more than 10 years until the plateau is reached.

User Advice: There is definitely potential for real-time virtual visits to reduce costly emergency room visits and to provide a more convenient service to patients. Healthcare payer CIOs should be prepared to support the use of real-time virtual visits. Real-time virtual visit services more likely will compete with HDOs for patients. It is, therefore, essential to monitor competitive activity and to consider offering these kinds of services as well. HDO CIOs should work with senior leaders in evaluating the possibility and costs of setting up a real-time virtual visit network as a way to provide service to existing patients and to attract new patients.

HDOs that deploy real-time virtual visits must proceed cautiously, closely engaging clinicians in a program of cultural change. Real-time virtual visits should be deployed in such a way that they do not unnecessarily disrupt existing patterns of referral and care. They should be integrated into a continuum of care that includes prevention and follow-up, especially for patients with chronic conditions. It will be critical to carefully manage the handoff and information sharing between remote clinicians and face-to-face clinicians. HDOs that use real-time virtual visits will need to devise metrics to measure their value and should include patient satisfaction surveys. HDOs will want these metrics to show improved access to clinicians, in addition to improved quality of care.

Healthcare payers need to investigate whether or not real-time virtual visits can, in fact, reduce costs and improve quality. If the metrics demonstrate the visits' value, healthcare payers should not only reimburse for services rendered, but also encourage its appropriate use.

Business Impact: Real-time virtual visits offer potential benefits, although as yet unproven, to multiple stakeholders:

- Healthcare consumers can get almost immediate and convenient access to medical care from home for minor medical conditions and for chronic disease management. This will be appealing to time-pressured individuals (for example, working parents of young children), patients with mobility challenges, chronic disease sufferers and patients who live in areas with shortages of clinicians. It can also appeal to patients with highly sensitive conditions, such as behavioral health.
- HDOs may be able to reduce the number of uncompensated emergency room visits by offering patients real-time virtual visits.
- Healthcare payers can reduce the number of emergency room visits and can shift care to a lower-cost setting: the patient's home. They can use real-time virtual visits as a tool for triaging patients to prevent unnecessary face-to-face visits. They can also use the service as a tool to attract new members — for example, by making the system available to nonmembers for an additional cost.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: American Well; Teladoc

Wearable User Interfaces

Analysis By: Angela McIntyre

Definition: Wearable user interfaces describe the interaction between humans and computing through electronics designed to be worn on the body. They may sense the human body or the environment around the wearer and transmit the information to a smartphone or to the cloud. Ideally, wearable user interfaces are unobtrusive, always on, wirelessly connected and provide timely information in context. Examples of wearable electronics are smart watches, smart glasses, smart clothing, fitness monitor wristbands, sensors on the skin and audio headsets.

Position and Adoption Speed Justification: This past year saw the hype on wearable user interfaces reach the Peak of Inflated Expectations and become tempered with realism about the value consumers perceive in new wearable devices. Devices are not viewed as stylish by consumers; the data collected from wearable sensors yields insights that are marginally useful to wearers. Apps and algorithms that can interpret noisy data from wearable sensors are needed to increase the usefulness of recommendations. Use cases in which wearable user interfaces are more convenient than smartphones are limited. Smartphones are gaining sensors and apps that give them health and fitness tracking capabilities similar to wearables. Nonetheless, apps on smartphones are enabling new capabilities and insights from wearables.

Yet interest in wearable interfaces remains high, and Google is fostering an ecosystem that is expected to gain traction. Android Wear will enable a consistent user interface across different types of wearables. For example, Android-based wearables will have a similar user experience in the layout of glanceable displays, gestures for navigating among apps, and using voice commands for control and to access information. Google and affiliated service providers have potential access to personal information gathered by other wearable devices using services on an Android Wear platform.

Data from wearable devices can be combined with data from other devices in the Internet of Things and from other sources on the Internet, adding to big data. Apps, services and virtual personal assistants (VPAs) will provide increasingly useful insights to wearers as part of cognizant computing by using personal data collected from wearable electronics. The consumer trends for adoption are being driven by quantified self, convenience and the desire for immediate alerts, especially regarding social networks. Tracking data for medical reasons will be a longer-term driver for wearables.

Over the next 10 years, wearable user interfaces will enable services to become more personalized to the preferences and needs of the user through contextual information and bio-data gathered through wearable electronics. Similarly, wearable devices will serve as controllers for other devices in the Internet of Things. For example, consumers with Nest thermostats can control them remotely through Google Glass. Similarly, the Pebble smartwatch can take a photo with the GoPro camera and start a car engine remotely. These are early examples of how wearable user interfaces will become increasingly integrated into daily life.

User Advice: Invest now in deployments or pilots for wearable user interfaces in the enterprise. Start with wearables for mobile workers who cannot conveniently or safely put aside what they have in their hands to use a phone or tablet, such as employees using tools or equipment, or who need to keep their heads up or to hold on for safety.

Engage with software developers now on augmented reality use cases specific to your business needs. Augmented reality solutions are in development for head-mounted displays (HMDs). However, robust software solutions using augmented reality beyond checklists will take an additional two to five years of development. The battery life of present HMDs lasts only a couple of hours for uses such as streaming video. Until at least full-day battery life is available, workers will find wearables inconvenient or impractical to use.

Where time-motion efficiency is essential to productivity, such as in call centers and logistics organizations, employers are investigating wearables, such as gaze tracking through audio headsets and location tracking through badges. Explore solutions that lead to recommendations to increase worker productivity or to monitor employees in physically demanding work environments.

Encourage the workforce to be healthier by implementing wellness programs that include wearable fitness trackers and also work with providers on advances in algorithms for fitness trackers. Fitness trackers in wristbands or other forms are motivating to people who want to be less sedentary. The general health of the consumer or employee can be measured with wearables, including body temperature, heart rate, heart rate variability (stress) and potentially blood glucose.

Explore longer-range opportunities for always-on information access through smart glasses or smart watches through voice input and video, but evaluate risks before heavily investing. Create policies around personal privacy and the restrictions around taking pictures in the workplace. Data security risk will also increase with the rise in content sharing among devices that are interacting across personal networks.

Business Impact: Early industries to adopt wearable electronics are aerospace and police, followed by sports, field service, manufacturing, logistics, transportation, oil and gas, retail, and healthcare. The healthcare market stands to benefit from wearable user interfaces that enable mobile health monitoring, especially for heart conditions. Wearable cameras are ready for deployment now for use cases such as police/security and inspections. Field service and manufacturing are using streaming video to an expert who sees what the wearer sees, which is useful for training or expert assistance. Sports is using wearables on players for "in the game" perspective tracking the performance of athletes. Augmented reality solutions on HMDs have the promise to increase productivity by providing part labels, checklists, maps and instructions superimposed on real-world views.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Aliph; Eleksen; Epson; Eurotech; Fitbit; FitLinxx; General Dynamics Itronix; Google; Kopin; LXE; Motorola; Oculus VR; Pebble; Plantronics; Recon Instruments; Samsung; Sony; Vuzix

Recommended Reading: "Cool Vendors in Wearable Electronics, 2014"

"Innovation Insight: Smartglasses Bring Innovation to Workplace Efficiency"

"Market Trends: Enter the Wearable Electronics Market With Products for the Quantified Self"

"Fellows Interview: Thad Starner, Wearable Computing Pioneer"

Healthcare-Payer-Oriented Patient-Centered Medical Home

Analysis By: Robert H. Booz

Definition: The patient-centered medical home (PCMH) is a holistic care delivery model that designates a personal physician to arrange all medical care. The process includes the patient and, as appropriate, the patient's family or authorized representative in care decisions. It creates and maintains the care model by financially rewarding providers who perform care integration services.

Position and Adoption Speed Justification: The precept of the PCMH is to have a personal physician responsible and rewarded for tracking a patient's entire care experience, regardless of where care takes place or who is providing it, in the belief that this will result in better and more cost-efficient care. Primary care physician associations created the Joint Principles of the Patient-Centered Medical Home in the last decade. Instead of a specific and unequivocal set of defined attributes, the PCMH comprises these principles, characteristics and components:

- Personal physician
- Physician-directed medical care
- Whole-person orientation
- Coordinated or integrated care
- Integration of quality and safety into care delivery
- Enhanced access to care
- Payment changes to fund the medical home

The usefulness of the PCMH depends on information exchange among all medical care providers working with a patient. The model also requires patient participation to maximize improvements in health status and the control of medical costs. Functionally, the PCMH requires five major categories of applications and business operations: membership accounting; provider network management; care measurement and management; claims adjudication; and multiple physician payment capabilities. Care management is the central requirement. The other applications are most often subsumed into existing applications and processes. However, there are vendors that will

represent themselves as enabling the PCMH, and this is only partially true. Individual technology vendors are not specifically identified here, because the range of technology requirements generally exceeds any one vendor's capabilities. The past five years have seen growth of PCMH definition and certification by quasi regulatory bodies. More requirements have been promulgated by both the National Committee for Quality Assurance (NCQA) and the Agency for Healthcare Research and Quality (AHRQ). For example, NCQA 2014 PCMH Standards and Guidelines address the need to:

- Enhance access and continuity
- Identify and manage patient populations
- Plan and manage care
- Provide self-care and community support
- Track and coordinate care
- Measure and improve performance

While the trend toward accountable care is a motivating influence on the speed of adoption of this care delivery model, the PCMH is not equivalent to an accountable care organization (ACO). A PCMH is based on the fundamental recognition of the value of primary care physicians coordinating with specialists and other caregivers, rather than as a step taken for financial rewards related to discrete care costs or outcome measures. The PCMH concept can provide critical process-oriented insight for ACO success, but does not depend on it for adoption.

Most payers, while appreciative of the PCMH concept, are hesitant to fully embrace it. Adoption is slowly increasing, but the PCMH requires substantial cultural changes by payers and providers, relating to how medical care is delivered. Many payers are waiting to see if it can be achieved through small pilots with subsets of their provider panels. Moreover, some payers are concerned that cost savings and quality may not be positively impacted by the PCMH concept.

User Advice: The PCMH is predicated on the integration of medical care across a range of healthcare providers, under the supervision of a personal care coordinator. The future value of the PCMH is difficult to determine, because immediate quality improvements and cost reductions cannot easily be identified, measured and economically rationalized based on the results of only short-term studies. The value proposition of the PCMH is subject to a number of issues in delivery and management of medical and technology resources, such as patient compliance, that are beyond the control of the care environment.

Achieving the ideal state of the PCMH will require changes to provider technologies, such as referral management, electronic health records and revenue cycle management, to support care management with a variety of providers treating the patient. It must also integrate administrative and clinical services. Many healthcare payers will need to support capitation management, payment for cognitive services, or referral and authorization tracking to aid in PCMH administration and payment. These capabilities deliver greater functionality for managing PCMH processes and payment mechanisms. Making tools available to providers that allow them to create and maintain their referral and care coordination attributes will assist in PCMH adoption. This profile addresses the conceptual and business framework for the PCMH. For this reason, it does not address specific

software vendors, recognizing that the PCMH is an amalgamation of attributes, rather than a specific technology.

Business Impact: Payers considering the PCMH model should not center their decisions solely on whether there is demonstrable evidence of short-term improvements in medical outcomes. Their decision-making process must also address the interoperability of the medical care information needed to create and maintain a medical home. The goals of the PCMH are admirable, but the costs of IT enablement and provider practice changes, and uncertain ROI, may prohibit PCMH investments. The degree to which the PCMH can deliver valuable changes in the way care is delivered, and can eliminate duplication and defensive medicine practice patterns, remains in question. The issue is often an economic problem, because patient-centered care coordination is not reimbursed except through a PCMH. The cost of IT enablement and provider practice changes may limit adoption of a PCMH.

For the PCMH to shape and manage appropriate care, it must reinforce positive behaviors through primary care and cognitive reimbursement strategies. The constructive effects can be significant for healthcare payers that actively support the PCMH.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Personal Health Management Tools — Healthcare Providers

Analysis By: Thomas J. Handler, M.D.

Definition: Personal health management tools (PHMTs) are applications that provide interactive functionality to aid consumers in managing their health and disease processes, but do not include those that just provide educational information. These tools allow individuals to establish programs to track diet, exercise and routine care, and to monitor typical chronic illnesses, such as asthma and diabetes.

Position and Adoption Speed Justification: Healthcare providers, governments and healthcare payers continue to show significant and growing interest in increasing patient engagement as a way to improve outcomes and lower costs. PHMTs are thought to be a good way to accomplish all of these ends. This profile focuses on tools that are likely to be recommended, sponsored or used by providers in their patient engagement/monitoring strategies versus those used without provider involvement.

While healthcare consumers have been interested in online PHMTs for a long time, most of what had been available consisted of simplistic weight or health status calculators. With the growth in chronic care and increasing Internet and mobile use, there has been increasing interest in PHMTs worldwide. There's a growing belief that providing tools to patients will result in less costly care. Leading healthcare delivery organizations (HDOs) are forming innovation centers with medical informatics staff to experiment with patient-facing IT, including PHMTs. In the U.S., the

advancement of consumer involvement in healthcare financing and health management means there's a greater need for better PHMTs, particularly in populations where chronic illnesses or complex medical conditions are present.

The number of PHMTs is escalating with the growing interest in wearable devices and the concepts of the Internet of Things and quantified self. This accounts for some of the movement along the Hype Cycle. At the same time, there is growing realization that many of these tools have not yet had demonstrable impact on health, wellness or chronic disease. There is now more discussion about how to vet the products for quality. Initially, the more complex PHMTs are likely to be provided by healthcare payers or personal health record (PHR) vendors. Eventually, healthcare providers will become the dominant promoters because of changes in healthcare payment approaches that will reward them for taking an active role in managing patients with chronic diseases. Healthcare reforms in the form of patient-centered medical homes and accountable care organizations require patient engagement. PHMTs provide a useful way to connect to patients, and this may accelerate adoption rates.

User Advice: Healthcare CIOs should work with their clinician counterparts to identify PHMTs that have evidence of being well-designed and that have shown positive impacts. Vetting the quality of these tools, especially for subsets of their patients with chronic or complex medical conditions, should improve branding and potentially impact quality. CIOs should work with senior leaders to develop expectations and policy around the support of these vetted tools. Clinicians, as trusted advisors, are in an ideal position to promote the use of PHMTs.

Business Impact: In theory, PHMTs may profoundly improve the quality of care delivered to patients. Key to this change will be evidence of the effectiveness of the various tools and the difficult tasks of achieving patient acceptance and persistent use. Until there is such evidence, the impact of these tools remains low. In the new era of pay for performance and documented quality, HDOs that provide good PHMTs may be in a better position to attract patients and reap the benefits of pay-for-performance initiatives.

Benefit Rating: Low

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Emmi Solutions; Fitbit; GetWellNetwork; MyFitnessPal

Sliding Into the Trough

Continua 2014

Analysis By: Zafar Chaudry, M.D.

Definition: Continua Health Alliance (Continua) is a global industry alliance that creates open interoperability guidelines for personal health monitoring devices such as weight scales, blood pressure monitors and glucose meters that enables vendors to build interoperable sensors, home

networks and telehealth platforms. Continua has a product certification program with a consumer-recognizable logo that signifies interoperability across certified products. Continua's 2014 Design Guidelines are the most recent set of specifications in production use.

Position and Adoption Speed Justification: Continua has focused its efforts on collaboration with government regulatory agencies to provide methods for safe and effective management of diverse vendor solutions and work with the healthcare industry to develop new ways to address the costs of providing personal telehealth systems. Continua's 2014 Design Guidelines are formatted to International Telecommunication Union (ITU) specifications and feature: interface between personal area network (PAN), local-area network (LAN) and touch area network (TAN); health devices and application hosting devices (AHDs) including Near Field Communication (NFC), international normalized ratio (INR) and Bluetooth Low Energy (LE) Glucose Meter; and consent enforcement via wide-area network (WAN) and Health Record Network (HRN) health devices. These are the first global interoperability standards ratified by the ITU for personal connected health (ITU-T H.810). These guidelines were specifically written for device manufacturers that intend to go through the Continua certification process with their devices, companies that integrate Continua devices in systems and subsystems, and test labs that certify compliance with Continua specifications. These guidelines focus on the following interfaces: interfaces to personal area network health devices, interfaces between disease management services WAN devices and electronic health record (EHR) devices.

An important recent milestone for global e-health standardization has been the final approval of the ITU-T H.810 standard, in 2013, to better enable interoperability between e-health devices. This standard contains Continua Health Alliance's design guidelines for interoperability for personal health systems. Continua has achieved very little traction when measured by actual use of connecting home or portable devices to EHR systems. More traction has been achieved through manufacturers developing devices that upload data using Wi-Fi or Bluetooth-enabled smartphones to cloud-based, vendor-specific repositories. These devices do not typically use the Continua specifications. Continua's progress remains slow. However, the ITU has embraced Continua's standards, as have several governments including the U.K., Denmark and Singapore. Other national initiatives include Japan, with some commercial deployments that require the use of Continua standards, and Abu Dhabi, which is developing a Continua standards-based mobile platform. To date, however, there are no U.S. procurements or regulations that require Continua standards or certification. Hype Cycle positioning is based on a global view of adoption.

Continua has more than 200 members, most of which are technology providers as well as three very large healthcare delivery organizations (HDOs), 13 international standards organizations, and government agencies from six countries. Similar alliances have worked well for propagating interoperability technologies such as Bluetooth and USB. The approach, however, has yet to be proven in healthcare, even though the Continua Health Alliance has promoted numerous educational sessions globally. As of April 2014, a new organization, known as the Personal Connected Health Alliance (PCHA), established by the Continua Health Alliance, Health Information Management Systems Society (HIMSS) and the mHealth Summit has been formed to represent the consumer voice in personal connected health. PCHA's goal is to ensure that personal connected health technologies, such as smartphones, mobile apps, sensors and personal health tracking devices, are user-friendly and secure and can easily collect, display and relay personal health data.

As of May 2014, there are only 81 Continua-certified devices. These include weighing scales, blood pressure monitors, glucose meters, pulse oximeters, cardiovascular monitors, thermometers, strength monitors, prescription adherence monitors and peak flow monitors. The number of devices available in any specific market may actually be much lower than the total certified because some of the certifications were for demonstration devices. Nonetheless, the data indicates that there is a slight step up in manufacturers' interest. The representative vendors listed are vendors that support the Continua interoperability guidelines.

User Advice: HDOs looking at personal health monitoring devices should:

- Formulate a strategy moving forward as to how to tackle this growing area
- Consider specifying compliance with Continua to ensure personal health monitoring devices are interoperable
- Seek evidence that using Continua standards will actually lead to measurable benefits
- Speak with device manufacturers about their product road maps and whether Continua is actually on the agenda
- Determine from device manufacturers whether they are truly willing to support Continua requirements in multivendor configurations
- Determine whether plug-and-play interoperability can be achieved in practice, at the technical as well as clinical levels
- Plan for an architecture that includes both Continua-certified devices and devices that are connected via cloud integration

Governmental agencies that seek to pursue a higher level of patient engagement will benefit from specifying Continua compliance; however, they are usually reliant on other agencies to approve the devices, and on the manufacturers to offer the devices in their markets. In addition, they have only speculation or sketchy evidence that care programs based on such devices can produce measurable improvements in population health status or costs. Such agencies may find it advantageous to wait until the current pioneering efforts have borne fruit, particularly since it is difficult to attract manufacturers into a market where their sales might be limited to pilot efforts.

Business Impact: Home and mobile monitoring has the potential to substantially improve the quality of care and reduce costs by enhancing patient engagement; enabling more-frequent interactions with caregivers and healthcare providers, rather than periodic office visits; and enabling patients to remain in the community or at home. As these approaches become medically accepted and find an economic niche, Continua can greatly accelerate its adoption by reducing the "technical therapy" required to get the monitors operating and interfaced.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: AT&T; Capsule; Fujitsu; GE Healthcare; Hitachi; IBM; Intel; Medtronic; Orange; Panasonic; Philips Healthcare; Qualcomm; Roche; Samsung; Sharp; Tunstall Healthcare; Verizon Wireless

Recommended Reading: "Agenda Overview for Healthcare, 2014"

"Hype Cycle for Emerging Technologies, 2013"

"Continua Will Be Critical to Moving Care to Home and Mobile Settings"

Care Coordination Applications

Analysis By: Vi Shaffer; Jeff Cribbs

Definition: Care coordination applications are workflow and decision support solutions for emerging roles within HDOs operating under population health management and value-based purchasing (as opposed to fee-for-service) contracts with payers. Care coordinators' or navigators' roles focus on those cohorts of higher-risk/-severity patients, for whom failure to monitor and coordinate care will yield avoidable morbidity and costs (such as ER visits and hospital admissions). Care coordinators may or may not be clinicians.

Position and Adoption Speed Justification: HDOs that undertook early care coordination have relied on limited IT support, spreadsheets and "swivel-chair integration" — accessing multiple IT systems to get information and coordinate care activities. Now, an increasing number of U.S. HDOs are participating in Accountable Care Organization (ACO) models or private value-based purchasing agreements. This market is hungry for practical solutions, and is in an area of increasing demand and frustration, because so many products are still in the pre-trough, market roiling, venture capital investing and product developing stages. Products' functionality, architecture and packaging with other capabilities vary substantially from one vendor to the next. Four common packaging approaches are to:

- Deliver discrete point solution applications
- Make the care coordinator a role
- Offer it, within an EHR system, as an integrated healthcare megasuite vendor application set (along with the EHR, scheduling and billing)
- Package it on a platform performing both analytics and application functions

So far, leading-edge HDOs are choosing products that have useful, if limited, current value. Several vendors are platforming or replatforming, and claim the potential for the HDO to perform analytics and applications together. Healthcare megasuite vendors are leveraging their existing architectures and expanded analytics capabilities to position as the strategic vendor for population health management.

Benchmarking against the U.S. market, we have moved this ahead fairly aggressively to 30% post-peak, because R&D is progressing, and enough ACOs are using care coordination so that both the

initial value and the real problems associated with technologies and full-solution delivery are being exposed. This is as expected at this stage of the Hype Cycle. High on the list are challenges with getting data in from the wide variety of EHRs these vendors have to contend with for looser-affiliation model ACO clients, or with HDOs rapidly acquiring physician practices with an eclectic array of systems. Also, as expected at this stage, new entrants are still emerging, and venture capitalists are very active in this arena (as with population health analytics). Be warned that some of the sample vendors listed have "solutions" that are far more aspirational than real.

Note that population health management and care coordination are initiatives in many countries, with some vendors targeting global leadership. In some markets, the buyer may not be the independent healthcare provider, but rather a governmental or quasigovernmental public health agency, or a healthcare trust working in consort with public and/or private hospitals and health systems. Functions can include coordinating healthcare providers with other public health and social services agencies (such as in the case of childhood obesity and asthma).

User Advice:

- The single most important thing the CEO must do to make population health management and care coordination successful is to transform from an independent physician-centric culture to a care team and integrated health system culture. Failure to focus on this will prevent population health management success, and will make the population health executives', CIOs' and CMIOs' lives pretty miserable as they try to be agents of change.
- CIOs and population health management business leaders should establish an IT approach to care coordination that is aligned with both care navigators' and primary care physicians' needs and workflows. Solutions should not be limited to a physician office encounter (pre-, during or post-) or to a home health visit centric view of requirements. For example, an HDO must be able to execute a "campaign" (both information and action-promoting) across a cohort of patients, much like a CRM system can execute a marketing outreach or customer communication campaign. Vendors also must be able to articulate how they envision coordinating workflows with patient scheduling and EHR systems functionality.
- Applications must be paired with a sound population health analytics approach, and a plan for how analytics-triggered actions (such as appointment scheduling for gap close) are handed off to workflows.

Business Impact: The ability to reliably and systemically close a wide variety of gaps in care, and to coordinate efficiently in a patient-centric way across previously siloed entities and services, is the purpose of care coordination applications. This is necessary for an HDO to sustain financial viability and business success in incentive, risk-reward and full-risk accountable care and population health management models.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Aetna; Allscripts; Caradigm; Cerner; eClinicalWorks; Epic; Lightbeam Health Solutions; Lumeris; McKesson; NantHealth; Optum; Orion Health; Phytel; Solutions Hospitalis SEC; Wellcentive

Recommended Reading: "Top Actions for Healthcare Delivery Organization CIOs, 2014: Approach Care Management Pragmatically"

"Business Drivers of Technology Decisions for Healthcare Providers"

Health Insurance Marketplaces for U.S. Healthcare Payers

Analysis By: Robert H. Booz

Definition: The U.S. Affordable Care Act (ACA) requires that states have public health insurance marketplaces (formerly called American health benefit exchanges or health insurance exchanges) that enable the purchase of coverage from designated health plans and assist certain categories of small employers. The marketplace may be governmental or public entities established by a state or by the federal government. The term is also used for private exchanges that are multipayer sites for products offered outside the public marketplace.

Position and Adoption Speed Justification: Health insurance marketplaces are growing in prominence as a way to transact marketing and sales activities directly to the consumer. Their potential is significant, but early issues have made the high hopes for their promise hit the reality of problem-filled rollouts. Marketplaces are online sites that establish virtual multipayer markets for health insurance benefits. The public marketplaces' (also known as public exchanges) go live date was 1 October 2013, with opening of enrollment for a 1 January 2014 effective enrollment date. Significant problems with the federal and state public exchanges resulted in turmoil that caused extension of enrollment dates beyond the 31 March 2014 closure of open enrollment. Private marketplaces, in which insurers or other companies establish virtual multipayer markets for health insurance benefits, are also appearing. These private marketplaces will continue to be interesting for the market, and healthcare payers are moving forward with public and private marketplaces as ways to attract employers and individual customers, despite the IT implementation and market challenges associated with public exchanges.

The major risks associated with the marketplace provisions of the ACA have caused some large players in the healthcare insurance business to sit on the sidelines during the initial public health insurance marketplace hype. Others are cautiously beginning to address market transformation with private marketplace offerings. Despite these concerns, payers are investing in the key areas affected by marketplace activities. These include sales and marketing, product configuration, rating and underwriting, eligibility and enrollment, customer service, and care management

There is significant speculation on whether the actual public marketplace enrollment will resemble the rating assumptions used to develop the marketplace's premium rates. Healthcare payers that are still undecided should base their participation decision making on the yet-to—be-solved IT challenges related to bill payment. Public marketplaces are able to enroll and serve members, but must interface with the federal government to calculate subsidies and determine ongoing eligibility

status. That area remains difficult to navigate. State authorities — or, in the case of federal marketplaces, federal authorities — must approve participation and rate levels for public marketplaces. Success is not assured, even with the best of planning and most cautious assumptions. The hype, however, is real, and disillusion is rampant in the payer community. The uncertainty of success and many unknown variables, such as actual enrollment mix and payment, persist and must be considered.

This entry has moved from embryonic to adolescent in just a year because public exchanges are mandated by regulatory compliance. Private exchanges are equally variable at this point. There are many published reports, however, depicting great optimism for consumer uptake associated with these marketplaces. Actual adoption as measured by exchange participation will determine future placement on subsequent Hype Cycles.

User Advice: Healthcare payers considering inclusion in marketplaces must be more transparent in how they define their products, services and premium rates. Detailed reporting in areas such as administrative costs, enrollment and disenrollment data, product configuration, measures relating to prompt payment of claims, customer service, plan provider networks, and outcomes of grievance and appeals processes are subject to ongoing review and improvement. Public marketplaces are not insurers, nor do they bear risk. They recognize qualified health plan products offered by commercial insurers that cover specified populations, such as those who obtain coverage through small employers and those who are without employer coverage. The public marketplaces compete with established products and distribution channels. Details about the success of state-based public marketplaces continue to emerge. Private marketplaces are growing more slowly than public ones, but there is a strengthening of demand among large employers looking to simplify their benefit offerings.

Health plans should already have addressed increasing the functionality of their portals and mobile applications, improving their eligibility creation and maintenance functionality, adding new capabilities to the product configuration application, and augmenting their CRM capabilities. These are the "table stakes" required to be in the marketplace arena. The most crucial element — integration of the federal data hub, which will confirm eligibility and subsidy information — is still being addressed for confirmation that there is sufficient scale necessary to support operational and growth requirements. Healthcare payers must have contingency plans for marketplace issues. Further, healthcare payers that participate in exchanges must be ready and able to walk away if operational and financial results prove unsustainably onerous.

Business Impact: The health benefit exchange creates dual effects for health payers. Individual purchasers (and members of certain small employer groups) choose between the options of qualified health plans that compete on price, with identical benefits. This can turn health insurance choices into commodities, with buying decisions based largely on price, rather than value. As this commoditization occurs, wise healthcare payers can become more intimate with their customers through high-touch, presale and postsale contact, and work to integrate benefits and features that reach beyond prices to establish value in the mind of the consumer. Failure to do so will relegate consumer choices to periodic buying experiences, rather than promote the "stickiness" needed to retain clients and lower the cost of sales by retaining membership across eligibility periods.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Sample Vendors: Benefitfocus; Connecture; eHealthInsurance

Recommended Reading: "Agenda Overview for Healthcare, 2014"

Mobile Health Monitoring

Analysis By: Barry Runyon; Jessica Ekholm

Definition: Mobile health monitoring is the use of mobile devices and information and communications technologies to actively monitor the health of patients. Patients are provided mobile and wearable monitoring devices that capture physiological metrics, such as blood pressure, glucose level, pulse, blood oxygen level and weight, and then transmit or stage the patient data for analysis, review and intervention.

Position and Adoption Speed Justification: Advances in smartphone platforms, sensor technologies, cellular networks, cloud computing and mobile and wearable medical devices have removed many of the technical barriers to mobile health monitoring. Industry cooperatives such as the Continua Health Alliance, the ZigBee Alliance and the Bluetooth Special Interest Group have furthered the cause of device interoperability. Over this past year, we have seen an increased interest in mobile health monitoring, driven by a number of factors:

- Smartphone use by adults is at an all-time high.
- The increased burden of chronic disease in emerging markets, many of which have poor landline coverage and better mobile coverage, is generating interest from government healthcare agencies in deploying mobile versions of home health monitoring devices.
- Interest is growing among healthcare delivery organizations (HDOs) in developed and emerging markets in using mobility to overcome the "location dependence" limitation of home health monitoring technologies. The use of portable or wearable devices opens the possibility of monitoring active, mobile patients continually and in real time.
- The popularity of personal health record (PHR) applications is enabling healthcare consumers to create Web-based healthcare data repositories that are able to accept data from health and fitness monitoring devices.
- The so-called "quantified self" is generating increasing fascination. Sports product manufacturers, such as Adidas and Nike, are offering motion trackers that help create a better jogging experience. Professional sports teams use a variety of dedicated sensors and devices to measure the performance of team players. The widespread adoption of smartphones with low-cost applications that enable mobile health monitoring is leading to growing interest among healthcare consumers in self-monitoring.

- Affordable, wireless gateways connect to standard home health monitors (weight, blood glucose and blood pressure) and automate data collection and secure transmission.
- Smartphone manufacturers will begin to incorporate biosensor and monitoring technologies into the devices — making it easier for medical application developers to deploy their functionality and less expensive for the consumer.
- The number of wearable devices on the market with the potential to help both patients and clinicians monitor vital signs and symptoms has increased dramatically.
- Acceptance of cloud-based services by HDOs is increasing.

Despite growing interest, most deployments of mobile health monitoring are pilot projects. HDOs, for the most part, are not yet convinced that the business case for mobile health monitoring is viable and have not yet shown the organizational commitment to develop sustainable services on a large scale. In 2012, Telcare (see "Cool Vendors in Healthcare Providers, 2012") began shipping U.S. Food and Drug Administration (FDA)-cleared glucometers that automatically connect to a cellular data network and integrate with Telcare's own website, payer call centers and the electronic health records of healthcare providers. The ease of deployment of products such as Telcare should help move some pilots to larger-scale, operational programs — in part driven by the fact that consumer mobile blood glucose monitoring devices (such as iHealth's Wireless Smart Gluco-Monitoring System) are gaining greater acceptance with consumers and employers. As mobile health monitoring evolves and its clinical uses become more clearly defined, it will most likely fragment into certain submarkets focused on particular clinical areas, such as obesity, chronic obstructive pulmonary disease (COPD), diabetes and cardiac care.

User Advice: Whether mobile health monitoring pilots evolve into operational deployments depends on the ability of HDOs to overcome certain obstacles, including legal and licensing restrictions, inconsistent reimbursement by healthcare payers, and the reality that mobile health monitoring will require new staffing and workforce considerations and new business processes for dealing with remotely generated patient data, as well as new ways of integrating this information into their business and clinical systems.

HDOs should focus on the process and business issues raised by mobile health monitoring. It is essential to develop the ability to manage large numbers of mobile devices and remote patients, to change business and clinical processes to handle remotely generated patient data, and to change the staffing model to be able to orchestrate time-critical interventions for patients.

HDOs should not rush to replace home health monitoring in favor of mobile health monitoring. Mobile health monitoring will be used as a supplement or alternative to home health monitoring and will likely be used to service certain types of patients (such as younger, more active and more tech-savvy patients).

Business Impact: If deployed appropriately, mobile health monitoring will enable closer monitoring and faster intervention in the care of certain groups of patients. Mobile health monitoring can improve patient engagement, enhance the patient experience and increase adherence to care plans.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Abbott Diabetes Care; Aerotel Medical Systems; Ambio Health; Ideal Life; Johnson & Johnson; Medic4all; Medtronic; Nonin Medical; OBS Medical; Preventice; Ringful Health; Roche; Tunstall Healthcare; Withings

Recommended Reading: "Analytics Gets Personal With the Quantified Self"

"Failure to Address Organizational Issues Will Derail Telemedicine Initiatives"

"A Framework for Understanding Telehealth, Telemedicine and Other Remote Healthcare Delivery Solutions"

"Survey Analysis: Telemedicine Initiatives Reflect Pragmatism in Adoption"

"2014 Strategic Road Map for the Real-Time Healthcare System"

Personal Health Record

Analysis By: Thomas J. Handler, M.D.

Definition: Personal health records (PHRs) enable individuals to gather, create, manage and share personal medical information in a secure and confidential environment. Although the information within the PHR may have originally been transmitted to the PHR by a healthcare organization (HCO; e.g., a healthcare delivery organization or a health plan), the copy in the PHR is entirely under the control of the individual described by the record or a designee. PHRs do not include portals that permit patients' access to the digital health record systems of HCOs.

Position and Adoption Speed Justification: We are once again keeping the PHR on the Hype Cycle primarily in order to differentiate between a PHR and a patient portal. We still predict that it is unlikely that PHRs will actually reach the Plateau of Productivity in most countries for at least 10 years, if ever. Once again, in the past year, there has been essentially no further adoption of PHRs. There are two specific barriers to the success of PHRs — difficulty in engaging enough patients to care about accessing their PHRs and difficulty in moving healthcare delivery organizations (HDOs) to transmit a patient's data to third-party PHRs. HDO reluctance can be traced to two issues. The first is the substantial costs of creating and operating interfaces to PHRs. The second is the HDO view that holding the patient data inhibits patients from moving to other HDOs or obtaining services from a mixed set of HDOs. The barriers are interrelated. One reason that people are not finding value in their PHRs is precisely because very little data from HDOs is present, and one reason HDOs are unwilling to invest in PHR interfaces is the lack of patient demand.

Despite many failures, the topic continues to draw interest. Government policymakers see the PHR as the solution to a dilemma trading off concerns for people to control their protected health

information and the benefits of sharing long-term patient data among healthcare providers, clinical researchers and agencies that monitor the costs of, and equitable access to, healthcare. Policymakers frequently further promote PHRs as assisting in the transparency necessary for free-market healthcare and the fungibility of healthcare services. Although there is no evidence to support these views, there is also no evidence to deny them, and they are an article of faith in conservative governments.

Another reason that the topic of PHRs continues to draw interest is that there are systemic changes in technology and attitudes that could conceivably tip the scale between barriers and incentives during the next five years. People with well-developed chronic diseases or motivation to improve their lifestyles are increasingly of the generation that are used to accessing their financial data and executing financial transactions on their smartphones, and they will expect no less for their healthcare data.

Patients are increasingly finding apps that combine smartphone usage with access on tablets or PCs and have come to appreciate having multiple different ways to access and manipulate their data "in the cloud." They are also seeing that smartphones and cellular data access finally provide real ease of use for recording home weight, blood pressure, oxygen saturation, glucose and activity. These same people, however, are finding that their data is siloed at the websites of different device vendors in the cloud. This may create demand for PHRs.

In the U.S., standards required for Stage 2 of the Meaningful Use incentive program address the issues of basic data format and content, security, and a voluntary and disposable patient ID (the "direct" address). This will remove one of the issues that have inhibited HDOs from contributing data to PHRs.

There is a further barrier to PHRs offering sufficient value to attract patient users. This is the willingness of healthcare providers to accept data that passed through the patient's control between one provider and another. Digital signature technology can create a substantial level of assurance that a report truly comes from the purported source and has not been modified. However, there are no in-place standards for doing this, and there are substantial cultural barriers to accepting such data into an electronic health record (EHR) system.

The most effective patient engagement will continue to come by having patients use portals connected to the EHR systems of HDOs. Nonetheless, patients in many countries will have their care provided by multiple HDOs over time, and some will have their care in multiple countries. There remains the possibility that portal use will be supplemented by PHR use. There is no doubt that PHRs will continue to be a subject of interest in many countries.

User Advice: CIOs should avoid heavy investment in interfaces to PHRs until there is reason to believe that their efforts will provide sufficient value to patients to tempt them to use PHRs.

In countries where governmental programs dictate participation in PHRs, CIOs that are covered by them must treat the programs as a compliance requirement (that is, they should target "good enough" compliance, rather than seeking competitive advantage by being more compliant than their peer organizations).

Business Impact: If PHRs could meet all their goals equally, they would substantially contribute to changes at the transformative level, enabling innovative care processes to arise across the siloed collection of entities that compose the healthcare system. This could improve the level of patient engagement and contribute to transparency that would enable consumers and payers to make insightful economic choices among care alternatives.

However, during the next 10 years, the most likely scenario calls for zero to low impact.

Benefit Rating: Low

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Dossia; Epic; Microsoft

Recommended Reading: "The Definition of EHR in U.S. Health IT Incentive Regulations"

Video Visits

Analysis By: Barry Runyon

Definition: A video visit is the use of videoconferencing technology for remote consultations between clinicians and patients. Video visits can be used in conjunction with devices such as digital stethoscopes, otolaryngoscopes and digital cameras that enable the remotely located physician access and control. Most video visits are scheduled in advance by coordinators, but there is a growing move toward allowing patients to schedule visits themselves.

Position and Adoption Speed Justification: Video visits are best suited for medical disciplines in which the caregiver normally does not need to touch the patient — for example, rehabilitation and mental health — and for triage purposes including pre- and postsurgical evaluations to determine whether a face-to-face visit is needed. Most video visits occur in areas that are specifically designed for that purpose and equipped with the appropriate devices. Although video visits often use dedicated video carts, the use of desktop and mobile video is growing. As a result, video visits have the potential to move into the home and workplace for encounters that don't require specialized equipment. Video visits are particularly useful when patient transportation, frailty of the patient or security (for example, prison inmates) is an issue, and have been particularly effective in specialties such as dermatology and psychiatry. Examples and business models include:

- An academic medical center provides leadership in facilitating video visits with rural hospitals to cut travel time and avoid inappropriate referrals (University of Arkansas for Medical Sciences Medical Center).
- An academic medical center provides stroke patients follow-up care in their homes (Massachusetts General Hospital).

- A single geographically dispersed organization creates a central coordination function for video visits (U.S. Department of Veterans Affairs, University of Texas Medical Branch, Queensland Health).
- An organization collects membership fees from independent hospitals in exchange for providing video visit services (Ontario Telemedicine Network).

Challenges to adoption include:

- Designing a service that meets the needs of all constituents — clinicians, patients and healthcare delivery organizations (HDOs).
- Setting up an infrastructure for scheduling and coordinating visits and providing technical support.
- Establishing a mechanism for reimbursement, and obtaining reimbursements that are substantial enough to justify the use of video visits.
- Determining how to deal with the imbalance between the fact that the benefits (convenience, travel savings) typically accrue to the patient, but the costs typically are borne by the HDO or healthcare payer.
- Changing culture and workplace practices to ensure that clinicians and patients are comfortable using video.
- The lack of integration with clinical workflows and EHR systems.
- The significant costs of the IT infrastructure to deliver video visit services (network, endpoint devices, support).

Despite these barriers, some countries are making progress in making video visits a regular part of healthcare delivery. The growing acceptance of video visits in Canada was estimated to have saved Canadians living in rural and remote communities an estimated 47 million kilometers of travel and some $70 million in personal travel costs, and a cost avoidance for the health system of approximately $55 million in 2010.

Video visits are also being facilitated by technical advancements. Government agencies in many countries continue to spend money to improve broadband coverage (broadband infrastructure and affordable Internet access), including in the U.S., U.K., Canada, India, Australia, UAE, Qatar, New Zealand, Singapore and South Korea. In addition, desktop video has continued to mature thanks to advances such as scalable video coding and the incorporation of desktop video into unified communications. The increased consumer use of video and video chat (Skype, FaceTime, Tango, Viber) has become easier and more commonplace. The ability to conduct video-based consultations using a clinician's or patient's desktop or mobile device, rather than a dedicated room or kiosk, will accelerate the adoption of video visits.

The current market penetration of video visits reflects the existing installed base; the cultural, medico-legal and technical challenges to adoption; pressure from consumer-based video innovations and market activity; and the level of inquiry interest from Gartner healthcare provider clients worldwide.

User Advice: HDO IT and clinical leadership should:

- Explore how to collaborate with partners, such as insurers or other healthcare providers, to create sufficient scale to justify the development of an infrastructure for video visits, including personnel for scheduling and technical support. The most-attractive opportunities in using video for clinical care are in mental health, rehabilitation, triage, preoperative assessment and postoperative assessment.
- Explore additional uses of video, including medical education, clinician-to-clinician meetings, interpretation services, rounding robots and administrative meetings.
- Government healthcare agencies that serve large numbers of citizens in isolated areas or large prison populations should consider establishing regional or national video visit programs.
- Assemble evidence of value and lobby healthcare payer organizations to establish appropriate levels of reimbursement for video visits.
- Plan for an eventual future where patients and clinicians will interact via video through the desktop or mobile device — one that includes home and mobile health monitoring, e-visits and personal health records.
- Closely track the evolving market for room and desktop videoconferencing systems to take advantage of reductions in price and improvements in quality, interoperability and security.
- Investigate video over the Internet versus expensive carrier circuits and specialized endpoint devices.
- Consider video visits as part of an overall plan to reduce energy costs and carbon emissions.
- Consider extending video visits to your patient portal to provide convenient and timely care and engage the patient.

Business Impact: Video visits can reduce travel time and costs for patients and clinicians, and can help HDOs make better use of clinicians' time. Moreover, they can help HDOs reduce costs and enable a more rapid and effective delivery of care to patients in remote locations.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: American TeleCare; Attend Anywhere; Cisco; Eceptionist; Global Media Group; IBM; InTouch Health; Lifesize; Polycom; Tely Labs; VCON; Vidyo

Recommended Reading: "Key Lessons From a Video Visit Deployment in Ontario"

"2014 Strategic Road Map for the Real-Time Healthcare System"

"Failure to Address Organizational Issues Will Derail Telemedicine Initiatives"

"A Framework for Understanding Telehealth, Telemedicine and Other Remote Healthcare Delivery Solutions"

"Survey Analysis: Telemedicine Initiatives Reflect Pragmatism in Adoption"

Health and Wellness Systems for U.S. Healthcare Payers

Analysis By: Jeff Cribbs

Definition: Health and wellness systems are tools and services used by healthcare payers and plan sponsors to promote health awareness and healthy lifestyle choices within their membership. The purpose of these systems is to mitigate long-term medical costs, as well as short-term costs from absenteeism (employees missing work) and "presenteeism" (employees who are at work but underproductive). Health and wellness systems are equally targeted at members across the continuum of care, including those with no current conditions or acute clinical events.

Position and Adoption Speed Justification: After several heady years of rushing to expand care management across the entire care continuum and after euphoric early findings on the ROI of programs, health and wellness systems entered a decline in market expectations as the realities of constricted budgets and the continued rise of medical costs forced plan sponsors and payers to choose where to allocate scarce care management budgets. The debate surrounding the ability of wellness programs to mitigate medical costs has raged on among prominent personalities, organizations and publications. Payers have also struggled to deliver the wide variety of requirements for wellness programs from employers and, most especially, to manage the incentives that are often attached to various wellness activities.

Engagement in health and wellness programs has received a boost from provisions of the U.S. Affordable Care Act that now allow monetary incentives of up to 30% of the total cost of the policy if the member participates and/or achieves certain wellness outcomes, such as being a nonsmoker or attaining certain results on biometric screenings or levels of physical activity. Employers continue to show an appetite to advance these kinds of member accountability models. In addition, the proliferation of monitoring devices, such as activity-monitoring apps, heart monitors and scales, has enabled a new means of measuring, gamifying and rewarding objective progress (see "QS Apps: Bring Your Own Wellness" within "Digital Workplace Hype Cycle"). Finally, employers have become increasingly convinced of the "soft ROI" of wellness — that is, even if wellness programs do not immediately reduce medical costs, their benefits to productivity, corporate culture and employee engagement are sufficient to justify their continuance.

User Advice: Most payers will need to have some level of health and wellness offerings, or else partner with a third party to provide these services, to satisfy plan sponsor demand. Payer IT leaders must work closely with account management and medical management to ensure that there is a reasonable amount of flexibility in the program options given to employers. Account management must prioritize demands from employers and prospects. Medical management must establish a clear position on what it believes wellness programs can achieve for an employer so that the payer is not forced into a reactive position where it must accommodate whatever diverse ideas that employers and their consultants imagine. IT leaders must clearly communicate what kinds of customization are easy to accommodate (for example, a change in incentive amounts or the

addition of certain activities or functionality) and what are not (for example, those that require processing through the core claims system).

Because wellness programs are, by definition, targeted at most or all of a population, payer CIOs and medical management leaders must take extra care to ensure that programs make efficient use of resources. Technology can help here. Individual periodic, telephonic coaching sessions — the central focus of traditional care management — may make sense for a small subset of wellness interventions, but more scalable platforms (such as webinars, competitions, online assessments and chatting, and social networks) should be used to address the majority of cases.

Business Impact: Because health and wellness systems are available to all, or nearly all, of a population, they are the components of care management that will be most widely associated with the payer's brand and/or the quality of the employer's benefits offerings. Isolated accounts of technical glitches, errors in tracking and awarding incentives, disjointed handoffs between internal and third-party systems, or "pointless" interactions with a health coach can be quickly escalated within an organization to purchasing decision makers. On the flip side, health and wellness systems provide a unique opportunity to project precisely the culture of health that is desired by the plan and/or employer to the entire membership. When assessing business impact, these factors must be considered — especially by payers that wish to differentiate the member experience — in addition to the impact of health and wellness on the bottom line.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Healthways; Limeade; RedBrick Health; Wellsource; WellSteps; Welltok

Recommended Reading: "Five Industry Trends Create Opportunity for a Revolution in Care Management Engagement"

"McKesson-RedBrick Partnership May Enhance Member Experience"

"Wellness Devices and Apps Spur Engagement, Financial Incentives and Controversy"

Home Health Monitoring

Analysis By: Barry Runyon; Angela McIntyre

Definition: Home health monitoring is the use of IT and telecommunications to monitor the health of patients at home. Patients are provided monitoring devices that capture physiological states, such as blood pressure, glucose level, pulse, blood oxygen level and weight, and then transmit or stage the data for clinical review. Other devices are used for communications and messaging — gathering information from patients on their symptoms, cognitive state and behavior, and sending them information and advice.

Position and Adoption Speed Justification: Home health monitoring involves sending data through wired or wireless connections to a hub or gateway device in the home, which, in turn, transmits the data to an external server or cloud where it is analyzed and alerts are sent to clinicians as needed.

To date, the majority of home health monitoring deployments have been pilot projects. However, there are a few examples of ongoing services:

- The U.S. Department of Veterans Affairs (VA) has deployed home health monitoring to more than 70,000 patients with high-cost conditions such as chronic heart failure, chronic obstructive pulmonary disease (COPD), diabetes, depression and posttraumatic stress disorder. The VA has reported significant reductions in hospital readmissions, favorable patient satisfaction scores and lower care costs.
- Currently, 17 states of the U.S. offer some form of Medicaid at-home telehealth.
- In Canada, the Canada Health Infoway program and the Ontario Telemedicine Network (OTN) are making significant investments in home health monitoring.
- In 2010, the European Commission also launched Renewing Health, which will evaluate nine regional home health monitoring deployments across Europe and will help them scale up to become national deployments.
- In England, a number of clinical commissioning groups are piloting home health monitoring in existing telecare programs, such as 3millionlives.

  Italy, Germany and Spain are already providing mainstream home health monitoring services to their populations.
- The Australian state of New South Wales has an initiative in place, Connecting Care in the Community, which aims to make home health monitoring available to 43,000 patients by 2015.

Barriers to adoption include legal and licensing restrictions, inconsistent reimbursement by healthcare payers, electronic health record (EHR) integration, and the need for new staffing and information-sharing approaches. For family caregivers, barriers include the perceived high cost and a belief that the care recipient will resist using the technology. Clinical and financial results from existing pilot programs need to be better understood by healthcare providers, along with regulatory implications.

There is strong interest among hospital-owned home health agencies and from communications service providers (CSPs). U.S. attention to home health monitoring has been boosted by initiatives under healthcare reform laws, including patient-centered medical homes and accountable care organizations.

Despite the media enthusiasm and the undeniable potential of home health monitoring, home health monitoring remains in the Trough of Disillusionment, with only slight forward momentum during the past year. However, recent studies indicate that the number of patients monitored in the home worldwide will increase significantly over the next three to five years.

User Advice: CIOs and chief marketing officers of healthcare delivery organizations (HDOs) and CSPs should:

- Identify ways to make home health monitoring economically viable for them to deliver and attractive for healthcare payers to fund. Therefore, it makes sense for HDOs and CSPs to promote their home health monitoring programs through their enterprise/consumer or patient/customer portals.
- Deploy home health monitoring as part of a program of chronic disease management and as a tool to help patients/consumers better manage their medical conditions. HDOs, research centers and trade associations must continue to demonstrate to healthcare payers the positive outcomes of home monitoring to encourage them to reimburse it more widely. Recognize that what will differentiate a home health monitoring deployment will be the software, the associated decision support, and the support network available to intervene in the case of alerts, consisting of employees who are trained in standard procedures for referral, assessment and patient/consumer education.
- Choose home health monitoring devices that are compatible with open standards for interoperability, such as the Continua Health Alliance standards, connectivity and data integration with EHRs. Device providers should have alliances with notable vendors of data tracking and analysis applications and with home health monitoring services. Devices will need regulatory approval, but they may be marketed to consumers, as well as being prescribed by clinicians.

Clinical home health monitoring is particularly well-suited for closed health systems, with tight links between the providers and payers of healthcare, and in situations where the healthcare provider assumes the financial risk for the costs of patient care. Clinicians should be encouraged to incorporate home health monitoring in cases where the adoption will improve care and reduce inconvenience to the patients. Consumer home health monitoring should be available to consumers who want to track their own health or the health of a loved one without necessarily being part of a health provider or payer network.

Business Impact: The potential impact of home health monitoring remains high. Recent healthcare market research indicates that the remote and wireless patient monitoring market will grow from $6 billion in 2011 to more than $18 billion in 2014, driven by the diversity of products available, the number of health conditions that require monitoring, and the growing demand for compact portable monitoring products. Home health agencies in the United States, which receive a fixed fee per patient from Medicare for up to two months after a hospital visit, have a financial interest in using technology to reduce the cost of delivering care.

If implemented correctly, home health monitoring can reduce:

- Hospital admissions, readmissions and bed days
- The environmental impact and cost due to patient and clinician travel
- Emergency room visits and inpatient admission delay

Home health monitoring appeals to patients, and a successfully implemented home health monitoring program could enhance the reputation of an HDO. Remote monitoring of homebound elderly patients by family or clinicians has the potential to improve health and the quality and timeliness of care and allow patients to live at home longer before being admitted to a long-term care facility.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Aerotel Medical Systems; Alcatel-Lucent; American TeleCare; AMD Global Telemedicine; Aurora Health Care; A&D Medical; Bosch Healthcare; Broomwell Healthwatch; Cardiocom; Docobo; Entra Health Systems; Honeywell HomMed; Ideal Life; Intel; Intel-GE Care Innovations; McKesson; Medgate; Medic4all; Nonin Medical; Numera; Omron; Philips Healthcare; Preventice; Samsung; SHL Telemedicine; TaiDoc; Telbios; TeleMedCare; Tunstall Healthcare; Viterion TeleHealthcare; Wipro

Recommended Reading: "Failure to Address Organizational Issues Will Derail Telemedicine Initiatives"

"A Framework for Understanding Telehealth, Telemedicine and Other Remote Healthcare Delivery Solutions"

"Survey Analysis: Telemedicine Initiatives Reflect Pragmatism in Adoption"

"2014 Strategic Road Map for the Real-Time Healthcare System"

"The Veterans Health Administration: Taking Home Telehealth Services to Scale Nationally"

Climbing the Slope

Patient Self-Service Kiosks

Analysis By: Barry Runyon

Definition: Patient self-service kiosks range from free-standing and desktop units to handheld devices, and address HDO operational requirements such as patient registration, check-in, wayfinding and account payments. Along with improved customer convenience and data quality, these kiosks offer new opportunities to engage the patient.

Position and Adoption Speed Justification: Providing a hard ROI for kiosks can be problematic. Although there is typically a cash-flow and revenue improvement associated with kiosks' ability to accept payments, it is rarely sufficient to provide a resounding purchase justification. The same is true for making an argument that self-service kiosks can lead to significant staffing reductions. This hasn't been the case. The barriers to adoption are largely financial. The units are expensive to purchase. Although the self-service kiosk can contribute to an improved customer/patient

experience, the combination of a difficult ROI, a challenging economy and competition from higher profile IT initiatives has resulted in no significant movement over the past few years.

Self-service has its own unique challenges. For new kiosk deployments, it is best to provide a staff to assist patients. The kiosk must be able to integrate with the HDO's particular business and clinical system portfolio, such as patient management, scheduling, billing and the electronic health record (EHR) system. It also should support common integration standards and protocols (such as HL7, Web services and APIs), or provide the necessary off-the-shelf connectors/adapters for these systems. In certain venues, kiosks will support strong authentication measures (such as card readers, biometrics and e-signatures), and should be PCI-compliant. Kiosks can also introduce a potential hub for infection.

Interest in patient self-service has been on the uptick lately due to new hospital facility design and construction activity and a desire by HDOs to deploy the IT to engage the patient, improve their care experience and make their participation more convenient (see "A Superior Patient Experience Is a Meaningful Measure of Care Quality"). It is also likely that patient self-service kiosks will increasingly give way to or be complemented by mobile kiosks employing Bluetooth low energy technology (e.g., iBeacon) for wayfinding and contextual marketing to the patient.

User Advice: HDO CIOs, IT and patient experience leadership should use self-service kiosks to enhance the patient experience, improve operational efficiency and improve data quality. Plan initial self-service functionality around the needs of patients. New registration functionality is often more complicated and time-consuming, and requires staff assistance. Use self-service kiosks as a supplement to staffing, rather than as a replacement of staff. Make self-service kiosk use voluntary, at least initially. Begin with check-in and payments. At first, kiosks will require hand-holding and should not be left completely unattended. Place kiosks in high-traffic areas where there are many repeat customers. Kiosk placement is of singular importance to ensure adoption. HDOs should incorporate the cost of application interfaces into their total cost of ownership analysis. Stand-alone units are most often found in inpatient settings for functions such as wayfinding and directory services. Wall-mounted and countertop units are used in ambulatory settings for check-in, consent forms and surveys. Handheld and tablet kiosks are found in ambulatory settings and in the admissions and emergency departments of HDOs.

Business Impact: Customer convenience should be the main consideration for deploying patient self-service kiosks. Reducing check-in times and associated frustrations will improve customer satisfaction and the patient experience. Self-service kiosks can be used to effectively automate and streamline certain registration, check-in, data collection and customer payment workflows. These self-service activities can improve the HDO's operational effectiveness, reduce head count in some cases and improve collections. Better data quality can contribute to better clinical outcomes, patient safety, compliance and revenue cycle management. Self-service kiosks can be used to capture updated patient information for near-real-time integration with other HDO clinical and business systems. Patients will increasingly view the degree to which an HDO offers self-service as a market differentiator. There is a real need to improve the patient experience and to become more operationally efficient and improve the quality of patient information.

Benefit Rating: Low

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: ACF Technologies; AutomationMed; Connected Technology Solutions (CTS); DynaTouch; Epic; Fujitsu; HealthAsyst; IBM; Intouch with Health; Kiosk Information Systems; Medhost; Medisolve; NCR; PatientPoint; PatientWorks; Savience; SeePoint (KioHealth); Vecna

Recommended Reading: "Three Good Reasons for Deploying Patient Self-Service Kiosks"

"Six Ways HDOs Can Improve the Patient Experience"

"A Superior Patient Experience Is a Meaningful Measure of Care Quality"

Interactive Patient Care Systems

Analysis By: Barry Runyon

Definition: Interactive patient care (IPC) systems use interactive TV with wireless peripherals (TV controls and pillow speakers); bedside multimedia devices (computers or displays on articulated arms or proprietary hardware); and tablet PCs to provide patients with convenient access to caregiver and personal communications, hospital services, entertainment, and educational content. Some IPC platforms offer clinical support, such as direct access to patient information and clinical systems like the electronic health record (EHR).

Position and Adoption Speed Justification: Patients want better services and an enhanced hospital experience. Hospitals are looking to improve outcomes and core care measures and to more actively engage patients in their own care. With IPC solutions, patients and their families can stay in touch in a variety of ways — via telephone, email, instant messaging or social media. Patients can communicate with their caregivers and learn about their specific conditions. IPC entertainment options make the hospital stay more tolerable for patients, family and visitors. Some healthcare delivery organizations (HDOs) are positioning IPC solutions as part of their "hospital of the future" or "smart room" strategies. Hospitals have traditionally supplied in-room telephone and TV services for their patients. More recently, they have been expanding their offerings to include on-demand video, Internet access, email, games, radio and educational content. IPC solutions commonly integrate with clinical, business and administrative systems, such as admission, discharge and transfer; EHRs; scheduling; food service; call center; billing; housekeeping; and nurse call. Most IPC systems integrate with IP telephony and unified communications platforms, as well as environmental control systems. Adoption has been dampened somewhat by a generally weak global economy; yet, interest in IPC has increased since last year, driven by global trends and incentives in the areas of patient engagement and patient-centric healthcare and new facility and bed tower construction activity. IPC vendors will benefit as patient experience metrics receive more weight in pay-for-performance programs in the U.S.

User Advice: IPC solutions represent an evolving market — particularly in the U.S. — with a limited number of mature installations. Before engaging with an IPC vendor, be sure it has sufficient experience integrating with your IT infrastructure and application portfolio. HDO IT leadership should downplay the revenue expectations from IPC solutions and focus on the softer but real ROI

associated with improved customer and patient satisfaction and retention, as well as better care outcomes and measures. Hospitals that decide to invest in IPC solutions should give weight to those that leverage their existing information communication and technology infrastructures, since this tends to reduce capital and support costs. It also enables faster implementation and integration, as well as a uniform approach to privacy and security.

Business Impact: IPC benefits accrue for both the hospital and the patient. Although there is a potential revenue stream for certain services — such as Internet access, on-demand entertainment and increased outpatient pharmacy activity — the real benefits surround improved patient satisfaction, outcomes and care measures, and operational efficiency. IPC solutions are evolving to enable improvements in the patient experience and engagement and are beginning to extend into other care venues, such as the home.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Aceso; Allen Technologies; CareView; Cerner; Epic; GetWellNetwork; Hospedia; Lincor Solutions; Parity; Siemens; Skylight; Sonifii Health Solutions; TeleHealth Services; TVR Communications

Recommended Reading: "Emphasize the Patient Experience With Interactive Patient Care"

"A Superior Patient Experience Is a Meaningful Measure of Care Quality"

"2014 Strategic Road Map for the Real-Time Healthcare System"

Online Consumer Health Education and Advice

Analysis By: Jeff Cribbs

Definition: Online consumer medical education and advice websites and applications provide services such as educational information about diseases, tools for self-diagnosis, previsit checklists and treatment options.

Position and Adoption Speed Justification: The instant accessibility of the Internet and the proliferation of Web-based medical content has, for some consumers, fundamentally changed their approach to interacting with the healthcare system. The paternalistic model of medicine was built in part on the disparity of access to medical knowledge between clinician and patient. Today, consumers can quickly access, potentially even from a smartphone while in the exam room, much of the evidence base, standards of care, diagnostic pathways and treatment alternatives that will be guiding the treating clinician's decisions.

A 2013 Pew survey found that 72% of Internet users looked online for health information of some kind — a number that includes basic healthcare navigation such as nearby facilities, a doctor

search, insurance options and office hours. In positioning online consumer medical education and advice, we track only those online inquiries that pertain to clinical information about diagnosis or treatment. For example, the same Pew survey showed that 35% attempted to make a diagnosis for themselves or someone else from online information. More enterprising users use online educational resources to weigh treatment options, generate lists of questions, assess economic costs, check public information on payers and providers, and inform themselves of their rights to coverage, privacy, and health information access. Increasingly, health-related Web content is provided within apps, queried by the context of the user's navigation of the app, rather than by free-text searches.

The accuracy of the online medical information has been a challenge to the value and legitimacy of online resources. According to the same Pew study, 65% of online searches originate in a search engine, while about a quarter of online searches begin on established health information websites, often provided by healthcare, government or nonprofit institutions with certified content review processes (for example, by the International Health on the Net Foundation). A 2014 study from the University of Florida found that the quality of the health information returned in a query was inversely related to the clinical nature of the terms queried — "cancer treatment" would yield predominantly evidence-based results, whereas "childhood vaccinations" might yield a mixture of validated resources and blogs, videos and popular commentary that are more likely to mislead, misinform, or otherwise encourage choices contrary to medical evidence (for example, refusing vaccinations) or rational navigation of the healthcare system (for example, refusing insurance coverage).

User Advice: Online consumer medical education and advice is a double-edged sword for the healthcare establishment. On the one hand, it can be a highly efficient means of delivering information to consumers, facilitating their participation and ownership of their health and wellness, which healthcare urgently needs. However, the lack of control over the quality of the information presented to the consumer and the lack of healthcare literacy can require time-consuming efforts to dispel misunderstanding, mutual mistrust, conflict, or at its worst, adverse outcomes for consumers.

Healthcare CIOs and technology leaders should recognize that many (possibly most) of their customers arrive, having already accessed third-party health information. They should identify the online information sources their consumers are accessing by such means as asking for employee anecdotes or conducting consumer surveys or structured assessments during consumer engagements. Consumer engagement initiatives should explicitly acknowledge other sources of health information available to the consumer.

Business Impact: The impact of online consumer medical education and advice is profound to a consumer — a central pillar of consumer activation and engagement and a marked departure from the pre-Internet healthcare environment. All healthcare organizations will have to accommodate this change in evaluating all of their consumer engagement efforts. Some have become producers or curators of online medical content in order to further their brand or to fulfill missions of consumer education.

Benefit Rating: Low

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Google; Healthline; MedlinePlus; UpToDate; WebMD

Patient Portals

Analysis By: Thomas J. Handler, M.D.

Definition: Patient portals enable a secure online patient-provider relationship and access to clinical and educational information as well personal health maintenance tools. They also include nonclinical functionality. Portals can be stand-alone or tethered (integrated) to electronic health record (EHR) systems or healthcare megasuite (e.g., clinical as well as financial, patient access) offerings.

Position and Adoption Speed Justification: The delivery of healthcare is moving from being predominantly face-to-face to more of a continuum with face-to-face encounters on one side and fully virtual encounters on the opposite side. Patient portals are one method for delivering virtual care and improving patient engagement. There are two forms of patients portals — tethered (integrated but not interfaced) to an EHR or megasuite product or stand-alone. The advantages of a stand-alone portal include functionality that may be absent from an EHR (although the incidence of this is shrinking) or the ability to provide a single portal that can be linked to several EHRs. The current state of interoperability limits the functionality of stand-alone portals because it is problematic at best to exchange clinical information across systems and because of workflow issues. Position on this Hype Cycle is based on U.S. adoption, which tends to be higher than in most other countries.

Ultimately, a patient portal should encompass clinical and nonclinical functionality. Most of the stand-alone portals are a combination of these sets of functionality. As tethered portals mature, they will no longer just be linked to EHRs, but will become tethered to megasuite vendors' offerings that include clinical, financial and administrative functionality. These portals can encourage greater patient involvement and better patient-provider communications. The best patient portals are designed to benefit the HDO as well as the patient and can build loyalty between the two. Patient portals should focus on:

- Making care more convenient by offering services such as online portal enrollment, appointment scheduling options, access to payer/plan eligibility and coverage information, prescription renewal/refill requests, preregistration functionality, referral requests and self-payments
- Improving the patient experience by offering patient-provider secure messaging, e-visits for nonacute healthcare issues and mobile support for those devices they commonly use
- Supporting health and wellness by providing timely access to lab and test results, medical decision aids, reviewed medical content, and communities of interest
- Providing support and tools for the patient's support network: family, close friends and unlicensed caregivers

In the U.S., the importance of a patient portal has been emphasized by being added to the meaningful use Stage 2 criteria. Ideally, a patient portal will include both clinical and nonclinical functionality, although, until recently, more attention had been paid to the somewhat easier-to-deliver nonclinical functionality. Positioning of this technology reflects the situation in the U.S. It's the country most advanced in using patient portals, and emphasizes the clinical functionality of the portals. In other countries, government health ministries are the main driving force behind patient portals. The primary form of patient portal outside the U.S. is a stand-alone regional or national system that provides patients with access to a summary of their medical data and recent interactions — that enables them to renew prescriptions, book appointments and have e-visits. Examples of countries and regions that have pioneered patient portals include Denmark, Estonia, Sweden, Andalusia (Spain), Lombardy (Italy), the U.K., New Zealand and Australia.

Today, many U.S. enterprise and ambulatory EHR system vendors provide or are building a clinical portal that can be used to provide patients with access to their test results. Some vendors provide additional functionality that can be used for more provider-patient interactions — for example, secure communication, prescription refill/renewal requests, e-visits, lab and diagnostic test results, medication lists, and patient education. Although patient portal technology is mature, adoption remains limited, with only a few leading HDOs effectively leveraging their vendors' patient portals to improve care and patient satisfaction.

Drivers for patient portals include rising healthcare consumer expectations of digital connectivity with their providers, efficiency benefits (especially for HDOs that are paid per patient), and, likely, reimbursements for e-visits, and, in some countries, political pressure on governments to make visible improvements to the patient experience. Although activists continue to raise concerns about privacy and security, this is not likely to significantly inhibit the use of portals. Barriers include lack of reimbursement for their use, difficulties in patient verification and, in some areas, lack of access to computer systems.

User Advice: Patient portals can be extensions of EHR systems or stand-alone systems. CIOs of HDOs that have multiple EHRs or whose EHRs do not have adequate portal functionality should consider using portal platforms to construct Web-based composite applications and then linking them to clinical applications (using service-oriented architecture [SOA] techniques — APIs and Web services — to reuse application and system logic and data). However, expectations need to be correctly set. Clinical information and functionality of stand-alone portals tend to be much less than tethered portals. Furthermore, even appropriately interfaced portals require clinicians to step outside of their regular workflows and use a "different" system, and clinical data may not be available for automated clinical decision support or care management functionality.

Portals that are tethered to an EHR have the advantage that the patient-clinician interactions are part of the normal EHR workflow, but they only have access to the clinical record contained within the system.

HDOs CIOs should be working with clinical leaders to develop a longer-term plan to extend interactive capabilities, including patient-provider communication and e-visits. Although vertical platforms or portal platforms can be useful, especially if the organization has multiple clinical applications, the functionality of a portal provided by the enterprise EHR system tends to fit clinician

workflow better and is, therefore, better used. The patient portal strategy should also be aligned with a self-service kiosk strategy.

Adoption will increase as healthcare payer CIOs work with their leadership to understand the capabilities of patient portals and to appropriately promote their use.

Business Impact: Patient portals provide patient access to test results and can increase patient satisfaction and improve brand loyalty. As more robust interactive functionality is built in that allows for direct patient clinician interactions, HDOs can expect improvements in clinician productivity. In addition, organizations can improve the quality of care delivered by using the clinical patient portal to improve communication between patients and providers.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Alere (Wellogic); Allscripts; Carefx; Cerner; Epic; InterSystems; Kryptiq; Medicity; Medseek; Orion Health; RelayHealth; Siemens

Recommended Reading: "Six Ways HDOs Can Improve the Patient Experience"

"Top Actions for Healthcare Delivery Organization CIOs: Use IT to Better Engage and Influence Patients"

"Selling and Securing the Patient Portal"

"Case Study: Henry Ford Health System's Enterprise Portal"

Healthcare Provider E-Visits

Analysis By: Thomas J. Handler, M.D.

Definition: An e-visit is a secure, nonurgent, Web-based consultation between a patient and a provider, where a pre-existing relationship exists. Consultations are well-defined and narrow in scope, such as medical questions, prescription requests, diagnoses and chronic disease management. An e-visit is an asynchronous and structured conversation and is often part of a patient portal.

Position and Adoption Speed Justification: Shortages of physicians, the difficulty of scheduling a visit, the growing acceptance of online services and the need to reduce costs have led to increased interest in e-visits by healthcare providers, payers and governments. This is further fueled by the desire of clinicians to grow their revenue, improve efficiencies and increase patient satisfaction, as well as the need to spend more time on complex, rather than simple, encounters. Moreover, patients and physicians are frustrated by endless rounds of "telephone tag" and are increasingly recognizing the value and convenience of the asynchronous nature of email or secure messaging.

Consumer surveys and the popularity of medical advice websites also demonstrate consumer interest in interacting electronically with clinicians.

Most electronic health record (EHR) vendors in the U.S. have added secure messaging capabilities to their clinical systems and patient portal offerings, permitting clinicians to take part in e-visits as part of their normal workflows.

The positioning of e-visits on the Hype Cycle reflects the situation in the U.S., where adoption is more prevalent than in most other markets. In general, the adoption of e-visits follows the adoption curve of patient portals integrated with EHR systems. It is anticipated that, by next year, e-visits in the U.S. market will reach the plateau. Other countries are further behind. In Europe, the Danish national health portal has offered an e-visit service for the past few years, although it does not appear to be heavily used. There is limited usage of e-visits in several other European countries. In the Asia/Pacific region, e-visits remain in their infancy. Adoption will increase worldwide once reimbursement for e-visits becomes more common, and healthcare payers and providers accept e-visits as a cost-effective substitute for certain types of face-to-face consultation.

User Advice: E-visits will likely become as ubiquitous as office visits and phone calls. HDO CIOs will need to work with clinical and administrative leaders to help ensure that their e-visit solutions are well-publicized and are run efficiently. Furthermore, it will be necessary to configure scheduling systems to set aside regular time slots for e-visits, rather than just squeeze them in between regular patients or after hours. If this is done right, patients will prefer to use the organization's e-visit solutions as opposed to competitors' offerings.

To increase patient satisfaction and decrease risks, HDO chief medical information officers (CMIOs) should help set expectations with patients, provide guidance on the use of e-visits, and create and enforce policies. These policies include ensuring that healthcare consumers understand what is appropriate for an e-visit and what turnaround time they can expect. To this end, HDOs should consider using response-time SLAs with clinicians. Clinicians must recognize that the messages will be considered a part of the legal medical record. Clinicians should also be correctly compensated for e-visits. At the very least, if the number of encounters is a performance metric, then clinicians should receive appropriate credit — likely, it will be some fraction of a traditional visit, because an e-visit should take less time and effort.

Healthcare payer CIOs should work with senior leaders to investigate how best to configure analytics to demonstrate that e-visits are used appropriately and that their use does, in fact, lead to improved quality at lower costs than traditional visit types do. Core claims systems may need to be adjusted for this new visit type. Care management needs to be integrated into the e-visit protocol to ensure both effectiveness and patient satisfaction.

Business Impact: A well-implemented e-visit program can reduce costs, increase patient satisfaction and engagement, improve care coordination, enhance brand loyalty, and improve clinician productivity.

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: athenahealth; Allscripts; Cerner; eClinicalWorks; Epic; Meditech; Siemens

Entering the Plateau

Medical Device Connectivity

Analysis By: Zafar Chaudry, M.D.

Definition: Medical device connectivity systems (MDCSs) are software application systems that connect medical instruments or monitors to the electronic health record (EHR) system. They transfer and translate data between proprietary instrument formats and the input requirements of specific EHR products and versions. They typically provide buffering during EHR downtime, can flag abnormal data ranges and provide the UI for a clinician to electronically review the data from the medical device or instrument.

Position and Adoption Speed Justification: MDCSs are a well-established technology that helps substantially with nursing efficiency and job satisfaction, and improves the timeliness and accuracy of charted information. They support high-acuity devices, such as infusion pumps and bedside monitors, as well as portable devices carried by clinicians for use in lower-acuity settings, such as for capturing vital signs or oxygen saturation in medicine/surgery units or clinics.

A substantial value that is added by MDCS vendors is extensive certification of specific instrument software releases with their systems. Interfaces are available for many classes of devices, including patient monitoring, infusion, respiratory care, anesthesia administration, critical care monitoring and lab analytics. These libraries continue to grow year over year.

Some vendors have already achieved substantial penetration of the global market through direct channels and remarketing by EHR vendors. Most major EHR vendors have current experience working with these products in various workflows. Device manufacturers are increasingly supportive, because they realize that EHR integration affects the time to market for new instruments.

In the U.S., many MDCSs are regulated by the U.S. Food and Drug Administration (FDA) as medical device data systems (MDDSs). Under this rubric, manufacturers do not require premarket approval, but must meet requirements for good manufacturing practices, including formally tracking problems and resolutions, collecting adverse events, and giving the FDA an annual report of adverse events. These regulations apply to healthcare development organizations that have built their own MDCS software.

FDA requirements are not specific for medical products that modify data, the display of the data or, by themselves, control the functions or parameters of any other medical device or are used in connection with active patient monitoring. A device that otherwise would be an MDDS is involved in active patient monitoring if the data it transfers is used for continuous monitoring of a patient or for

immediate clinical decision making. If an MDCS performs these additional functions, it is regulated more strictly, although the U.S. FDA approach is case by case.

We have positioned this technology toward the end of the Hype Cycle (reflecting the U.S. position), because the usage of these products is steady and uncontroversial (in the U.S.), as evidenced by a low level of inquiries in 2013. However, non U.S. healthcare delivery organizations (HDOs) are currently implementing integrated EHRs, so are early in the implementation and use of this technology.

User Advice: HDO CIOs should:

- Obtain business sponsorship from nursing and critical care medicine for an MDCS project.
- Develop a pilot program and work with clinicians to determine business value and success by measuring the time until device data is available in the EHR system and the use of nursing time.

U.S. HDOs should evaluate any self-developed interface software to determine whether it meets the definition of an MDDS. If so, they should adopt good manufacturing practices, institute adverse event reporting and file that data with the FDA. If they have self-developed software that exceeds the definition of an MDDS, they should seek the advice of counsel or consultants familiar with FDA procedures to decide whether to file a 510(k) premarket notification.

Business Impact: Medical device connectivity:

- Allows the clinician to spend more time on direct patient care, providing demonstrable savings in nursing full-time-equivalent requirements
- Improves the accuracy of charted vital signs and other respiratory and blood parameters
- Enables near-real-time access to this data and EHR-improved decision making and automated alerts
- Provides a faster time to market for new instruments and more-consistent instrument interactions with EHR systems
- Ensures more-productive use of nursing time, more-accurate charting and more-timely use of decision support by introducing medical device integration into nursing workflows

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Bridge-Tech Medical; careTrends; Capsule; Cardiopulmonary; Cerner; Data Innovations; Epic; GE Healthcare; iSirona; Nuvon; Sensitron; Siemens Healthcare

Recommended Reading: "Medical Device Manufacturers Need to Focus on Security"

Appendixes

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.
Trough of Disillusionment	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (July 2014)

Table 2. Benefit Ratings

Benefit Rating	Definition
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2014)

Table 3. Maturity Levels

Maturity Level	Status	Products/Vendors
Embryonic	▪ In labs	▪ None
Emerging	▪ Commercialization by vendors ▪ Pilots and deployments by industry leaders	▪ First generation ▪ High price ▪ Much customization
Adolescent	▪ Maturing technology capabilities and process understanding ▪ Uptake beyond early adopters	▪ Second generation ▪ Less customization
Early mainstream	▪ Proven technology ▪ Vendors, technology and adoption rapidly evolving	▪ Third generation ▪ More out of box ▪ Methodologies
Mature mainstream	▪ Robust technology ▪ Not much evolution in vendors or technology	▪ Several dominant vendors
Legacy	▪ Not appropriate for new developments ▪ Cost of migration constrains replacement	▪ Maintenance revenue focus
Obsolete	▪ Rarely used	▪ Used/resale market only

Source: Gartner (July 2014)

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Hype Cycle for Telemedicine, 2014"

"Hype Cycle for Healthcare Provider Applications, Analytics and Systems, 2014"

"Hype Cycle for Healthcare Payers, 2014"

"Predicts 2013: For Healthcare Delivery Organization IT Leaders, Great Potential Will Produce Greater Responsibility"

"Predicts 2013: U.S. Healthcare Payers Face Challenges From Regulatory Reform and Market Disruption"

"Business Drivers of Technology Decisions for Healthcare Payers, 2014"

"Business Drivers of Technology Decisions for Healthcare Providers"

"Hype Cycle for Internet of Things, 2014"

"Technology Overview: Quantified Self"

More on This Topic

This is part of an in-depth collection of research. See the collection:

- Gartner's Hype Cycle Special Report for 2014

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