OLIVER WYMAN

Health & Life Sciences

IT FOR ACOs

A GUIDE TO THE TECHNOLOGY HEALTHCARE PROVIDERS NEED TO SUCCEED IN THE WORLD OF VALUE-BASED CARE

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INTRODUCTION

The reform process set in motion by the Affordable Care Act is moving US healthcare toward a new model marked by (1) enhanced care coordination within and across care settings, (2) increased patient engagement, (3) an emphasis on health and preventive care, and (4) payment mechanisms based on the value of services delivered rather than their volume. The change proposed is nothing short of revolutionary, and as healthcare organizations embark on their transformations, they invariably discover how deeply their organizational, business, and care models have been shaped by the traditional fee-for-service reimbursement model.

The same could be said of their information technology. As healthcare providers experiment with new ways to deliver care, they find that their IT systems cannot keep up: They can't support coordinated care, they do a poor job of maintaining relationships with patients, they don't even supply the basic data needed to manage a contract based on value.

What does a value-based healthcare organization need from its IT? In the following pages we will lay that out in detail. We will focus on accountable care organizations (ACOs), not because they are the only form value-based care can take, but because they offer a good example of the full range of IT issues faced and they are a significant part of the current landscape. It is true that ACOs are not yet well defined and vary considerably, but in practice their business principles are very similar, and so are their IT needs.

In our experience, many of today's ACOs do not understand those needs nearly well enough. We still talk to organizations that believe they just need access to payer claims data, or that they will develop care coordination capabilities automatically as a side benefit of developing an electronic health record system to meet meaningful use (MU) standards and ICD-10. If nothing else, we hope we can lead them to a more accurate view of the challenges/prioritizations they face.

A word about the way material is presented here: Healthcare reform is a process that will extend well into the future, and IT will play a significant role at every stage. We find that it is useful to think of this future evolution as three overlapping waves:

WAVE ONE sees the growth of patient-centered care. Providers shift to business models based on value, and there is an emphasis on coordinated care and new care models for some categories of patients.

WAVE TWO focuses on engaging patients in their own health. Digitally enabled and anytime, anyplace care become consumer expectations, and providers work to truly understand consumer needs and preferences.

WAVE THREE brings healthcare into the realm of predictive and preventive management of diseases and personalized medicine.

For reasons that will become clear, we will describe ACOs needs wave at a time. Clearly technology will continue to evolve as the waves roll through the industry, so we will conclude with a review of the match between the automation needs we describe versus the current maturity level of the appropriate technologies and the issues known to affect their deployment.

TODAY
FEE-FOR-SERVICE
2014

My doctor controls my referrals, and I don't know who provides the best care

I only seek care when I have no other alternative

I feel rushed during doctor visits

Closed

Doctor's hours don't match real life hours

I have no idea how my insurance works – it's so confusing

I am the only person coordinating my care – doctors don't talk to each other and don't think about me once I leave their office

I avoid my healthcare because it's too confusing and inconvenient

"I feel lost and overwhelmed"

WAVE ONE
PATIENT-CENTERED CARE
2010-2016

I work with my care team to improve my health and live better – we have a shared plan that is personalized to me

"My care team truly cares about my holistic health – I am not alone"

The system is working for me

I believe that my healthiest days are ahead of me

I monitor my health with tools to identify issues early

My substance abuse and depression are managed

My care team proactively motivates me to stick to my care plan

My care team takes care of all my health needs

WAVE TWO
CONSUMER ENGAGEMENT
2014-2020

I use crowdsourced reviews of goods and service providers (like Yelp) to decide where I can get the best value

I know how to live well and be healthy – I have great resources (apps) at my disposal to inform me

Competing against friends in online health challenges motivates me to live healthier – I earn great rewards that I value

"I feel engaged in my health and am empowered to make informed decisions"

I can surf and navigate the health system with ease and the patient-centered care models are so convenient and easy to work with

I know what I need and how to buy it – shopping and health tools have made it easy and boosted my confidence

Consumer-driven competition is great – all the population health managers have extended office hours and most offer virtual web visits

I have web-based/mobile tools so I can manage my healthcare

I connect through social media to other patients with common experiences

WAVE THREE
SCIENCE OF PREVENTION
2018-2025

My life advocate helps me manage my life and makes the world of health options personal and simple

I carry my personalized life plan with me in my mobile phone – it helps me make life decisions to mitigate future health risks

I feel positive about how I will live my life and how my actions contribute to longevity

Microsensors constantly monitor my health and detect early stages of disease – feels comforting

I regularly read about new cures to diseases in the news

I take medication for diseases years before they show up as symptoms

Genomic diagnostic tests at the pharmacy tell me if I'm sick – the tests are automated and 100% accurate

"I understand my health and wellness profile and what I need to do to live long and well"

WAVE ONE

PATIENT-CENTERED CARE

Wave One's main goal is to put patients at the center of care. Most healthcare providers would say they already do, but that claim is belied by the briefest glance at the fragmented workflows of the current system and the difficulties providers have in handing off data between shifts, departments, and other entities within the organization—to say nothing of between organizations. Contemporary healthcare IT, like all of contemporary healthcare, is organized around physician-centric silos.

True patient-centered care requires a different approach. An ACO must have the IT capabilities that let it meet a set of basic principles:

CARE COORDINATION Where the current system focuses on individual care events, an ACO needs to think in terms of episodes of care—managed by a team of multi-skilled professionals, often working at multiple locations or for multiple organizations.

DISEASE MANAGEMENT In the long run, the greatest improvements in costs and patient wellbeing will come from preventing risk factors from becoming chronic diseases and preventing chronic diseases from progressing. That means it is essential to identify high-risk patients and enroll them in appropriate programs.

MANAGING COST AND QUALITY A core idea behind ACOs is that higher-quality care can lead to lower costs. To make that principle a reality, ACOs need to track and analyze physician performance, quality measures, costs, and the health needs of the populations they serve—and do it across multiple care settings.

FEE FOR VALUE ACOs need to be able to manage multiyear payer contracts that involve relatively complex performance metrics, and that will evolve over the years.

Given those basic requirements, let's look at the five basic elements of an ACO IT system for Wave One.

ELECTRONIC HEALTH RECORD

An ACO needs to share standardized care practices and patient data among its participants. That means that it needs interoperable EHRs broadly deployed across care settings. This has already been accomplished in most hospitals and physician practices, as a result of the meaningful use program. But four common issues remain:

FRAGMENTATION ACOs need to rationalize their EHR portfolio to a few products—and a few versions/releases if they are to achieve a level of interoperability that supports effective care transitions and care coordination across multiple settings. At most ACOs, rationalization is still an elusive goal.

LAGGING DEPLOYMENT IN SUB-ACUTE CARE SETTINGS Meaningful use has had little impact on nursing homes, home health, skilled nursing facilities, behavioral health facilities, and the like. But under the logic of Wave One, these sub-acute settings need to play an increasingly important role. Deployment of interoperable EHRs across the care spectrum is a high business and technology priority.

MISALIGNED DESIGN Today's EHR systems were created to support a care delivery model driven by perverse business incentives, so it should be no surprise that design is "optimally perverse" and minimally adapted to new care delivery models. For instance, they typically lack the appropriate patient types (such as patients in extensivist or intensive outpatient care programs); user roles (such as patient navigator); workflows (such as alerting the PCP or patient navigator when an extensivist patient is admitted to the hospital); or clinical content (such as care plans that include social and behavioral activities). In many cases a significant redesign is required—or, more accurately, a parallel redesign to support both old and new care delivery models during what could be a long transitional period.

LIMITED TEAM ORIENTATION Wave One's patient-centered logic requires a care team approach in which multiple clinicians (both physicians and non-physicians) contribute to a patient record (problem list, medication list, care plan, etc.) that is not only shareable, but "combinable" among the whole team. This represents a fundamental design departure from existing products: Team-oriented EHRs are still very much a technology of the future. In the interim, some EHR vendors have created a hybrid model in which a provider-centric base tier is complemented by a combinable "team-enabled" tier. This model should be strongly favored.

EHRs are a core technology requirement of ACOs. The issues with them should be alleviated by accelerating their deployment across the entire ACO, including sub-acute settings; launching dedicated redesign initiatives to accommodate new care delivery models and care coordination needs; and deploying the combinable/team-oriented layer of these EHRs whenever available.

HEALTH INFORMATION EXCHANGE

ACOs often span multiple care settings using many different EHRs. An HIE's interoperability services (patient identifier service, patient consent service, directories, security and audit trail services, semantic interoperability services, etc.) are core capabilities to allow the secured exchange of patient data among ACO participants. The ACO business construct eliminates the issues of governance and financial sustainability that plagued community and state HIEs. But setting up a private HIE remains a complex endeavor for several reasons:

LACK OF DEEP INTEGRATION The goal of an HIE is to support interoperability, meaning that data from a sending EHR is usable by the receiving EHR's clinical decision support system. Most HIEs fall short. Standards for the meaning of data (as opposed to their format) are inadequate, and most HIEs have limited semantic interoperability services. As a result, data exchanges often do little more than share "free text," which does not contribute significantly to better patient safety and care quality. Deep interoperability, though achievable, is usually an expensive proposition (another argument for limiting the number of EHRs an ACO supports.) A good practice is to define an "interoperability protocol" among ACO participants that outlines respective responsibilities (in terms of the use of standards, data governance, security, the interoperability levels that will be supported, etc.).

PHYSICIAN ADOPTION Physicians, who already demonstrate a poor track record at using their own EHRs meaningfully, are unlikely to pull data from an HIE portal. To foster physician adoption, clinical data from the HIE must be pushed directly into the EHRs physicians use each day. Again, one-time and ongoing costs can become quickly prohibitive if the ACO supports too many different EHRs.

CONFIDENTIALITY Most HIEs are still struggling to balance the competing goals of maintaining patient confidentiality and sharing patient data broadly to improve care. An ACO's HIE needs strong privacy policies and security capabilities to assure patients that their data will not be used beyond their consent. (On the most basic level, an ACO cannot function if patients are allowed to opt out of the ACO's HIE.) Privacy/security is a complex, still typically underdeveloped component of HIE implementations.

MESSAGING SERVICES Though few HIEs currently include robust messaging capabilities, it is clear that they are vitally important in supporting new care delivery models in a multi-EHR environment—almost as important as interoperability. Messaging should be given a high priority when selecting/implementing an HIE.

IMPLEMENTATION Technically, the HIE is a vast interface project. But each individual interface is of little business interest to any single EHR vendor, and most HIE vendors are small, with limited resources and implementation methodologies. It is good practice to anticipate that the HIE implementation will require an inordinate amount of project management and dedicated interface development resources.

An HIE is a core ACO technology requirement, unless the ACO uses the same universal EHR across all of its components. Because of the factors listed above, HIE implementations are difficult and costly—contrary to the expectations of most ACOs.

CARE COORDINATION CAPABILITY

The HIE is a needed connector, but it is just a "pipe." An ACO needs to achieve tight care coordination. There are two basic ways to make that happen:

OPTION ONE: UNIVERSAL EHR

There are multiple advantages to deploying a single EHR across an entire ACO. Patient data can be shared across all participants using the same content/meaning and a unique patient identifier. Automated workflows can cross over multiple care settings to help manage care transitions seamlessly, and an integrated database facilitates population management queries. Fully integrated clinical and financial applications can better support reimbursement models that incorporate quality measures and clinical outcomes. Fully integrated transactional and analytical applications allow point of care alerts and reminders for clinicians to meet quality metrics.

But the approach also presents a number of issues.

A significant one is cost: It is expensive and disruptive to implement a single EHR solution across an entire ACO—plus any entity that joins the ACO in the future. Many providers have justified the investment as a way to address ACO needs, comply with Meaningful Use and ICD-10, and rationalize their existing clinical system patchworks. But at an average cost of $200,000 to $300,000 per bed, it will become increasingly difficult to build a business case for a universal EHR solely on the basis of addressing ACO needs.

In addition, the universal EHR approach assumes that processes and data are completely integrated throughout the ACO. In practice, that sort of deep, irreversible commitment may be difficult for some ACO participants to accept. Furthermore, the very unifying concept of the universal EHR may be somewhat illusory in the sense that ACO constructs are flexible, with changing business partners. If ACOs are most likely to continue functioning in heterogeneous system environments, then the argument for a universal EHR starts to fall apart.

OPTION TWO: SPECIALIZED CARE COORDINATION SYSTEM

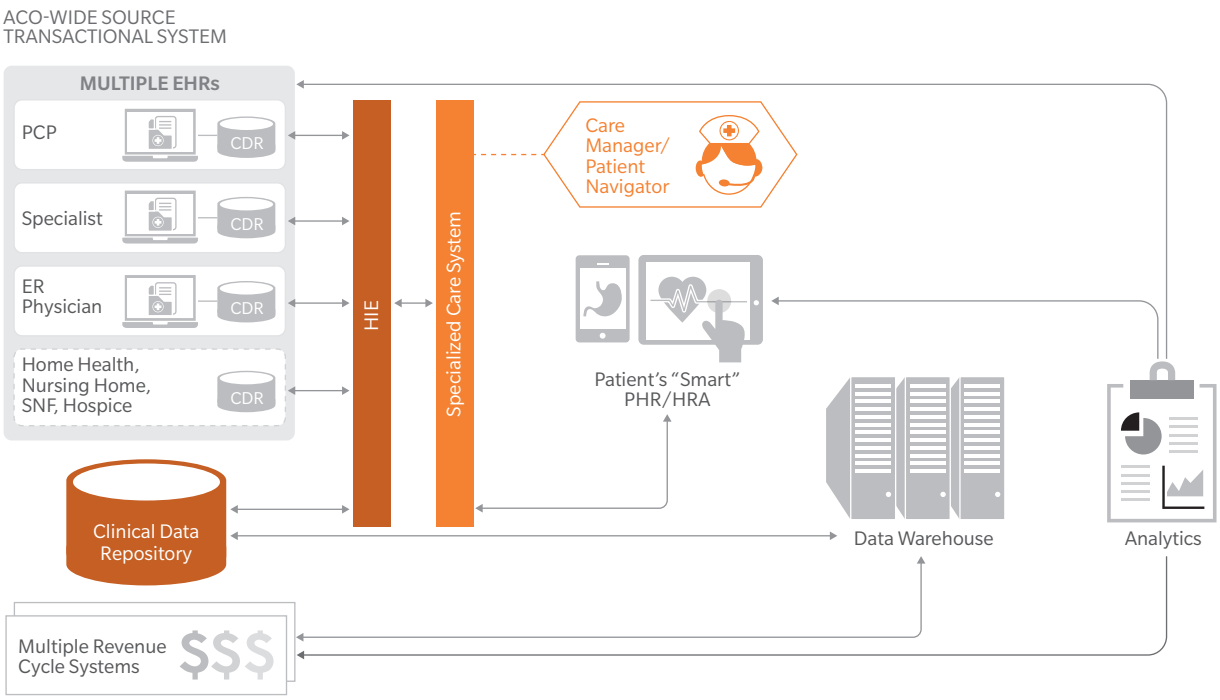
An alternative to the universal EHR is a specialized care coordination system (CCS) that sits alongside the ACO participants' existing EHRs. A CCS can be deployed across the ACO at significantly reduced levels of cost, effort, and commitment, because it keeps existing EHRs while allowing integrated care protocols for the populations managed by the ACO.

The CCS typically includes: an HIE; patient engagement tools; a care and utilization management application; and analytics to assess the efficiency of the ACO's wellness and care programs, monitor physicians' performance, and report on a variety of quality measures (Exhibit 1).

An important technical component (and differentiator among CCS solutions) is the workflow engine embedded in the care management application to create cross-EHR workflows whereby the CCS can insert an activity into a receiving EHR's internal workflows. A number of new CCS solutions achieve this functionality through new-generation workflow engines.

The CCS approach offers multiple advantages. An obvious one centers on lower cost and business disruption. The CCS approach does not assume that all ACO participants will eventually have to use the same EHR—a perspective that has a deep impact on how one thinks about technology infrastructure. But CCS solutions are not necessarily a retreat from integration: They represent a generation of systems

EXHIBIT 1: SPECIALIZED CARE COORDINATION SYSTEM



more directly attuned than traditional EHRs to the automation requirements of patient-centered care.

The specialized CCS approach also presents a number of issues:

INTEROPERABILITY A significant functional limitation is the lack of deep interoperability between the horizontal CCS application and the various EHRs. This is not a design given: The HIE and electronic workflow features of most CCSs could be used to enable deep interoperability. But it would be costly and therefore go against the main reason for selecting CCS in the first place. It is likely that, in a given ACO, the CCS will be installed with multi tiers of interoperability: from deep integration so that physicians will find all required CCS features embedded into their EHR for the most popularly deployed EHRs (or the most strategic care settings), to loose integration with other EHRs. In these more loosely integrated settings, the CCS will be used mostly by patient navigators and care managers; physicians will rely primarily on their EHRs.

MATURITY Specialized CCS solutions are relatively new, and many have been assembled by acquisition to create composite "ACO-in-a-box" solutions. The degree of actual integration among these components varies widely by vendor, as does the degree of maturity of each CCS component. These are new applications designed to serve new business models, and their capabilities call for careful evaluation. The robustness of messaging services and cross-platform electronic workflows; the richness of the interoperability toolkit to connect to various EHRs; the comprehensiveness of the patient engagement tools; the sophistication of the predictive modeling algorithms—all of these are key differentiators among CCSs.

If the ACO has already chosen a universal EHR approach, then option one is the de facto solution. If that option is or becomes unrealistic financially, politically, or in terms of time, then the CCS option is a realistic alternative. Regardless of the option selected, care coordination across multiple care settings is a core ACO technology requirement.

FEE-FOR-VALUE REVENUE SYSTEMS

One of the very reasons for healthcare reform is to transition from fee-for-service (FFS) to fee-for-value (FFV), and ACOs are experimenting with multiple forms of these FFV payment models such as care coordination payments, pay-for-performance, bundled payments, shared savings, and global payments, etc.

Existing provider revenue cycle (RC) systems can accommodate payments models where they essentially function as a modified FFS system incorporating bonuses or penalties depending on whether selected quality measures are met. However, the more at-risk the ACO's payment models become—which is where Healthcare 2.0 is going—the less relevant existing RC systems are.

The gap between the healthcare industry's rapid transformation and the deployment of the technologies needed to support this transformation is quite palpable throughout the revenue cycle. It seems that the industry is moving quickly to payments mechanisms it is quite incapable of managing automatically on a large scale. There is no quick fix. A system strategy is to supplement the RC systems with a contract management engine. A few exist, mostly repurposed "payer" systems that were designed to manage premiums, integrate multiple providers' payment requests, monitor resource utilization and quality measures, allocate reimbursement among multiple providers, etc. They do not match exactly ACOs' contract management needs, and their integration to the patient-centered care systems is often sub-optimal, but they do represent a partial solution. An increasing number of ACOs/providers are not only looking at these systems but also acquiring small health plans outright for that purpose.

A second system requirement often overlooked is the deployment of a document management system to manage stubborn paper documentation needs across the ACO.

COMPREHENSIVE ANALYTICS

The ACO needs analytical capability to report on a variety of quality measures, assess the efficiency of its care programs over the population it services, and monitor physicians' performance. A common architecture (Exhibit 2) is to use the HIE's transactional clinical data repository (CDR) as a data source to feed in a real or near real time basis an ACO-wide data warehouse on top of which the analytics reside.

In Wave One, the focus is on five primary categories of analytics:

COST ACCOUNTING These analytics help the ACO understand its cost structure and launch initiatives to improve its cost effectiveness. This is the most traditional form of analytics, and one an ACO must master—especially because the shift to value-based healthcare is expected to be accompanied by a sharp reduction in reimbursement. Cost accounting is not simple within a single organization; it is exponentially more complex in an ACO. But it is a critical capability that emerging ACOs cannot side step.

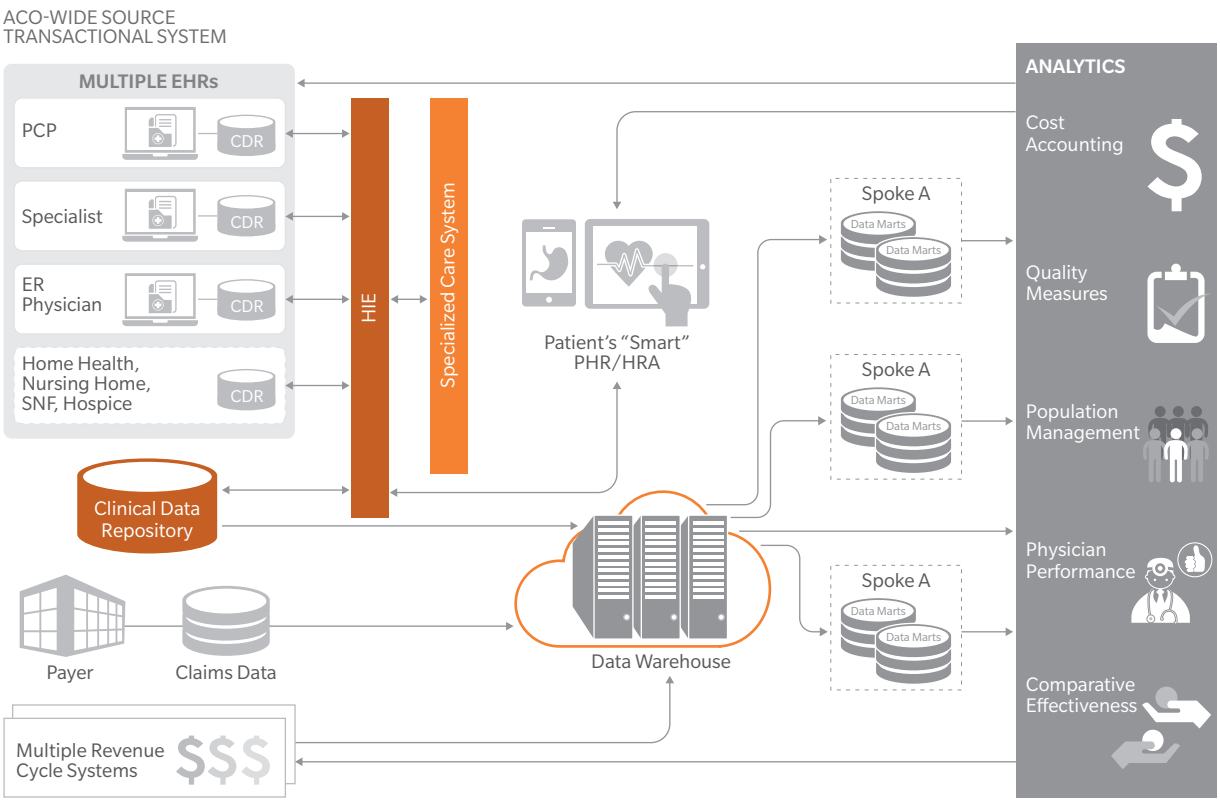
QUALITY MEASURE ANALYTICS These analytics report on a variety of internal and external quality measures to:

- Address PQRS, HRSA, HEDIS, and NCQA goals. Quality outcomes are the cornerstone of many health reform initiatives and quality metrics are often used to determine the amount of incentive payments that the ACO will receive.
- Show the distribution of quality and performance indicators across gender, age, and over time.
- Benchmark the ACO's performance against other ACOs and healthcare organizations.

External reporting should be centralized (at least virtually) to avoid internal analytic silos aligned with specific external agencies or programs. And regardless of external reporting needs, analytics should be treated as an important internal asset for continuously identifying, prioritizing, and monitoring improvement opportunities.
This is a core ACO technology requirement.

POPULATION MANAGEMENT ANALYTICS At a macro (or population) level, Wave One population management analytics identify and manage at-risk populations and monitor the efficiency of the ACO's care programs. Analytics of this sort make it possible to create dashboards and reports let the ACO closely monitor health trends in the populations it serves. At a micro (patient) level, population management analytics identify specific at-risk patients and register them in appropriate care protocols (via the CCS described earlier); they provide PCPs and care managers with patient-level information for outreach and communication.
This is a core ACO technology requirement.

EXHIBIT 2: WAVE ONE'S ACO ANALYTICS



PHYSICIAN PERFORMANCE ANALYTICS are designed to normalize (severity and case mix adjusted profiling), evaluate and report the performance of individual providers (PCPs and specialists) compared to established measures and goals. They typically include summary dashboards and scorecards benchmarking individual physician performance to a panel. These analytics offer the ability to:

- Drill down to individual/detailed performance components allowing easy access to details that facilitate deep understanding of practice patterns, cost efficiency drivers, and opportunities for improvement.
- Provide the ACO with detailed insight at the procedure, episode, and population level, allowing goals and reimbursement to be assigned to individual physicians, while giving physicians on-demand access to data to manage their own performance.
- Identify underperforming physicians and recognize exceptional performers. Implement best practice alerts and reminders.
- Create outreach programs for physicians focusing on improving efficiencies, medication safety, or care variance based on national guidelines and any custom measure the ACO wants to include.
- Improve provider performance by providing timely scorecards and information on non-compliance.
- Improve overall performance of physician networks. Improve utilization and quality metrics.

This is a core ACO technology requirement.

COMPARATIVE EFFECTIVENESS These analytics evaluate the relative benefits, risks, and costs of various treatment options for a given medical condition and a specific set of patients. They provide understanding of cost/performance relationships and offer the ability to create and manage a performance-based delivery and reimbursement program for medical episodes, including modeling, incentive determinations, and payments. As in some other areas, the financial dimension is typically provided by claims data, because ACO participants are reluctant to open their accounting systems to the data warehouse. This is an advanced ACO capability.

The ultimate goal of all these Wave One analytics is to change behaviors. ACOs need to move quickly to the point where analytics and decision support systems are nearly indistinguishable. Analytics need to trigger real-time alerts, reminders, and suggestions delivered directly to the care team through the electronic clinical workflow. For example, a clinician may be prompted by the system to provide smoking cessation advice (a routinely monitored quality measure) before the ambulatory encounter can be closed. Or the system can automatically alert a nurse that quality measures are not being adhered to for specific patients. The system may further submit appropriate corrective actions (such as ordering a test).

This level of integration assumes a significant transformation of the analytics function itself, from a retroactive, back-office function (with silos of expertise that grew organically around the reporting capability of the various transaction systems in place) to an interactive, dynamic, (virtually) integrated function across the entire ACO.

There are challenges to moving forward. Data quality and consistency are difficult to control even within a single organization. In a decentralized ACO, maintaining quality becomes exponentially more complex. So does data governance. There is a growing realization that ACO analytics require identifiable patient data, and are more difficult to deploy over HIEs following federated data models, i.e., with no centralized data warehouse. While centralized data warehouses require special attention in terms of privacy, security, and patient consent, they seem a necessary architectural construct. A federated model is fine in terms of adoption; it is limiting if the HIE is not considered an end in itself (sharing of data), but a means to enable many other parts of the ACO technology platform, including analytics

Analytics are a core capability. Many vendors offer ACO analytics solutions. But though the market is consolidating (and integrating with the HIE market, as front-end HIE vendors consolidate with back-end analytical vendors to offer an "integrated ACO solution"), it is still immature.

WAVE TWO

CONSUMER ENGAGEMENT

In Wave Two the ACO transforms today's disconnected, unengaged, and entitled patient into an economically and behaviorally aware and accountable consumer. Consumer engagement has two different but related goals: health engagement ("What do I need to do to be well and stay well?") and economic engagement ("What is the cost to me, where can I get the best value?").

The transformation of the IT function that accompanies Wave Two should not be underestimated. Today, physicians are healthcare IT's main customers. Wave One puts the patient at the center of the workflows but doesn't shift the fundamental orientation of IT. In Wave Two patients become major customers in their own right. In addition, an increasing number of patient activities will be performed online and remotely (consultations, scheduling, monitoring, payments, etc.), and a function within the ACO has to assume responsibility for ensuring that patients' virtual experience is similar to the physical one. This is a range of concerns no healthcare IT department has much experience with; it requires a new set of skill sets, tools, and methodologies.

As in Wave One, these goals are reflected in key business principles:

HOLISTIC UNDERSTANDING of the patients' goals, preferences, and behavioral data. Understand patients' risk factors, health status, health budget, and tolerance. Active engagement and monitoring of chronic disease patients. Amazon-like "They know me" user experience.

CONVENIENT ANYTIME/ANYWHERE availability of coaching and wellness care. Personalized offers. Help in scheduling and obtaining care in the appropriate physical or virtual setting. Context-specific reminders and alerts.

EMPHASIS ON PATIENT ENGAGEMENT and accountability. Incentives to follow healthy lifestyle and reduce risk factors. Direct consumer engagement utilized for health optimization across the spectrum of chronic and well patients.

PERSONALIZED HEALTH INFORMATION channeled to patients. Help patients understand how their actions impact their costs and rewards. Help them connect to "like patients." Price/performance transparency dashboards to inform consumer choices when selecting benefit plan coverage and shopping providers for value.

If Wave One's technology capabilities are reasonably well known, Wave Two's cover a far broader range of technologies and maturity levels and are more difficult to assess. Wave Two technology capabilities include three primary groups: (1) health engagement systems, (2) consumer analytics, and (3) private exchanges.

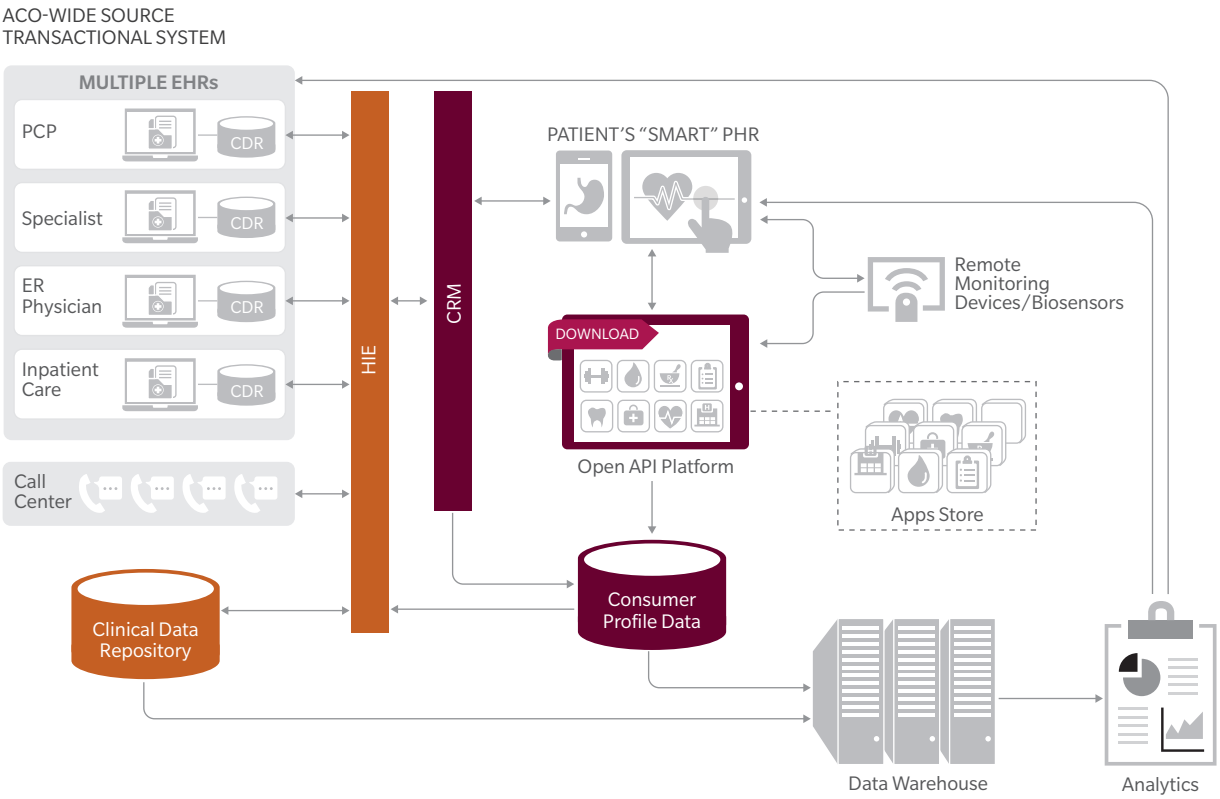
HEALTH ENGAGEMENT SYSTEMS

Health engagement systems themselves include three very different groups of technologies (Exhibit 3):

"SMART" PERSONAL HEALTH RECORD (PHR) SYSTEMS These systems, which are starting to be commonly deployed, are fed with patient data collected from all parts of the ACO, including patient-sourced data. They are "smart" because they work with ACO analytics to provide patients with context-specific alerts, reminders, and medical content. When combined with a customer relationship management system (see below), a smart PHR can contribute to a personalized "Amazon-like" patient experience in support of a comprehensive health engagement function. This is a core ACO technology requirement.

CUSTOMER RELATIONSHIP MANAGEMENT (CRM) SYSTEMS CRMs are used to provide PCPs, patient navigators, and health coaches/care managers with a consolidated view of individual patients' interactions with every part of the ACO. Toward that end, they are often combined with the capabilities of a call center and enterprise scheduling system. One example of a CRM use case: The PHR includes an electronic health risk assessment (HRA) that creates a data profile in the CRM. The CRM then uses its rules

EXHIBIT 3: HEALTH ENGAGEMENT SYSTEMS



engine and the patient profile to select a tailored set of events, articles, and recommendations of interest to the patient and sends them via a tailored channel (text message, e-mail to the PHR, etc.). Only a few vendors are offer robust healthcare solutions. This is a core ACO technology requirement.

DIGITAL HEALTH APPS The provider world has largely ignored the tens of thousands of digital health apps that patients eagerly use on their mobile phones, tablets, or wearable devices to help them adopt healthful habits, seek medical advice, or understand treatment options. As the digital channel becomes nearly ubiquitous, every ACO's strategy should include significant digital elements. Health apps are perfectly geared toward patient engagement: Some work to increase patient compliance with discharge instructions, follow up appointments, etc. Others interact with pedometers, scales, and other biosensors to send real-time data (on anything from activity status to blood sugar) to providers' EHRs and patients' PHRs.

A digital app store is an easy first step—one that lets the organization take on the roles of "personal" advisor, support group, health concierge, personal trainer, shopping advisor, and social service coordinator rolled into one. Such a project makes use of an open application programming interface (API) platform, a technology that was perfected years ago by companies like Amazon and eBay and can be leased quickly, safely, and cheaply from a variety of vendors. The ACO can choose how deeply to integrate apps with its databases and workflows, though generally deeper integration will generate to deeper engagement. Integration point examples include: patient's access from the PHR to the provider's app store; patient's access to a consolidated health dashboard right back into the patient's PHR; PCP or health manager access to the dashboard from the EHR application to help monitor the patient's health progress; importing app-generated data into the provider's EHR; integration of app-generated data (including analysis of social media) into population management analytics as well as customer analytics to provide insights into behavioral trends and patterns, the efficiency of given treatments, or what processes should be changed or created to optimize new insights.

The potential value of integrated digital apps is truly transformational. They allow the ACO to understand and drive behavioral changes and interact with physicians and patients at a profoundly different level. The ACO, unlike a traditional FFS healthcare organization, has a strong economic incentive to deploy them. This is a core ACO technology requirement.

CONSUMER-ORIENTED HEALTHCARE DECISION SUPPORT SYSTEMS AND PRIVATE EXCHANGES

A central theme of the emerging healthcare market is transparency: Individual consumers and small and large businesses will shop for healthcare value, armed with an unprecedented amount of information about the costs, quality, and outcomes of care. Many technologies will support this process. Preference engines and decision support systems will support patients' choices, providing real-time information on specific procedures, coverage, or the availability of a clinical trial. Private exchanges will offer an array of choices and will help shoppers access information on the ACO's coverage, provider options, and relative quality measures. Technologies like these are not technically complex to set up (for instance, multiple commercial platforms are available to support a private exchange as a service), but they require a holistic strategy. As retailers have discovered it before them, in a digital age:

- It is possible to lose clients before a contact is ever made. Instant and mobile price discovery and price and feature comparison enable consumers to comparison shop and find lower-priced, better-performing competitors. ACOs have to develop a holistic consumer experience across patient portals, digital apps, and public and private exchanges with the goal of creating an optimal shopping experience.
- In an information-driven market, the delivery of information is part of what customers judge by. A poorly designed Web site or an inconvenient interface that makes it hard to complete transactions online can be just as damaging as poor reviews.
- Competition is no longer just price, selection, and service. ACOs are competing in new information channels including third party reviews, search engines, and social media: winners in this area will be those ACOs that create consumer-centric digital app platforms that are mobile, intuitive, and easily customized to patients' individual situations.

Payers are shifting from a B2B to B2C business model. That transformation is having a profound impact on them, and it will transform providers as well. Fortunately there is a large and growing body of knowledge about how to sell services to consumers online in directly comparative modes. ACOs should exploit the lessons other companies have learned before them. And though consumer-oriented healthcare decision support systems and private exchanges are still considered an advanced capability, we suggest they are quickly becoming a core technology requirement.

CONSUMER ANALYTICS

Consumer analytics analyze patients as consumers: By adopting them, healthcare is at least to some degree joining (all other) service industries where understanding consumers' needs is key to success. Consumer analytics' main objectives are to:

ANALYZE PATIENT PREFERENCES, SATISFIERS, AND DISSATISFIERS as they relate to behaviors and consumption patterns, identify peripheral services patients would find it convenient to buy from the AOCs (or areas where they would perceive a conflict of interest), etc. They are used to develop the ACO equivalent of "hassle maps" that have helped other industries identify and remove customer dissatisifiers to increase competitive advantage.

IDENTIFY MOTIVATIONAL FACTORS that will help increase patient accountability for their own health. Patient accountability is a major gap in the debate over healthcare reform. The ambition is to use analytics to better understand patients' goals, the barriers to their achieving them, and ways the barriers could be reduced.

ANALYZE CONSUMER PROFILE DATA generated by the CRM, digital apps (including social media), and sensors to identify hidden relationships and patterns.

Consumer analytics, drawing on a data set that has increased and diversified exponentially, mark the arrival of "big data" in the ACO. "Big" is a misnomer: It refers less to size than to diversity of types and sources of data. ACO big data incorporate clinical and financial data from across the continuum of care, patient-generated data from CRM systems and digital health apps: patient goals, preferences, behavioral data, health risks and concerns, interactions with the ACO, etc. ACO big data also include structured and normalized data, but also unstructured data (including parts of progress notes, e-mails, call center transcripts, etc.).

The arrival of big data and consumer analytics in ACOs also marks the arrival of three data management concepts:

HYBRID ANALYSTS Wave Two analytics, even more than Wave One's, require hybrid analysts who understand patient data, statistical pattern analysis, and change management. These professionals are needed to help the ACO transform data into information, insights, and behavioral change.

"CLEAN ENOUGH" DATA Because big data works by identifying potential patterns and correlations quickly out of massive amounts of structured and unstructured data, patient data do not always need to be thoroughly "clean" to be used.

INFRASTRUCTURE-AS-A-SERVICE The ACO IT function probably needs to get out of the infrastructure business. Given the size of ACO databases (which will grow exponentially in Wave Three) and the complexity of the data management tools involved, there is a strong business case for IT to switch to an infrastructure-as-a-service model.

Consumer analytics are an advanced ACO technological requirement.

WAVE THREE

THE SCIENCE OF PREVENTION

Wave Two is about engaging patients in their own health; Wave Three is about moving healthcare into the realms of predictive and preventive health management. Wave Three's goals are reflected in its key business principles:

PROACTIVE HEALTH AND WELLNESS MANAGEMENT, optimizing the health of populations covered by the ACO

FOCUS ON PREDICTIVE MODELING, PREVENTION, AND EARLY INTERVENTION, to reduce reliance on acute and emergency resources

EMPHASIS ON HEALTH/PREVENTIVE MEDICINE. The role of population health manager becomes key

MAINSTREAMING OF GENETIC-BASED/ PERSONALIZED MEDICINE as genetic-based prevention programs and genetic-enabled treatment programs

Wave Three technology capabilities cover the systems and tools that help understand, predict, and prevent diseases. The impact of translational medicine on Wave Three is expected to be such that technologies can be divided into traditional and genetic-enabled systems and tools.

TRADITIONAL TECHNOLOGIES TO IDENTIFY, MONITOR, AND PREVENT RISKS

Two mature analytical capabilities support this requirement:

PREDICTIVE MODELING/AT-RISK PATIENT POPULATION ANALYTICS These analytics systematically analyze all patient data in the data warehouse, using algorithms to identify high-risk patients—and those likely to become high-risk—before they require high-cost care. This allows the ACO to register them in appropriate disease-management programs or new care delivery models. Similar predictive models identify risk factors leading to readmissions, tying patients to appropriate evidence-based checklists based on their condition. This is a core ACO technology requirement.

HEALTH GAP ANALYTICS These analytics are the flip side of at-risk patient analytics. They analyze the care the patient has received, identify gaps, and issue actionable notifications. Health gap analytics are increasingly common, but mostly in the form of reports produced for a physician at the point of care when the patient is registered or scheduled. The new generation of the technology delivers alerts not just to physicians, patients themselves via the PHR, care managers, and other staff members at the point of contact. For example, an admitting clerk signing in a patient for an unrelated event might receive a notification suggesting a colonoscopy or a breast exam. The concept is to involve a dynamic definition of a care team to engage a patient to "do the right thing" whenever the opportunity presents. This is a core ACO technology requirement.

TECHNOLOGIES USING GENETICS TO IDENTIFY, MONITOR, AND PREVENT RISKS

If the history of other fundamental discoveries is of any guidance, we have probably overestimated the short-term impact of genetics and genomics in medicine, but completely underestimated their long-term effects. But as a practical matter, even the use of currently available genomic-based technologies will depend on the privacy framework that defines how an ACO may use patients' genetic/genomic data.

Today that framework is undefined. Healthcare is struggling to balance patients' privacy rights with the need to share data to enhance patient care. When genetic/genomic data are added to the mix, the stakes rise exponentially. And because ACOs blur the traditional line between payer and provider, traditional approaches to data access rights no longer provide adequate guidance. There is a recognized profound conflict in giving access to a specific patient's genetic data to an ACO, whose business model relies on risk management. At the same time, the ACO is the most motivated and best positioned stakeholder to use the data to benefit patients. Legislators will probably err on the side of patient privacy and a strict distinction between the ACO's predictive analytics/risk management role versus its care coordination/care delivery role.

For an ACO, the first of these technologies to be deployed will probably be genetic-enabled EHRs, the principles of which have been understood for quite some time. When the first generation of genetic-enabled EHRs arrives, it will probably be in the form of extensions to the traditional EHRs with:

- A much more detailed, systematic, and structured capture of family histories. This information will inform decision support tools to help clinicians choose appropriate genetic and genomic tests and make sense of their results.
- Enhancements to securely manage sensitive genetic/genomic test and profile data (with the added complexities that this data is valuable for a patient's lifetime, must be sharable, and will be revisited regularly as the genomic knowledge base grows.)
- An enhanced decision support engine that can provide just-in-time reminders and alerts to physicians at either the population or patient level: given the myriad of possible markers and decision rules, this is by far the single most critical factor delaying the development of these new EHRs.

Although the price of genetic testing is dropping rapidly and will become an increasing source of individual screening, it is unlikely that even first generation genetic-enabled EHR s will become a generalized technology in the predictable future. This is an advanced ACO technology requirement.

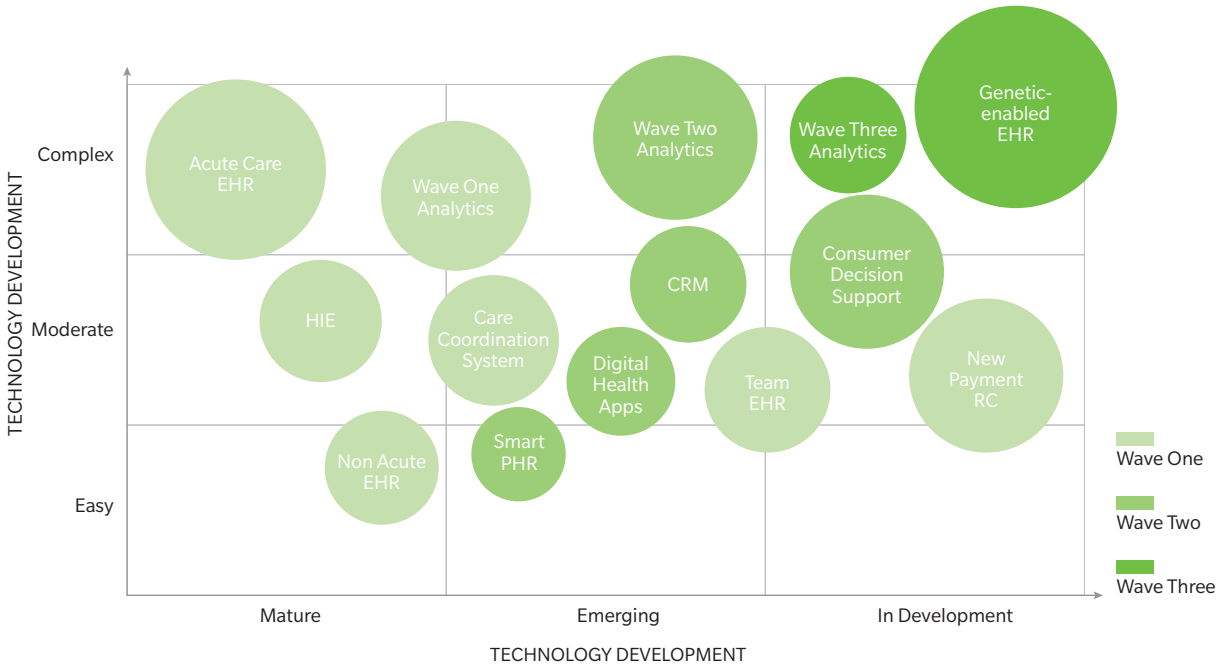
A DEPLOYMENT ROADMAP FOR ACOs

ACOs need technology that goes well beyond EHRs. This is only to be expected: They are adopting care models radically different from what EHRs are optimized to support. ACOs need capabilities—including the ability to process value-based payments—that are remarkably lacking in today's healthcare technology landscape, making it unlikely that EHRs alone will address ACOs' automation needs or that the deployment of an ACO technology platform will be fast, cheap, or simple.

ACOs need to prioritize, and in doing so an important consideration needs to be each technology's maturity level. Exhibit 4 plots this assessment along two axes: status of development and complexity of deployment, with the size of the circles indicating the relative costs involved. (See the Appendix for details). The picture that emerges is mixed: Except for three technologies (acute and non-acute EHRs and HIE), ACO technologies are still emerging or in development. We note several significant points:

- The most salient technology gap is the lack of systems to manage value-based payment models.
- ACO technology is a pre-consolidation commercial market with many players and widely different designs and capabilities. There are relatively few easy-to-deploy integrated solutions.
- Many of these technologies are new to healthcare, which contributes to the complexity of deployment. CRM and Wave Two consumer analytics are examples.
- Genetic-enabled EHRs are "off-the-chart" for the foreseeable future.

EXHIBIT 4: ACO TECHNOLOGIES' MATURITY LEVELS



Complicating the planning process is the fact that while each individual technology supports a fundamental ACO business requirement, they only achieve their full power in combination. For example, a key ACO success factor is the ability to change physician behavior by getting providers to accept accountability for their individual and collective performance. No individual technology can bring about that sort of cultural change. But when providers operate in an environment that includes a medical home system, plus a CRM, plus point-of-care health gap reports, plus physician performance analytics, they experience strong and consistent encouragement to truly collaborate in care management—and the support that enables them to succeed at it. It is truly the ACO technology platform that can bring sufficient transparency, dependency, and critical mass to demonstrate to each participant that his or her performance and compensation are interdependent. Once this is achieved, a lot of the micromanaging goes away.

Another example: Historically, individual PCPs have little influence on secondary and tertiary care. Group practices with experienced medical directors have been much more effective. The ACO technology platform provides the PCP with the greater and more consistent communication and consultation tools that these group practices have. It also codifies best care protocols. In essence, the ACO technology platform enables group practice management for the PCP. Again, ACOs are new, complex business constructs, and so is the technology platform that supports them.

That said, if the ACO technology platform represents a massive change over the current systems, it is a given that its implementation will take time. The fact that an ACO technology platform's full combined effect will only be realized when all components are in place does not mean that all components need to be in place for the ACO to start functioning.

The wave framework utilized earlier provides an overall roadmap:

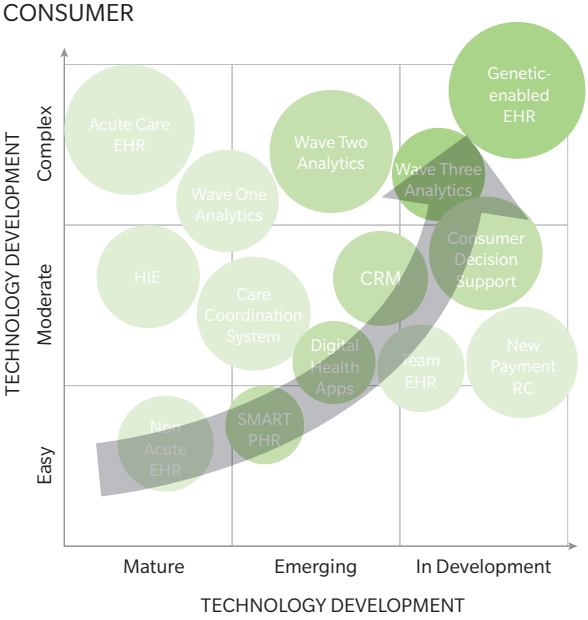
WAVE ONE represents a coherent deployment ensemble, with EHRs, HIEs, and care coordination functionality (using either a universal EHR approach or a third-party care coordination application). Wave One does not assume that a new fee-for-value payment system will be available; it assumes that Wave One analytics (quality measures, population management) will allow the ACO to manage the simplest forms of new payment models. As mentioned earlier, Wave One also assumes a profound reengineering of the analytics function.

WAVE TWO also represents a coherent ensemble. To phase the effort, two deployment thrusts can be envisioned (Exhibit 5). One favors an "extravert" consumer/patient access thrust with the deployment of smart PHRs, with linked-in health apps, a full CRM system, etc. It will require a deep retail orientation that most healthcare and IT organizations are just starting to adopt. The second favors an "introvert" analytics thrust with the continued strengthening of analytics capabilities and continued process/performance improvement efforts. The move toward big data in Wave Two will require significant infrastructure upgrades.

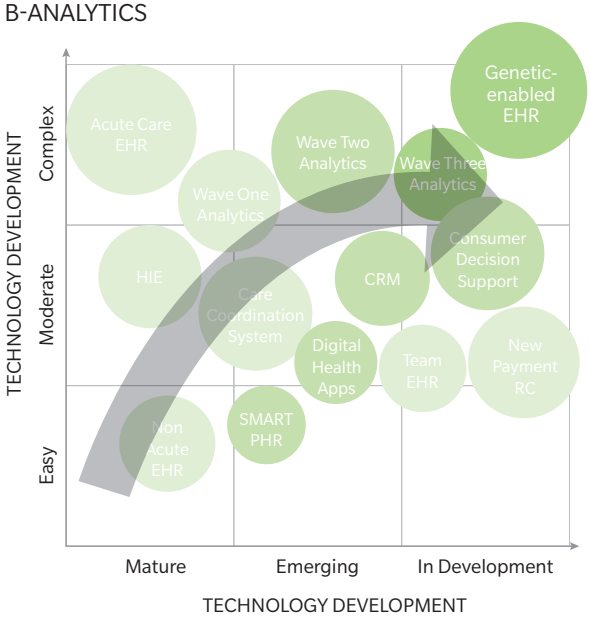
WAVE THREE, despite its umbrella theme of prevention and health, is not coherent technically. On the one hand, it will quickly be possible to extend care coordination systems to look for gaps in care or to identify high-risk populations and register them in an appropriate care plan. On the other, it will probably take a decade to deploy genetic-enabled prevention and care delivery technologies, even if privacy concerns are addressed. While these technologies will be leveraged by ACOs, they will probably first be seen in academic medical centers.

EXHIBIT 5: WAVE TWO'S DEPLOYMENT THRUSTS

CONSUMER



B-ANALYTICS



The waves correspond to a logical roadmap leading the ACO through an increasingly robust set of technology capabilities. For purposes of planning, we estimate that it will take roughly two years to deploy each wave. (We assume that the deployment is assigned a reasonable priority—not a completely safe assumption at a time when healthcare technology departments are already facing a perfect storm of requirements with MU compliance, ICD-10 remediation, etc.) The actual timeline will vary greatly depending on the ACO's existing level of automation, the heterogeneity of its technology environment, the magnitude of the resources assigned to the ACO's technology platform, etc. And of course it is crucial to remember that the ACO technology platform represents significant new functionality, which requires time to plan, implement, and optimize. And the technology is intimately tied to the ACO's governance and its operating, business, and clinical models, which themselves are being radically redefined.

IN SUMMARY

The deep transformation of our healthcare delivery and payment environment needs to be matched by an equally deep transformation, not a mere adjustment, of our technology environment. And we must deal with the added complication that old and new models will have to coexist during what may be a long transition, and that different parts of an ACO will feel new business/system needs with different acuity along the way. The risk is high that each business unit will trigger individual system initiatives that end up negating the benefits of integration; benefits it took us so long to understand in the old world of healthcare.

If ACOs' technology requirements are multiple, the "waves"suggest that they can be logically phased. Furthermore, within each wave, each ACO will have certain latitude to trigger the launch of a given new system initiative based on the individual circumstances of its own shift to fee-for-value. What should not be lost, however, is that each of these initiatives should be planned within a coherent IT architecture in which system optimization is designed for the ACO as a whole, not for its individual components. Each ACO's architecture will vary somewhat based on differences in its business composition, the architectural choices already made, etc. The important thing is to define overall architecture upfront (and keep the definition current as technologies and standards evolve) so that systems interoperate with one another while being installed over time as needed.

What is also important is to approach the deployment of each technology first and foremost as an initiative in transforming people and processes. The description of each wave includes multiple examples of the need for new skill sets, new data management approaches, etc. that go well beyond just the implementation of enabling tools.

The scope of an ACO's IT enablers may be bigger than hoped. It implies closely aligning business and system goals; prioritizing within a coherent architecture; setting up system projects as technology-enabled reengineering initiatives: That should sound familiar. We need to apply again the lessons we learned the last time around.

APPENDIX

ACO TECHNOLOGIES' MATURITY LEVEL

WAVE	TECHNOLOGY COMPONENTS	REQUIREMENT IMPORTANCE	CURRENT DEVELOPMENT STATUS	OBSTACLES TO TECHNOLOGY DEVELOPMENT	OBSTACLES TO TECHNOLOGY DEPLOYMENT	COST MAGNITUDE
1	Acute care EHR, Clinical Data Repository (CDR)	Core	Mature	Fragmented vendor market	• Costs • Physician adoption • Redesign for new care delivery models	$$$$
1	Sub-acute care EHR	Core	Mature	Fragmented provider and software vendor markets	• Limited internal resources • No HITECH incentives	$$
1	Care team-oriented EHR	Advanced	Early development	Complex redesign of EHR		$$
1	HIE	Core	Mature	Immature interoperability standards Overlooked messaging services	• Data privacy constraints • Physician adoption • Multiple interface needs	$$$
1	Care Coordination system	Core	Emerging		• Costs (if "big EHR") • Connectivity with EHR (if specialized CCS solution)	$$$
1	FFV Payment system/ Contract Management	Core	Early development	Complex, multiple requirements		$$$
1	ACO Analytics: • Cost Accounting • Quality Indicators • Pop. Mgmt. • Physician Perform • Comparative Effectiveness	 • Core • Core • Core • Core • Advanced	 • Mature • Emerging • Emerging • Emerging • Early development		• Data quality/data governance issue • Need to reorganize the Analytics function	 • $$ • $$ • $$ • $$ • $$
2	Smart PHR	Core	Emerging			
2	Healthcare CRM	Core	Emerging	Few vendors in healthcare		$$
2	Digital Health apps	Advanced	Mature (open API)	Multiple vendors with point standalone solutions	• Integration with ACO's systems and databases • New skill set	$-$$
2	Consumer-oriented Decision Support/ Private Exchanges	Advanced	Early development		• Defining holistic approach/ new skill set	$$
2	Consumer Analytics	Core	Emerging	Few vendors in healthcare	• Entry into "Big Data"	$$$
3	ACO Analytics: • Predictive Modeling • Health Gap Analytics	 • Core • Core	 • Emerging • Emerging		• Data quality. Gaps in data capture	$$
3	Genetic-enabled EHRs	Advanced	Early development	Immensely complex decision support	• Data security • Significant data storage needs	$$$$

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