The purpose of this paper is to discuss the data management requirements of the outer circle—Population Health Management (PHM)—not the claims processing, detailed cost accounting, and contract management systems of the inner circle, fixed price contracting.

Population Health Management and Accountable Care

Ignoring the complexities of the federal definition, the concept behind Accountable Care Organizations (ACOs) has been practiced for many years by integrated delivery networks, such as Intermountain Healthcare and Kaiser Permanente. Accountable care boils down to a very simple combination of: (1) Managing fixed-price contracts for the treatment and management of individual patient health (in contrast to fee-for-service, time-and-materials contracts); and (2) Applying the patient-specific concept of balancing cost-of-care with quality-of-care, to large populations of patients. The venn diagram looks like the following:
The purpose of this paper is to discuss the data management requirements of the outer circle—Population Health Management (PHM)—not the claims processing, detailed cost accounting, and contract management systems of the inner circle, fixed price contracting.

In full disclosure, I am associated with a vendor, Health Catalyst, that claims to provide a solution to the requirements in that outer circle of PHM. For 22 of my 30 years as a healthcare professional, I’ve been a CIO—the person on the other side of the table, looking for vendors that I could trust to provide the products and services that my organization needed, particularly analytics products. I joined Health Catalyst under a contract that guarantees my rights to tenured public opinion, whether the opinions I publicly express expose shortcomings of Health Catalyst or not. My loyalty resides first with the betterment of healthcare for our country. All other loyalties, including those to Health Catalyst, fall to second place.

Sanders’ Criteria vs. CCHIT ACO Framework

In June 2013, the former Certification Commission for Health Information Technology (CCHIT) released a white paper entitled, *A Health IT Framework for Accountable Care*, which had a similar intent to that which I undertake in this paper. It is an excellent paper in its own regard and should be referenced when organizations are evaluating vendors and plotting their PHM strategy. In the CCHIT document, the authors make a powerful statement about the need for analytics, which is, of course, in total alignment with my opinion:

“A high priority is the establishment of a data warehouse that can accept, store, normalize, and integrate data from multiple clinical, operational, financial, and patient derived systems. All of the key processes and many of the functions and HIT capabilities listed are dependent on the existence of such a data repository. How your organization performs with respect to its goals will be dependent on a timeline that outlines what data will be incorporated and when.”

As a CIO, I’m looking for an objective checklist for strategy development and vendor evaluation and a sense of timing and prioritization tailored to the realities of the market. Those realities include: (1) A vendor market with incomplete PHM offerings; (2) Of the U.S. patient population, only 28.3 million lives are being managed under accountable care arrangements (according to a report on Health Affairs Blog). I incorporate the concepts contained in the CCHIT paper and turn those concepts into a checklist for implementation of PHM, given the state of the market.

Evaluating Population Health Management Companies

One thing is clear about the future of healthcare: our ability to deliver high-quality, economically sustainable care will depend on how well we can manage the health of populations. For many integrated delivery networks that have been balancing the economics of care with the quality of care for decades, the concept of PHM is embedded in the culture, even though the term “population health management” was not commonly used until more recently. At places like Intermountain Healthcare, they were simply delivering what they considered the best care for their patients and community and didn’t see the need for a new term to describe their natural tendency. PHM is in an early stage of maturity and, as is normally the case in such early stages, it is suffering from inconsistent definitions and understanding, overhyped by vendors and ill-defined by the
industry. Rarely a group to shy away from chaos, healthcare IT vendors are labeling themselves with this new and popular term, quite often simply re-branding their old-school, fee-for-service, and encounter-based analytic solutions. Furthermore, population health management in and of itself is still something of an experiment, so vendors are trying to hit a moving target as new models (bundled payments, various iterations of the ACO concept, etc.), attempt to move us, as a nation, toward the goals of improving quality and lowering costs. As a result of this chaotic environment, let me say with emphasis:

*No single vendor in the current healthcare IT market currently meets all the requirements of population health management, as practiced by the leading integrated delivery networks.*

To help organizations make sense of the vendor options that are available—and to help them understand all that is required to effectively manage populations—I’ve developed 12 criteria in the context of today’s healthcare market. Organizations can use these criteria to plan PHM strategy and evaluate vendor products. The criteria reflect the following important points:

**Sequence Matters:** The numbered order of the criteria isn’t random. It is listed in a logical progression, like a course curriculum. The criteria listed earlier are foundational. Subsequent criteria are to varying degrees dependent on the foundation of earlier criteria and will function no better than the design and functionality of preceding criteria.

**Market Maturity and Evolution:** The latter criteria are the most complicated technically and culturally, and the least developed in the industry. I am predicting they will require more time to evolve than the criteria earlier in the list. While some criteria continue to evolve, work on building a foundation of the more developed pieces first.

**Summary and Details of the 12 Criteria**

Below is a summary of the 12 criteria.

**Criteria #1: Precise Patient Registries**

*Evidence-based definitions of patients to include in population health registries.*

Building accurate population registries is the foundation of effective population health management. Precise registries are the gatekeepers to accuracy. Without precise definition of the populations of concern first, everything else in the strategy suffers.

Traditionally, population cohorts have been defined using billing data, specifically ICD-9 codes. However, relying solely on billing data to define the patients in these cohorts, means organizations will likely miss 30 to 40 percent of the patients that should be included. In a value-based, fixed-price contracting model, that level of inaccuracy will be financially devastating.

Definitions of populations must be clinically informed. Billing codes represent a first step but represent an incomplete, even haphazard representation of a patient’s full state of health needs. To empower health systems to accurately plan for and address healthcare requirements across their served populations, registries must take into account such data as:

> At places like Intermountain Healthcare, they were simply delivering what they considered the best care for their patients and community and didn’t see the need for a new term to describe their natural tendency.
Precise registries are the gatekeepers to accuracy. Without precise definition of the populations of concern first, everything else in the strategy suffers.

All of this data, extracted and filtered from different data sources in the organization’s ecosystem and bound together in an enterprise data warehouse (EDW), is required to build an accurate profile of a disease (or other) patient state. The design of disease and other patient registries is worthy of its own white paper, but for the immediate context, the following diagram illustrates the high-level design of a disease registry that is precise and accurate.

Data flows from left to right, from source systems into the disease registry inference engine, then into the registry itself where it is combined with a vast array of other data about those patients, then associated with the appropriate accountable care clinician, and finally exposed for analysis in the context of population health management.
Criterion #2: Patient-Provider Attribution

Strategies and algorithms to assign patients to accountable physicians/clinicians.

One of the most complicated aspects of population health management (and accountable care) is determining who is really responsible for the patient. Who constitutes the patient’s care team and what is their relative involvement in the patient’s care? There are a number of different ways to identify the patient relationship of each care team member. Sometimes the patient will explicitly select a physician—a relationship established primarily through the insurance company. However, this formal assignment doesn’t always represent the reality of accountability. Even though one doctor is the assigned primary care provider (PCP), the patient might actually visit another doctor more frequently—a specialist for instance, like an OB/GYN or endocrinologist.

A common method for appropriately attributing clinician-patient relationship is developing algorithms that can analyze a patient’s visit patterns. This kind of sophisticated attribution work will become even more essential—and challenging—when assigning financial risk and performance incentives back to the physicians that are accountable for the care.

Once again, patient-physician attribution strategy is worthy of a separate white paper, but the generally accepted high-level options for assigning attribution are the following:

- Patient selection of physician during open enrollment
- “Most frequently visited” physician over the past two years
- Random assignment of patients to primary care physicians in the same geographic area
- Random assignment of patients in an employer group to primary care physicians in the PPO or HMO

A related topic is the process for assigning a patient to the ACO, after which they can be attributed to an accountable physician for health management. In addition to agreeing to the best way to manage attribution strategically within the healthcare organization, ACOs should ensure they understand the implications of their payers’ attribution strategy for the populations they are managing in these contracts.

Criterion #3: Precise Numerators in the Patient Registries

Discrete, evidence-based methods for flagging the patients in the registries who are difficult to manage or should be excluded (and capturing population-level risk).

It is challenging enough to precisely define the patients that should be included in a registry and assigning those patients to accountable physicians. Equally challenging is identifying patients in the registries that will be particularly difficult to manage. There are many reasons a patient may face extraordinary challenges with adhering to their tasks and role in the care partnership, and these tend to accumulate in tandem with the increasing complexity of a patient’s health challenges. Every EMR should be capable of capturing data that reflects the socio-economic indicators that impact health and well-being, including these:
Language barriers
Cognitive inability to participate in a care protocol
Physical inability to participate in a care protocol
Income and economic barriers
Home and local violence
Willing and informed refusal to participate in a care protocol, e.g. religious reasons
Medication contraindications to participating in a care protocol
Geographic inability to participate in a care protocol

Mortality (it can be surprisingly difficult to identify these patients)
These categories supplement traditional—but still important—methods of stratifying patients, such as the complexity of their condition. The care management processes must be tailored to accommodate these types of patients and the physician’s level of accountability for their care adjusted, especially when physician compensation is tied to their patients’ adherence to care protocols. Assigning these specific attributes to a patient requires a combination of subjective human judgment and sophisticated analytic technology. For example, it’s not always easy to objectively assess whether a patient lacks the necessary cognitive ability to participate in a protocol. A clinician or a care manager familiar with the patient’s care processes and personal issues should make this assignment—which requires an IT system that allows them to manually flag the patient with this attribute and triage the patient to a different care management process. At this point, there must be a strategy in place for managing those patients differently, such as home care, financial assistance plans, building outreach clinics in specific geographic areas, or assigning health coaches.

The CMS Hierarchical Condition Category (HCC) risk scores are one technique for assigning health risk scores to large populations so that ACOs are not motivated to prune the most challenging patients from their patient panels. Given the financial importance of accurate risk scores, your population health management solution should support you to ensure that patients are properly coded. Note, however, that HCC scores do not accommodate the patient-specific conditions listed above, especially at the individual patient level, and this further depth will be necessary for truly managing the patient’s care.

The inability to account for patients’ individual requirements in this way will contribute significantly to physicians’ dissatisfaction with population health management processes. Physicians resent being penalized for patients that fall outside the boundaries of clinical effectiveness guidelines when the physicians know it is empirically impossible for those patients to meet those guidelines within the bounds of usual care processes. At the same time, the segment of the population which faces these extra barriers puts the entire program at risk for underperformance. The ability to account for the large portion of the population with special circumstances is key to achieving both physician buy-in and effective population health management.

Criteria #4: Clinical and Cost Metrics

Monitoring clinical effectiveness and total cost of care to the system and the patient.
The next logical step in developing a system for population health management is to measure the practice of medicine against clinical protocols and continue to measure the variability in care. This requires organizations to build dashboards not only around specific patients, but around populations of patients. Importantly, measurement should not just focus exclusively on clinical quality—it must also track the total cost of care both for specific patients and on a per-capita basis across the population.

Ultimately, this kind of measurement prepares an organization for fixed-fee contracting in a true value-based system. During the journey from fee-for-service to full capitation, these metrics can also provide health systems with a powerful tool during contract negotiations with payers. Access to this type of quality data and cost data puts healthcare provider organizations in a stronger position to negotiate and retain the best contracts compared to competitors that do not have access to this type of analytics. Finally, having a mechanism to track and identify opportunities to improve performance midway through the performance period is critical, given the dollars often associated with these measures.

It is important to also provide quality, outcome and cost variance feedback to physicians – risk adjusted—at the point of care, and to provide a holistic picture of these patterns of variance. A physician who is highly variant in one area of care, may be overall lower in total care for all patients, or may provide better outcomes. In other words—spending more in one area is not necessarily bad. Your analytics platform and culture must be capable of looking at these scenarios, holistically.

**Criterion #5: Basic Clinical Practice Guidelines**

**Evidence-based triage and clinical protocols for single disease states.**

An effective population health management system defines how it will manage each population cohort. The problem with evidence-based medicine today is the general lack of applicability of that evidence outside the carefully controlled clinical trial that generated the evidence—clinical trials are rarely generalizable to the real-world messiness of complex patient profiles.

In the future, traditional clinical trial “evidence” will be displaced by the evidence derived from the analysis of local data sourced from the EDW. Recent achievements using registry-based randomized clinical trials provide a new template for healthcare organizations, enabling them to generate their own evidence at a fraction of the usual cost and, in some cases, also a fraction of the time, and to provide more locally relevant results than traditional-randomized clinical trials from academic medicine.

Until local data and registry-based trials are more widely used, the industry must make do with the evidence and guidelines that are available now. Many organizations try to define and develop their best-practice protocols internally, but that isn’t a scalable approach in the long run. Based on my experience and observation in several organizations, I estimate that a single clinical protocol of moderate complexity costs an average of $190,000 in labor to develop internally. There are dozens of external commercial sources for evidence-based protocols and clinical effectiveness guidelines, such as the CMS Accountable Care Organization measures, the Physician Quality Reporting System, the Agency for Healthcare Research and Quality, the National Quality Forum, and others. Commercial vendors such as Zynx Health, BMJ, Elsevier, Think Research, and Wolters Kluwer, offer clinical practice reference products, as well.
Healthcare provider organizations need to establish a “Clinical Practice Guidelines” governance body and then select their source(s) and processes for implementing and maintaining clinical protocols for managing the patients in the population health management program. If there is an inability to achieve consensus or overcome other hurdles to the adoption of clinical practice guidelines, organizations can still achieve significant improvements in quality and cost of care by simply measuring and reducing variability in care, then shifting the common practice of that care to the right of the quality curve.

Obviously, all this change in clinical culture and practice will entail a long journey. Start that journey by defining clinical practice guidelines for the patient cohorts and clinical process families that offer the highest opportunity for improvement and cost savings.

### Criterion #6: Risk Management Outreach

**Stratified work queues that feed care management teams and processes.**

Risk stratification enables an organization to analyze and minimize the progression of a disease and the development of comorbidities. This ability to stratify and then to set in motion the processes for outreach are important aspects of managing a population effectively. Once patients in the registry are stratified and monitored, organizations must develop strategies to identify and intervene with those patients that are on a high-risk trajectory. Also, over time, as the data becomes richer, profiling and proactively treating patients before they become members of the registry is the ultimate goal of healthcare—avoiding disease altogether, not reactively treating for it. Referring to criteria #3 at this point, healthcare organizations will also be able to stratify patients associated with social and other barriers to participation, thereby customizing their care management strategy.

### Criterion #7: Acquiring External Data

**Access to clinical encounter data, cost data, laboratory test results, and pharmacy data outside the core healthcare delivery organization.**

Several years ago, the population health market was heavily focused on the acquisition of data via health information exchanges (HIEs). The complexity of this process (defining business processes, governance structures, clinical relationships, and data sharing agreements), coupled with the relatively basic data available through this mechanism, has led to a shift away from this approach. Instead, most organizations rely on claims data to gain a view of care outside the core of their healthcare delivery systems. The challenge for most healthcare organizations lies in poor data quality—missing critical data elements—and frequency of data delivery, exacerbating the already inherent lag associated with claims files. Healthcare organizations bearing risk need to be proactive in negotiations with payers to ensure they receive a full claims file for all enrolled members, for all services, and regardless of where the care was rendered. The value of claims data is that it provides a view of the patient’s care across the continuum, and organizations shouldn’t dismiss the value this data can provide for analysis of utilization and trends. However, it’s important to understand this data’s limitations, namely the lack of clinical depth necessary to gain insight at the patient level to design outcomes improvement interventions.

Over time, and particularly as healthcare organizations bear more financial risk, adding nuance to this claims dataset—via additional sources like clinical, cost, lab, and pharmacy data—is necessary to gain the depth of insight required to proactively manage populations.
Criterion #8: Engaging with Patients

Engaging patients and establishing a communication system about their care.

The current information technology options for this criterion are fragmented and immature but will improve dramatically in the next three years. In today’s industry, our typical solution for engaging patients is through a personal health record (PHR) tightly associated with a vendor’s and healthcare delivery organization’s EMR and, increasingly, care management platforms for the subset of patients selected for care management.

The patient engagement platform of the future will be owned completely by the patient and be decoupled from a dependency on an EMR vendor and a single healthcare organization. These platforms need to evolve into a personal health project management system—imagine a system that combines the features of cloud-based project management programs like BaseCamp (milestones, goals, budgets, file and image sharing, and teamwork) with knowledge management tools (to support personalized health content, advice, suggestions and prompts), and social support like PatientsLikeMe.

Even before then, we need to start embracing the technology platforms and methods that patients use in their everyday lives and make them part of the healthcare delivery process. Today, as a result of misplaced HIPAA risk management, healthcare delivery systems regularly prohibit convenient modes of communication, taking the decision away from the patient, while at the same time allowing massive amounts of clinical data to be exposed on unencrypted laptops and thumb drives.

New forums for human engagement are prevalent in our world, and we must become more liberal, risk tolerant, and flexible about how to use them. Rather than paternalistically deciding for patients what level of privacy is required, we need to find a way to ensure they are able to understand privacy risks and make informed decisions for themselves on how and where their health information is held and transmitted. This expectation is particularly true for Millennials and later. They want to own their own information and own more control of their own care. They are no longer loyal to a physician; they are loyal to themselves and their finances. We must adjust our application of HIPAA, allowing the patient to play a larger role in the decision-making about balancing data security with data sharing and convenience.

Give this criterion some time to evolve, technically and culturally—but be prepared to jettison the organization’s current PHR for something much more informative, customized, collaborative, and functionally rich in the near future.

Criterion #9: Educating Patients

Patient education material and distribution system, tailored to the patient’s status and protocol.

This is, of course, closely related to criterion #8, but is significantly more complicated than exchanging messages with the care management project team. Our current system for patient education is hampered by the lack of well-vetted, highly personalized materials and an ineffective distribution system. We have a long way to go.
As I mentioned above, the de facto technological solution for patient engagement today is the patient portal and/or PHR. PHRs tend to present generic educational information, at best presenting general information about a patient’s chronic disease. This means that a low-income, preteen girl with type 1 diabetes may receive essentially the same education material as a middle-aged executive man with type 2 diabetes and a completely different background. Comorbidities are something else that today’s educational materials aren’t tailored enough to address. If a patient has diabetes and cardiovascular disease, they can receive educational materials about each condition but rarely something that blends the two. Pharmaceutical education materials are worse – extremely verbose, never tailored to address the potential interactions between the individual patient’s actual medication or diagnosis lists – designed by and for liability lawyers rather than for patients.

Our industry also needs to improve the quality of the information. Educational materials tend to be sourced from third-party libraries, and there is no certified, widely available method of evaluating the quality of this material. Furthermore, most patient educational materials—even if the information is accurate—are static content, unable to flex to meet the educational level and cognitive abilities of their audience. Recent studies by the Kaiser Family Foundation indicate that only 10 percent of patients are capable of being fully engaged in their own healthcare, because of education level and our industry’s inability to communicate with them in a way that’s meaningful and actionable.

The final challenge to patient education that I will raise here is related to a point discussed in criteria #8. We have yet to embrace the most effective methods for distributing educational materials to patients. PHRs have not been widely adopted. Distribution involving methods that patients embrace, such as email and text messaging can positively affect their willingness to engage with educational materials. Using a publish and subscribe model—that patients control—ACOs will someday be capable of integrating with highly personalized patient educational materials and pushing these through existing channels of human engagement such as Twitter, Facebook, and Amazon. Look for these capabilities in care management vendors.

**Criterion #10: Complex Clinical Practice Guidelines**

**Evidence-based triage and clinical protocols for comorbid patients.**

As an industry, healthcare has yet to develop effective comorbid treatment protocols (worth noting that the American College of Physicians is attempting to address this need). Instead, we fall back on attempting to apply multiple single-disease protocols to a single patient. These single-disease protocols are linear and don’t interact well.

Unfortunately, the reality of healthcare is that a large percentage of the patients which population health management should target are comorbid. In particular, Medicare patients, on average, are affected by at least three chronic diseases at the same time. At the same time, polypharmacy is a serious problem impacting the health status, outcomes, complications and challenges to adherence for all complex patients and older patients in particular.

Establishing protocols for comorbid patients is much more complicated than applying protocols for single disease states. Frankly, there aren’t many sources in the industry for clinical protocols that can account for comorbid patients. Leaving physicians to build their own guidelines, or chain individual disease treatment protocols together is not an acceptable solution. Developing comorbid protocols must be a significant focus of our healthcare agenda over the next several years. Organizations that optimize comorbid care will be in a strong position to differentiate themselves in the market, both financially and clinically.
Criterion #11: Care Team Coordination

Inter-clinician communication and project management system.

An effective system for managing populations requires a more automated way for communicating among members of the care team. Relying on faxes, referral letters, the EMR Inbox, and telephones just won’t suffice anymore.

We need to treat every high-risk patient as if they are at the center of a project plan. If they’ve had an acute encounter, we should present them with recovery milestones and assign someone to them to help them reach these milestones. For a chronic disease like diabetes, we should present them with a lifetime project plan for health. If they start falling out of the expected trajectory for health, we need to intervene to get them back on that path.

All members of a patient’s care management team should be able to quickly and easily see the patient’s overall project plan, next milestones, and the responsibilities of each member.

It should be no surprise, then, that the ideal system for care team coordination would function like a project management tool, like BaseCamp or Kanban. Today’s EMRs are designed as encounter management tools (and aren’t even particularly good at that). Tomorrow’s EMRs will incorporate project management concepts into their functionality. They will be patient-centric, not encounter-centric. A truly effective user interface would still display the individual encounter, but it would also display the project plan for chronic condition management or health maintenance for that patient, as well as the cost of care for the patient and the patient’s population. Every member of the care team—including the patient or a designated family member—would be able to monitor what everyone else was doing along the care plan.

Criterion #12: Tracking Specific Outcomes

Patient-reported outcomes measurement system, tailored to the patient’s status and protocol.

Patient-reported outcomes data is one of the most important pieces of data missing from our data ecosystem today. The list of measures on which health systems routinely solicit feedback from patients is woefully short: patient satisfaction (which measures the patient’s experience of the care delivery, but not the health outcomes), pain scores, and (usually very late in the process) end-of-life preferences. Unfortunately, the industry presently has no reasonable options for addressing this need. This is the last criterion because it arguably requires of healthcare the most evolution, culturally and technically, to implement; and organizations can make significant progress on population health while this criterion develops and evolves in the industry.

There are two parallel tracks of evolution required of healthcare to address patient-reported outcomes. The first is achieving development, validation, and healthcare professional buy-in for a new universe of measures. We remain a long way from widespread, well-established patient-reported outcome measure sets for all patient groups and clinical scenarios where these would be useful. However, the PROMIS network of validated patient-reported outcome instruments and community of institutions implementing patient-reported outcome measures (PROMs) continue to grow and now provides a viable starting point for institutions seeking to add PROMs to their repertoire of tools to understand health system performance.
The second track is tied to criteria 8 and 9. When organizations have modernized their methods for engaging and communicating to patients, they will be able to leverage those various methods of communication to request outcomes data from patients and to thereby build a more complete picture of the health ecosystem’s effectiveness at delivering the health outcomes that matter most according to the perspective that matters most, the patient’s.

Beyond merely collecting PROMs data from patients, as with all measurement data, a patient-reported outcomes system will need a closed-loop data relationship with the EMR to be fully effective. What does this look like? The clinician must have the ability to pre-program automated, timed delivery of a patient-reported outcomes survey tailored to the patient based upon the patient’s diagnosis and treatment plan. The outcomes data that is collected must be integrated back into the patient’s record in the EMR for the clinician to incorporate into their ongoing care of the patient, and then exported to the EDW for analytic purposes. Ideally, the patient would also be provided with visualizations of their own PROMs data mapped over time so they can track their own progress and use the data to participate more fully in their own care.

When we do eventually achieve a fully implemented system of patient-reported outcomes, it will include robust, validated PROMs instruments that cover the waterfront of addressing patient scenarios, PROM data collection that intertwines with patient’s normal daily modes of communication, and closed loop integration with the provider’s electronic workflow and health system’s analytics data stream. Only then will we have a complete picture of whether the health system is delivering to patients—to all of us—the outcomes we care about. This enhanced view will lead to some discomfort as we identify gaps that fall outside healthcare delivery silos, but will also offer insights that can drive streamlining of the patient journey and offer to patients an opportunity for data-driven engagement in their health goals that will help to activate them as full partners in their own care.

**Asset Allocation and Timing**

As the market evolves and the healthcare organization matures in its implementation of population health, the diagram below depicts the recommended allocation of assets:
Use the criteria to build a roadmap toward population health management and to evaluate progress. Get started as soon as possible with the first six criteria while the latter six continue to develop in the market. By the time the organization is operating effectively according to criterion #6, the market will have matured, business models will have developed, and better products will be available. Tilting these 12 criteria on their side, as an X-axis, gives a reasonable, yet aggressive, organizational roadmap and timeline:

In Conclusion

As I mentioned at the beginning of this paper, no single vendor today offers an integrated and fully functional population health management solution that meets all 12 criteria.

The key points to remember are:

- The integrated delivery networks have been practicing population health management for a number of years. Follow their lead.
- There is no single vendor that can provide a complete PHM solution today.
- The sequence in which you implement these criteria is important. As you approach each one, carefully consider the current state of the vendor market and industry trends, focus first on those criteria for which you can identify robust solutions now, remember that subsequent criteria will only be as good as the design and functionality of preceding criteria, and continue to build up as the market continues to develop over the next three years.

Beyond encouraging organizations to get started with the basics today, the most important piece of advice I could offer is to take care when selecting a vendor to build the foundational technology infrastructure. That vendor must be able to deliver an infrastructure that is flexible and scalable over the next few years, which will be able to develop with you to serve all 12 criteria as you work your way through them over time, as the market evolves.
About the Author

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Prior to his career in healthcare IT, Dale Sanders worked for 14 years in military, national-intelligence, and manufacturing sectors, specializing in analytics and decision support. In addition to his role at Health Catalyst, he serves as the senior technology advisor and CIO for the National Health System in the Cayman Islands. Previously, he was CIO of Northwestern University Medical Center, and regional director of Medical Informatics at Intermountain Healthcare, where he served in a number of capacities, including chief architect of Intermountain’s enterprise data warehouse. Dale is a founder of the Healthcare Data Warehousing Association. He holds Bachelor of Science degrees in Chemistry and in Biology from Ft. Lewis College, Durango Colorado, and is a graduate of the U.S. Air Force Information Systems Engineering program.
ABOUT HEALTH CATALYST

Health Catalyst is a mission-driven data warehousing, analytics, and outcomes improvement company that helps healthcare organizations of all sizes perform the clinical, financial, and operational reporting and analysis needed for population health and accountable care. Our proven enterprise data warehouse (EDW) and analytics platform helps improve quality, add efficiency and lower costs in support of more than 50 million patients for organizations ranging from the largest US health system to forward-thinking physician practices.

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