2017

HEALTHCARE ANALYTICS

MARKET TRENDS REPORT

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Chilmark Research LLC

745 Atlantic Ave., Suite 901
Boston, MA 02111
www.ChilmarkResearch.com
info@chilmarkresearch.com
Ph. 617.615.9344

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EXECUTIVE SUMMARY

Chapter 1: Executive Summary

Thanks in part to the transition to value-based reimbursement (VBR) the market for healthcare data analytics has continued to grow. Providers are assuming some level of upside or downside risk as well as taking responsibility for measuring quality, monitoring spending, and controlling utilization. This year, the analytics solutions we review in this report are more mature and more focused on end-user needs. At the same time, they can be thought of as pioneers because the current uses of analytics technology is narrower that it will be in five years.

Previous editions of this report described vendors and products that address reporting needs under early VBR models such as ACOs and the Medicare Shared Savings Program (MSSP). These products have since expanded in scope to support private payer risk-based contracts, clinically integrated networks (CIN), and evolving Medicare risk arrangements. They have also expanded to include a range of activities not always associated with population health management (PHM). The common thread – the need to optimize revenue under diverse payment models – gives rise to the need for analytics and reporting software.

Despite uncertainty in Washington D.C., the Center for Medicare and Medicaid Services' (CMS') flagship VBR programs have evolved into the Merit-based Incentive Payment System (MIPS) and Alternative Payment Models (APMs). Even as CMS has publicized these changes and other market participants have discussed them at length, many physicians remain unaware and unprepared for how the new payment systems change their interactions with CMS.. Many lack a clear idea of the alternatives open to them or how quality reporting might affect demand for their services. This presents opportunities for most of the vendors in this report.

A key purpose of the analytics applications described in this report is to help healthcare organizations (HCOs) cope with the transition to new payment systems while maximizing revenue – whether in the form of traditional FFS reimbursements or value-based payments. A secondary objective is to help HCOs reduce medical spending and unnecessary utilization. The pace of this transformation remains uncertain and HCOs of all types straddle the two different payment regimes of FFS and VBR.

We found a common product approach among all the vendors surveyed. In short, all of their analytics solutions aggregate a longitudinal patient record based claims and EHR data. This provides the basis for an analysis to determine which patients to focus on for performance improvement programs. It also enables reporting for the purposes of quality and cost improvement efforts. Finally, these applications support the ability of HCOs to refer patients to care management programs. (Figure 1.1)

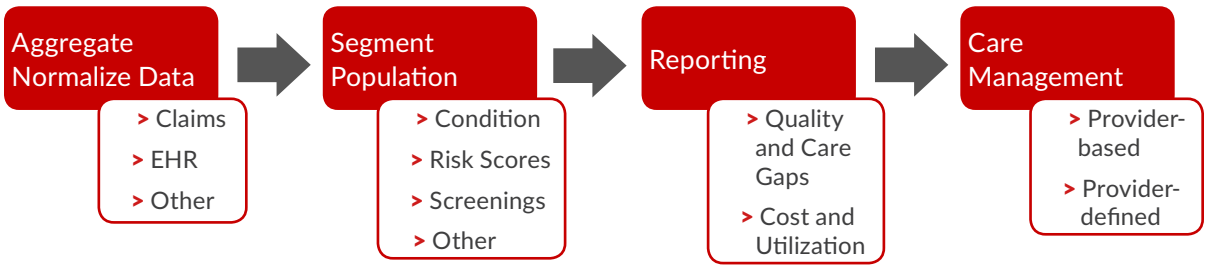

Figure 1.1: The Analytics Context

BUILDING THE DATA STORE

Claims data provide the big picture view of patient-provider interactions while EHRs provide detailed clinical observations. This combination of claims and EHR data allows providers to gain the requisite visibility into cost and quality monitoring of value-based arrangements with payers. However, these data types don't provide a complete picture of the risks. But piecing together a longitudinal view of patient data from these two data sources is not as simple as it sounds. Blind spots and delays inherent in obtaining claims data are par for the course. Every vendor profiled in this report has strong experience combining EHR and claims data, experience that many of their HCO customers lack. These vendors know how to address the technical and data integration and can assume responsibility for maintaining the integrity and validity of combined data for the benefit of payers and providers.

In the past Chilmark Research has evaluated products based on their ability to include other data, including data from devices and social determinants of health (SDoH) and each year we find more sources of potentially valuable data. Vendors are clearly interested in adding more data. In the coming years, we expect to see analytics products using other kinds of data, such as device, genomic, patient-generated, or long term, post-acute care-sourced (LTPAC).

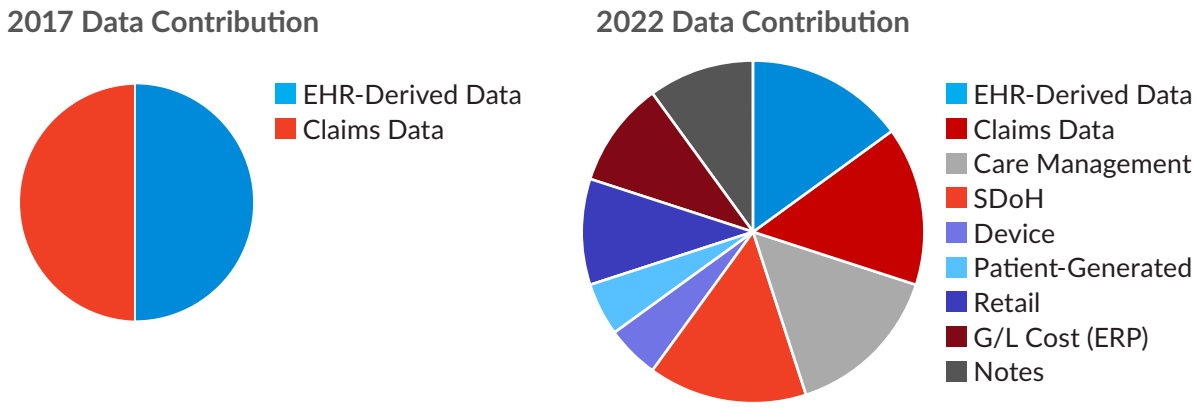

Figure 1.2: More Data Types and Higher Data Volumes

SEGMENTING THE POPULATION

The most basic question analytics can help answer is which patients should be the focus of which population health management (PHM) efforts. The analytics tools described in this report segment populations into patient registries and cohorts based on risk characteristics, costs, utilization intensity, program, or disease. This important element of PHM enables decision-makers to focus attention on specific populations and conditions for which optimized care can deliver the greatest improvements in health — and most positive financial outcomes for providers and payers.

REPORTING APPLICATIONS

All of the solutions profiled in this report include a variety reports and dashboards for clinical and other users. These concentrate on the important aspects of successful participation in VBR: quality performance and care gaps, costs and utilization, and network analysis. While these solutions have focused squarely on the needs of

office-based physicians for the last few years, many vendors are now starting to expand their functional horizons. Vendor roadmaps include such varied application options as contract modeling, activity-based costing, comparative effectiveness of care pathways, safety, revenue cycle, and adherence.

The expansion into new functional areas is inevitable now that the value of analytics is an accepted fact. For many users, these solutions have introduced the idea that data can shed a valuable new light on clinical and associated administrative processes. In a sense, these applications have triggered a realization that the use of analytics is no longer optional for HCOs in an environment where an HCO's ability to thrive depends on fully utilizing data to support decisions.

NEW APPROACHES AND TECHNOLOGIES

The solutions described in this report rely on tried and true relational technology, conventional development tools, and longstanding HIT hosting options. Given the anticipated explosion of data types and data volumes and the speed-to-development the market will soon require, vendors will need to expand their existing approaches to analytics product development.

Some vendors have experimented with DevOps, cloud, microservices, containerization, agile development, and open APIs to integrate diverse data from inside and outside an organization into more concise and focused analytics. Many of these new technologies and approaches offer potential solutions to the functional and usability ills of healthcare's various systems of record — we expect to see their usefulness proliferate.

A fundamental building block for better supporting developers is a comprehensive set of open and standard APIs. Fast Healthcare Interoperability Resources (FHIR) and SMART on FHIR are the leading candidates to anchor such standards industrywide. FHIR provides easier access to patient clinical data and SMART on FHIR makes it easier to add functionality to existing applications. Both technologies will likely need to be augmented by other APIs to provide a truly comprehensive set of APIs suitable for analytics developers and analysts.

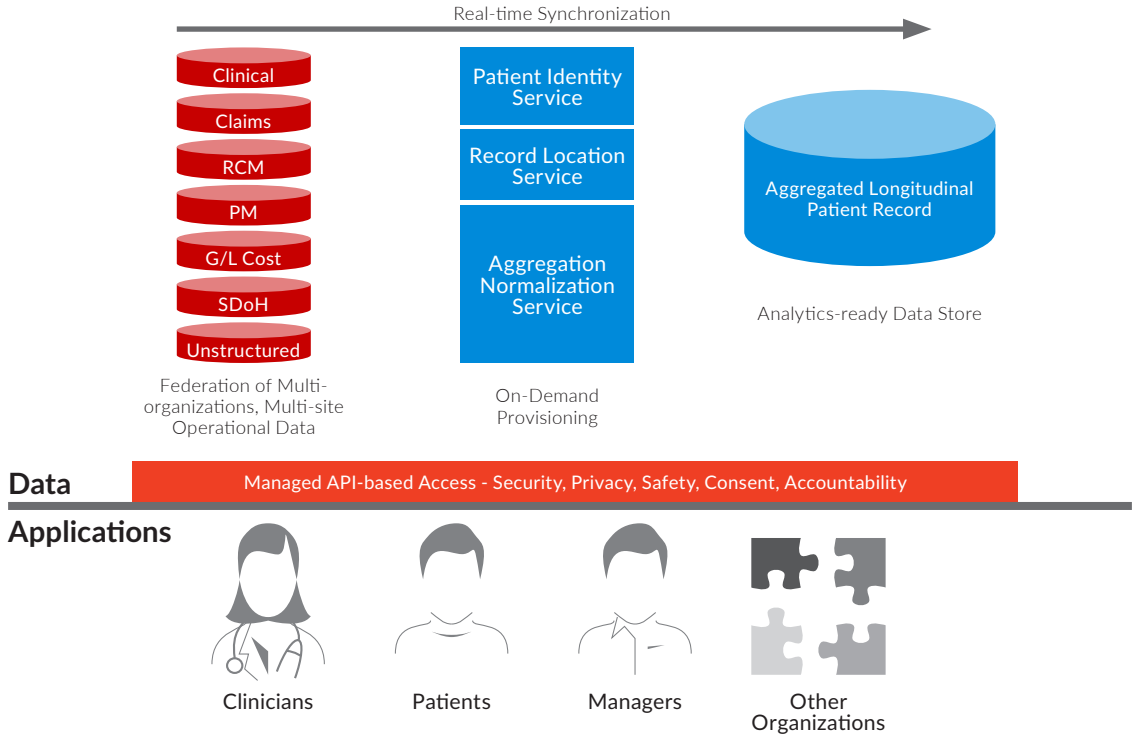

Figure 1.3: Provisioning Data for Analytics

Building and maintaining analytics ready data stores data stores is time- and resource-intensive. Implementers need to understand the intricacies of each source, not to mention the complex timing and dependencies involved in updating existing data stores with new information from systems of record. In most cases, the resulting analytics data stores tend to be used for a finite set of applications. This purpose-built aspect points to a wider need for automation to reduce the work involved in maintaining data stores for analytics.

On-demand provisioning of data for analytics along with integral synchronization from source data is a tall order at this point. Vendors will ultimately have to introduce better tools for creating analytics-ready data stores despite the terminology complications and variability that bedevil healthcare data. Both analysts and users need more and better automation tools for building analytics data stores. The increasing popularity and acceptance of newer business intelligence (BI) tools is also driving the need for more data, faster. Automating data provisioning and offering some ability for users to provision data would expand the reach of analytics.

CONCLUSION

The development of robust data analytics capabilities that can provide comprehensive solutions for PHM and care coordination are still likely several years away. Today, most HCOs' analytics efforts are squarely focused on bridging the gap between FFS and VBR. The analytics vendors described in this report are dedicated to providing their customers a way to transition to VBC. Near-term, the focus remains on reporting on quality metrics and care gaps, utilization and costs, and more predictive capabilities. But leading institutions are beginning to meld clinical, operational, financial, structured, and unstructured data to understand the costs and outcomes of care delivered across the larger community they serve. The amount and variety of data, as well as its value, is set to grow dramatically in the coming years.

ANALYTICS MARKET DYNAMICS

Chapter 2: Analytics Market Dynamics

The fitful transition from fee-for-service (FFS) to value-based payments (VBP) is changing many healthcare leaders' ideas about the role of risk in clinical and financial decisions. As HCOs expand their perspective from delivering care on a patient-by patient basis to managing the health status of populations, many are implementing clinical programs that require them to understand, monitor, and mitigate risk.

The most basic question for these organizations is which patients should be the focus of which population health management (PHM) efforts. Analytics helps answer this question by directing attention to a variety of different criteria to create patient registries and cohorts.

The analytics tools described in this report segment populations into categories based on risk characteristics, costs, utilization intensity, program, and/or disease. This element of PHM enables decision-makers to focus attention on certain cohorts so they can more successfully optimize care delivery and financial outcomes.

Population Health Segmentation and Stratification

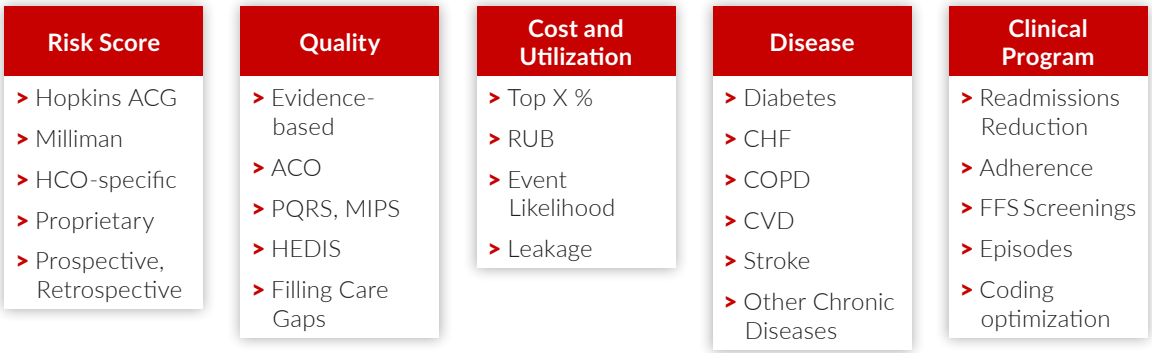

Figure 2.1: Targeting Populations

Before HCOs can fully realize the benefits of data analytics, they first must overcome some difficulties. Sourcing data has improved in the last few years but is still hampered by legacy technologies and interoperability friction between disparate organizations and applications. While claims data is providing significant value, latency imposes a need to educate users about the age of the data on their screens. Many HCOs struggle with EHR, claims-data quality, and normalization. Delivering analytics to the point of care remains the most challenging hurdle and inarguably the weakest link in the solutions reviewed for this report. Getting data into the hands of someone who can act and then getting them to act is an ongoing process.

With a reasonable data warehouse in place, HCOs must ensure that their users are able to make the best use of data. End-user education and better data skills are obvious first steps. Educating clinicians about data and adding data scientist skills in clinical organizations helps reduce reliance on overstretched IT organizations and budgets. These measures are being done formally in the largest HCOs and less formally in smaller organizations. The idea is to build an organization in which self-service analytics for clinicians becomes a reasonable option.

ACTUARIAL CHALLENGES FOR PROVIDERS

Previous editions of this report described how vendors and products addressed new reporting demands under early VBR models such as ACOs and Medicare Shared Savings Program (MSSP). The early analytic products have since expanded in scope to support private payers as they develop risk-based contracts, clinically integrated networks (CIN) in meeting the demands of those contracts, and any group affected by evolving Medicare risk ar-

rangements. The common thread – providers assuming some level of risk (upside or downside) coupled with the need to measure quality, monitor spending, and control utilization – is that the need for analytics and reporting software continues to grow.

With many exceptions, HCOs still have limited experience with risk-based contracting. ACOs in particular often lack the organizational knowledge to fully anticipate how risks in in their patient populations could affect reimbursement. Many HCOs have neither the financial resources nor the organizational scale to invest in the IT they would need to integrate risk-assessment capabilities into their applications.

The object of analytics applications is to help HCOs extract value from their data and bridge gaps in their in-house technical expertise by giving clinicians and other users direct insights into the quality, cost, and utilization of their clinical practices. Such insights will help any HCO with risk contracts gradually help its clinical and administrative staffs become more adept at using the technology and understanding how it can help the organization successfully transition to VBR.

ANALYTICS SOLUTIONS GET REAL

As analytics products expand in scope from PHM to a more complete platform for healthcare analytics, a number of important capabilities will distinguish the truly useful products from the rest of the field, and add significant functional enhancement to existing products. (Table 2.1)

Differentiator	Primary Benefit(s)	Current Availability
API Program	Embeddable analytics or data for any application provides potential for easier implementations and more pervasive use	Non-existent
Cross-domain registries	Consistent definitions across quality, cost, and utilization domains. Precise cohort definitions improves risk profiling	Minimal
Self-service analytics and data provisioning	Reassign IT personnel for other development tasks Increased user satisfaction with applications Makes more complex data available	Non-existent to Minimal
SDoH support	Improved risk adjustment, better understanding of adherence issues	Minimal
G/L Cost Analytics	Understand cost implications of better or worse quality, utilization or spend performance	Non-existent
Algorithms	Portable computing artifacts applicable in multiple contexts	Non-existent
Integration in workflow	Actionable insights at point of care/point of decision	Minimal or spotty

Table 2.1: Important Differentiators for Analytics in Healthcare

THE TIME IS RIPE FOR PAYER-PROVIDER COLLABORATION

The proliferation of redundant and inconsistent data sources is one of the most significant hurdles to value-based health initiatives, which depend on the availability of reliable information. The traditional separation of data, information and program initiatives along provider-payer lines is simply not sustainable given budget constraints and demanding quality standards. Through collaboration, these entities stand to gain a common information

view, reduce duplication and redundancy, and achieve greater accuracy, timeliness, and reliability. Ultimately, collaborative efforts will enable both health plans and providers to shift their investment focus from just getting information to using information to improve cost, quality, and outcomes.

For all of these reasons, Chilmark Research believes that the market will see payer/provider collaborative information service models emerge in the coming year. Further, these models will successfully aggregate, validate, and share information. These solutions could sit between the health plan and the provider and provide a common data set as well as a common application platform that is shared and used as the primary data source by both. Providers and health plans would avoid duplicating data and related business activities, thus establishing more consistent, cost effective, and streamlined processes.

Building on transaction and clearinghouse models of the past, a range of potential partnership models could evolve — from conventional business development to joint ventures to actual mergers and acquisitions. We have already seen some examples of collaborative information sharing platforms, with Manifest MedEx probably the best known among them.

Manifest Medx

The product of a merger between Cal-Index and Inland HIE, Manifest MedEx is an independent, nonprofit organization developing a statewide, next-generation HIE. It is a collaboration of health plans (e.g. Blue Shield of California, Anthem Blue Cross), hospitals (Adventist Health, Arrowhead Regional Medical Center), physician groups, reference labs, radiology centers, and public health agencies. To date, it has assembled data on about 17 million lives and connects to over 150 different provider organizations around California.

MACRA STRENGTHENS FOCUS ON QUALITY

Congress and CMS continue to tinker with payment programs in the long march to VBR. The Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) introduced two payment tracks for eligible clinicians (EC): the Merit-based Incentive Payment System (MIPS) and the Advanced Alternative Payment Models (APM). Both tracks change the formulas for physician reimbursement and sunset three major quality reporting programs, Meaningful Use (MU), Physician Quality Reporting System (PQRS), and the Value Modifier (VM). At a high level, MACRA holds out the promise of reducing the reporting burdens on physicians over time.

While reducing the burden would seem to undercut the need for data analysis and reporting, physicians can choose the quality metrics they report from a collection of over 250 measures. Few physicians, for instance, are focused on the intricacies of MIPS. Many are unaware that they can choose quality metrics and that their selection will influence reimbursement levels, nor do many physicians realize that quality metrics will be available on the Physician Compare website. Many physicians would welcome the opportunity to preview how they will be depicted in this forum. In fact, an overall lack of physician awareness and preparedness presents opportunities for most of the vendors in this report.

NEW ADMINISTRATION, NEW APPROACH

In the wake of the 2016 election, the Affordable Care Act (ACA) and its follow-on regulations are under a microscope. As we prepared this report, the U.S. Senate failed to pass the Better Care Reconciliation Act (BCRA) but debate on how repeal ACA was alive. While the legislation remains up in the air, it is safe to say that the philosophy of allowing market forces to drive changes in areas such as healthcare computing could soon displace government initiatives put in place during the previous administration. HHS and CMS will be making or revisiting a range of healthcare decisions based on new or repealed legislation if and when such actions occur.

While the coverage of the new administration's approach to health insurance marketplaces gets the most ink, payment reform is also in flux. Most healthcare stakeholders see MACRA and some ACA-era programs as part

of the fabric of healthcare delivery in the United States. Even with the ACA in jeopardy, controlling healthcare spending is a widely held goal, often driven by the belief that high healthcare costs jeopardize a range of national and private growth prospects. Unfortunately, the current level of uncertainty about possible policy changes has caused many to think twice before investing in IT. No matter what happens, HCOs will still need to continue to invest in analytics given the level of public interest in reducing costs and improving quality. (Table 2.2)

Policy Goal	Anticipated Effects	Potential Impacts for Analytics Solutions
Control healthcare spending	> Greater collection burden for HCOs > More administrative processes for provider organizations	> Strong demand for predictive analytics to delay or eliminate high cost utilization > Medical and pharma costs explicitly considered at point of care
Roll back regulations	> Reduced scope of CEHRT definition > More flexible definition of APM > Bundled payment programs delayed or eliminated	> Expanding inventory of quality metrics > Market demands new care delivery models offering convenience, value
Reform Medicaid	> Convert Medicaid to block grants	> State-based reporting could increase > Medicaid MCO reporting could increase
Reduce ONC funding	> Programs to better support interoperability > Improve EHR usability	> Better availability of data across organizations and venues > Push to move analytics and reporting into EHRs and away from portals

Table 2.2: Potential Impacts of Congressional and Administration Policy Changes

Over the past several years, payment reform has produced several changes including support for bundled payments. CMS' pilots for bundled payments have grown since 2013 from the Bundled Payments for Care Improvement Initiative (BPCI) to include Comprehensive Care for Joint Care (CJR), Oncology Care Model (OCM), and the Episode Payment Model (EPM). These programs share a common goal of encouraging disparate providers to coordinate care for a single episode through the use of a single shared payment system that rewards quality and outcomes. For now, the timetable for CMS' bundled payments has been delayed and the eventual shape of such programs remains unclear.

These programs, as conceived, require more cross-enterprise cooperation and data flow than most other programs associated with payment reform. Analytics vendors in general have not rushed to add support. The substantive evidence in favor of expanding bundled payments – that coordination incented by bundles can reduce costs and improve outcomes – has shown promise. For now, analytics vendors seem to be on the fence, awaiting more support from CMS and stronger market signals from other payers.

SHIFT TO LOWER-ACUITY SETTINGS

The shift to VBC is consistent with the secular trend to move care to lower-acuity settings. Early monitoring, detection, and intervention, as incented by the payment system, can lead to lower utilization and lower costs over a longer term. As every healthcare professional knows, slowing the progression of chronic diseases has the potential to delay or eliminate costly interventions and/or adverse events.

Many of the analytics products we reviewed for this report directly address this issue in a number of specific, narrowly defined ways. Most provide data to help reduce avoidable readmissions. Some can predict the likelihood of other kinds of utilization such as ED visits. Some go so far as to predict medical spending levels of some interventions, which would be valuable to payers and providers looking for better ways to identify patient cohorts that will respond favorably to lower-acuity interventions and programs.

ELECTRONIC HEALTH RECORDS AND CLAIMS DATA

EHRs and claims data are the fuel for analytics. Combining the two a big picture view of patient/provider interactions augmented with the sort of detailed clinical observations found in an EHR. Every vendor profiled in this report has experience combining EHR and claims data — in contrast to their HCO customers, many of whom do not have straightforward access to EHR data from other HCOs and/or may not have experience dealing with multiple payer or plan claims formats. Despite the promising state of vendor capabilities, combining these two sources of patient data comes with inherent difficulties.

- **Patients change insurers and providers on a fairly regular basis.** This makes piecing together a longitudinal view of patient data using EHR and claims data a time-consuming and arduous process. Blind spots are not always apparent, and claims data has a built-in time lag. Companies like IBM Watson Health with its MarketScan data can track patients across payers and plans. If all-payer claims databases ever become comprehensive, such offerings could also help fill in the data gaps in the patient record.

- **Payers and providers struggle with variable clinical data within and across organizations.** Inconsistent representations or expressions of clinical concepts and data elements make semantic intelligibility difficult. But no agreement on what a universal clinical terminology could or would look like exists today. Translating this variability into a single and unified representation of data remains a challenge.

- **Current solutions lack post-acute data or functionality.** While inpatient and outpatient rehab venues certainly suffer more from IT underinvestment than other venues, the need for access to post-acute provider data will increase as VBC proliferates. Even if bundled payments from CMS are eliminated, hospitals still need to scrutinize post-discharge care processes more closely if they are concerned with improving outcomes. For the same reason, post-acute providers will need better access to prior community and hospital care events.

- **Chart abstraction is time and resource-intensive.** Chart abstraction is also a fact of life for many provider organizations. While the vendors in this report automate the combination of EHR and claims data to the maximum extent, the need for different kinds of supplementary manual and automated extraction methods and jobs is still widespread. The goal for most vendors it to create the longitudinal patient record without resorting to such supplemental measures.

BEYOND EHR AND CLAIMS DATA: IT GOES GROCERY SHOPPING

The vendor solutions profiled in this report rely on an aggregated combination of EHR-derived and paid claims data. This combination allows providers to assemble the data needed to meet the monitoring and reporting requirements of value-based arrangements with payers. However, these data types don't provide a full picture of the risks. In past Chilmark Research reports on the analytics market, we have evaluated products based on their ability to include other data, including device and social determinants of health (SDoH) data sources. These additional data sources are not widely used in these products but we expect their value and utility to increase over time. For example, Caradigm and Geneia use SDoH to generate a score indicating patients' motivation to participate in a care-management program.

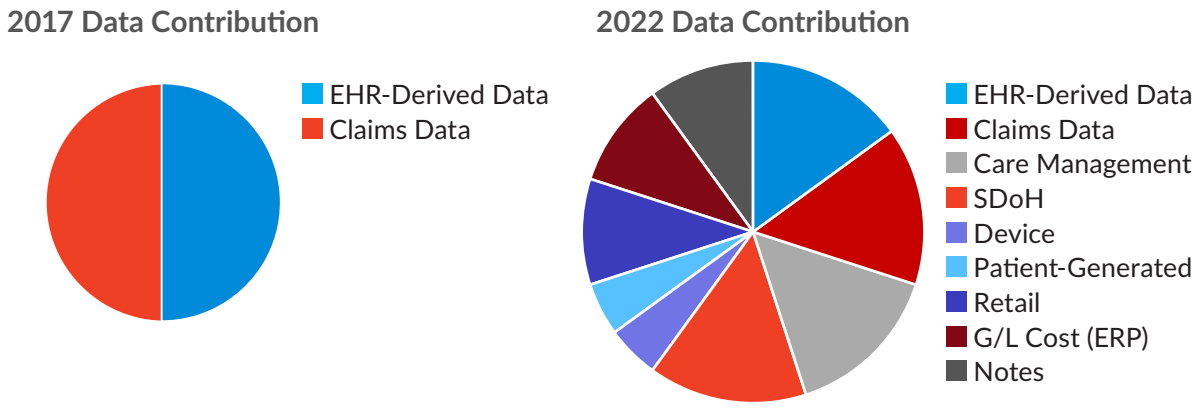

Figure 2.2: More Data Types and Higher Data Volumes

Data sources such as grocery-shopping history or home-town weather information are not used in any of the products in this report. Nonetheless, given the rising importance of risk-adjustment to reimbursement, SDoH data will ultimately provide a more complete picture of each patient's risks than past claims and EHR-based data alone. Grocery purchase histories could augment a clinical history to put health risks in a new light. Retail purchasing of over-the-counter medical products could point to undocumented healthcare risks, at either a patient level or a zip code level.

A wider variety of data types will also make cohort identification more effective. Any risk-based clinical program depends on an accurate and complete definition of the patients involved. Today's products rely on a population explorer or canned registry to define patient cohorts. HCOs are looking for more precise ways to identify patient subsets of their population. Providing this will involve more extensive use of internal data sources that may not be reflected in analytics data stores, such as clinician notes. It will also require more comprehensive data about patients from external data sources.

Data Type	Example	Potential Uses
SDoH	Retail purchasing history social media data	Risk scores, patient care, care management
Device	Glucose monitors Scales	Readmissions reduction, care management program, home healthcare
Free text	EHR notes Lab/pathology notes radiology notes	Quality metrics, coding gaps, risk scores, clinical research, use cases exist with minimal deployments
Patient-generated	Pain scale Fitness devices Satisfaction surveys	Patient care, risk, quality, care management

Data Type	Example	Potential Uses
Public data sets	Weather data Air quality data CDC data CMS Framingham Heart Study	Patient care, clinical decision support, clinical research
G/L Costs	ERP data (e.g., Lawson, SAP)	Minimal use but growing interest

Table 2.3 - Untapped Sources and Uses of Risk Information

FREE TEXT AND THE UNTAPPED VALUE OF CLINICIAN NOTES

Among the healthcare leaders we interviewed for this report, we found a widespread belief that valuable data exists in clinician notes. This free text presents a number of intriguing possibilities for analytics and could supplement structured data for multiple purposes. Most of the vendors in this report have an interest in further developing natural language processing (NLP) capabilities and some have embarked on a variety of exploratory efforts. These efforts are, for now, focused on finding uncoded risk factors, reimbursement opportunities, and care gaps.

Although none of the vendors in this report have any functionality generally available, NLP has the potential to help hospitals and health systems more accurately risk-adjust patients for optimized revenue performance. To understand true acuity at both a patient and population level, several indicators that affect reimbursement must be as accurate and complete as possible. These include RAF for Medicare Advantage patients, case-mix adjustment for managed care patients, and the CCM uplift for Medicare patients. Further, well-managed conditions need to be reflected in any metrics that can affect reimbursement levels. If such factors are not coded, reimbursement could be needlessly reduced..

Right now, HCOs routinely use chart reviews and abstraction to fill in these gaps. These manual methods are expensive and time-consuming. With the exception of several vendors that identify HCC coding gaps, few vendors can automate and ultimately replace much of the chart abstraction that goes into coding reviews. NLP has matured to the point where it is being actively considered as a tool that can help identify risks in free text that otherwise would require significant manual efforts to uncover.

Vendor Landscape: The vendor with the loftiest ambitions is Health Catalyst, which aspires to extract maximum value from clinical observations, regardless of how they are recorded. IBM Watson Health has also made early moves to apply its cognitive capabilities to free text. Currently, its Care Manager offering uses NLP on notes in the patient's record. Epic also extracts data from clinician notes and presents the result in its EHR. For now, NLP is has yet to deliver significant benefits to PHM or analytics efforts but we expect gradual improvement over the medium term.

DATA FEED QUALITY

Users want to understand the provenance of their data. Organizations are concerned about the integrity and fidelity of data flowing to them. Consequently, vendors are talking about data feed quality more than in the past. Before they clean, normalize, and aggregate inbound data, they need to be certain that inbound data transfers arrive on time, in the expected volumes, and in the anticipated formats. This step, critical to the quality of the

final applications, is partially or completely dependent on the performance of other organizations such as payers or other providers. These mundane operations are the first stages in a complex set of interdependent processing steps before data can appear in applications where users can analyze it. Typically, HCOs refresh their analytics data store from all sources according to a schedule. These elaborate preparations all add up to whether or not users trust the data in their reports and dashboards.

Vendor Landscape: While every vendor in this report pays attention to this issue, Arcadia, Epic, and Health Catalyst provide reports or dashboards that describe what is happening with data feeds. These reports often show where data feed quality issues impact specific measures, reports, or organizations and support efforts to begin corrective actions.

PUTTING REPORTS INTO PRACTICE

HCOs, seeking to establish a more uniform set of clinical practices as they pursue cost and quality goals, want to use data to educate clinicians about better ways to organize and manage care. The idea is to engage clinicians in the organizational task of building more effective and efficient clinical workflows.

Many vendors refer to their reports and dashboards as the basis for a "conversation" with individual providers. Invariably they are referring to individuals whose quality or cost performance needs improvement. Clinician receptivity to such conversations varies. The more astute vendors point out that analytics is great at identifying problems but that people in practices often struggle to address them.

The potential value of analytics in examining how practice variation affects health outcomes remains largely unexplored by all sectors of the industry. Analytics could also be used to look at large data sets to evaluate differences between alternative care pathways but this too remains in the realm of possibility.

NEW TECHNOLOGY AND NEW ANALYTICS

CLOUD DEPLOYMENT SLOWLY BECOMING ACCEPTABLE

HCOs in general have not embraced cloud computing with the same enthusiasm as other industries but this attitude is changing. Most of the products in this report are hosted by a vendor and offered on a SaaS basis. Cerner's HealtheIntent is a hosted-only option and has enjoyed strong demand. It has also attracted a few customers who use its Amazon Web Services (AWS)-based recovery option. Even Epic, long a devotee of on-premises software, now offers a hosted version of Epic Caboodle. Many of the smaller vendors host some or all of their offerings on AWS or Azure. Cloud deployment makes a lot of sense for analytics vendors because it offers more leeway to evolve products to market needs.

BEYOND RELATIONAL

As data types become more diverse, relational databases need not shoulder the burden exclusively. This workhorse technology has been the basis for analytics for decades but outside of healthcare, NoSQL alternatives are proving increasingly useful in analytics efforts. Graph databases, such as Neo4j or AllegroGraph, have some natural advantages describing and characterizing hierarchic data and could be a valuable tool for data discovery. Open-source database products like Apache Kafka are supporting streaming data sources and could play a larger role in processing HL7 data streams. These technologies offer scale and a focus on specialized data types.

Within healthcare, several vendors are experimenting with Hadoop variants, usually with some kind of SQL support or Elasticsearch as an alternative to MapReduce. However, adoption in healthcare lags other industries. Over time, healthcare will certainly benefit from support for more diverse data types, scale, and ease-of-programming provided by these fast-growing relational alternatives.

COGNITIVE COMPUTING AND MACHINE INTELLIGENCE

Whether it is called machine learning or cognitive computing, this much-discussed technology, often seen as an extension to NoSQL, has attracted a lot of attention. Many HCOs are keenly interested in specific predictions about utilization, course of illness, patient likelihood to adhere, and other discrete events. Others want to evaluate clinical process variation to find the care pathway that achieves a desired outcome. Still others are interested in applying this technology for chart abstraction to identify care and coding gaps. The point is that this technology promises to extract more value from structured and/or unstructured data.

Challenges to adoption include the availability of skills and data itself. Qualified data scientists and/or informaticists must have an extensive range of skills, including, but not limited to, data ingestion and normalization, application design and prototyping, data infrastructure management – all on top of a solid foundation of clinical knowledge and programming experience. HCOs that can dedicate programmers and informaticists to experiment with these technologies find that existing development frameworks are not especially programmer-friendly. Part-time programmers face an even steeper learning curve.

Machine learning also requires lots of data to adequately train models to the point that users trust the output. The availability of clean and usable data is often more predictive of success than the algorithms themselves. For now, only the largest HCOs, using several years of historical data, can pull together the volumes needed to build and refine models. Furthermore, the only way to truly assess utility is by actually applying a machine learning model in a live business or clinical process. It will take experimentation and iteration for this technology to deliver sufficient benefits to gain acceptance by clinicians and other healthcare users.

Vendor Landscape: Mindful of such challenges, several vendors are nonetheless pursuing machine learning technology. IBM Watson Health is undoubtedly the highest profile vendor in this space. But Cerner, Epic, Caradigm, and Health Catalyst have cognitive computing product plans not only for the development of algorithms or predictive analytics but also for processing source data to be used in more traditional analytics and reporting.

CONTRACT MODELING

The quality, cost, and utilization data provided in the products in this report provide a wealth of information that HCOs could use in their negotiations with payers. HCOs, operating under either or both FFS and value-based arrangements, need a way to forecast revenue based on their past performance. Historical data provides obvious value in helping determine whether a payer's proposed contract makes financial and operational sense.

As private payers introduce bundled payment programs, HCOs need better visibility into whether they can meet the required quality goals under terms that can vary from one payer to another.

The network utilization features in the products in this report are a reasonable start. Providers can see their historic performance for pertinent quality metrics, and cost and utilization targets. From payers' perspective, the currently available products do not have the ability to define cohorts precisely enough to include only members who fall within a certain set of parameters. None provide the ability to forecast performance with a modeled patient cohort. So past performance can be a guide but current products are not yet predictive enough.

Vendor Landscape: Of all vendors we surveyed, only HealthEC talks about using its products to support contract modeling, and only in a narrow sense. It uses its Out-of-Network reports to help its customers identify practices and physicians with overlapping patient populations and good performance on metrics. This information can be used in buy/merge/partner discussions. While not exactly contract modeling, it does support an important part of the analysis.

REVENUE CYCLE ANALYTICS

Revenue cycle management (RCM) products have evolved to meet the requirements of FFS. Their built-in analytics capabilities provide useful reporting for seeing overall payment trends. As care moves to lower-acuity settings, risk contracts have proliferated, and reimbursements have come under increased scrutiny, HCOs are looking to use analytics to address a crop of new and emerging issues and challenges to the revenue cycle.

HCOs that formerly cast a watchful eye on the cost of collecting reimbursement from all sources are now having to dedicate resources to more actively manage administrative costs. In response to a rising number of payment denials from private insurers, HCO have shifted their focus from simply recovering from denials to avoiding denials in the first place. Increased scrutiny of payment factors such as patient deductibles and copays, prior authorization, and proper coding calls for more robust analytics and reporting capabilities than current RCM applications provide.

Vendor Landscape: While all of the EHR vendors in this report provide RCM solutions, their analytics focus primarily on FFS concerns. The challenges of cashflow, collections, and sources of revenue will be complicated as revenue shifts to become more risk-based. Analytics technology will be a major contributor to addressing these challenges.

ADHERENCE ANALYTICS

Practicing physicians, fretting over quality goals, know that patient behaviors like exercise, medications adherence, diet, blood sugar testing, and sleep affect outcomes. There may be data that can point them to patients who might better adhere with a little additional focus. Such information could be patient-reported, recorded on devices, or derived from consumer datasets. Currently, few vendors provide any kind of information about patient adherence.

HealthEC and Conifer provide some data on patients' prescription refills. Medications adherence data is also available in some ambulatory EHRs, from pharmaceutical companies and pharmacy benefit managers (PBM). While medications adherence is arguably the most important form of adherence and the easiest to track, it is not alone. Ultimately, physicians will need to understand adherence along multiple dimensions for patients and caregivers. Adherence data could have downstream uses in comparing the effectiveness of different care pathways or protocols.

SAFETY ANALYTICS ACROSS THE CONTINUUM

Patient harm is the third leading cause of death in the U.S. and has also been shown to negatively impact HCOs' financial margins, readmission rates, and quality performance. Given the prevalence of adverse events within care settings, it is surprising that there are relatively few ways to predict the likelihood of patient harms of various types.

Part of the problem is the lack of data that directly reflects or reports incidents. There is no way to document many adverse events in EHRs, for instance. Some adverse events are sufficiently well known to merit standardize protocols. In the inpatient setting, there are quality metrics for tracking central line or catheter-related infections. At a systemic level, adverse event detection and reporting occurs in different ways, including incident reporting, chart review, malpractice claims, and some limited automated surveillance. But this variety of methods provides minimal insight into the scope or severity of the problem and less to facilitate the kind of data gathering that would help reduce adverse events.

To be sure, hospitals, post-acute care facilities, or any facility-based provider could better use the data they have on hand to control incidents, some of which are so well known and occur so frequently that they have their own acronyms. The long-term trend to move care to lower acuity settings will make harm-reduction an increasingly important topic in ambulatory settings as well.

In all of these settings, safety analytics could start by simply tracking instances of harm over time. As users become comfortable with the idea of seeing this kind of data, applications can become more sophisticated.

COMPARATIVE EFFECTIVENESS

Clinicians can be reluctant to adopt evidence-based practices if they believe that other sources of evidence are more credible. Data from actual clinical practice could help dispel dueling views of what constitutes the best evidence and analytics could be a good way to conduct research into the effectiveness of different clinical pathways. The combined data found in EHR and claims, with the possible addition of clinician notes, can deliver a better understanding of clinical pathway effectiveness. Machine learning techniques have become more adept at sifting through these data stores and offer the potential toe evaluate more different alternatives. Currently only the most innovative provider organizations have experience with this but most HCOs would be able to use a productized solution.

HOSPITAL ANALYTICS

Although we do not cover hospital-oriented analytics in this report, several vendors have extensive portfolios worth mentioning. Their products address many of the cost, utilization and quality issues discussed in this report and also include budgets, cash collections, and other revenue cycle related reports and analysis. Cerner, Epic, and Allscripts – major hospital EHR vendors – have substantial products that focus on Joint Commission and other relevant quality metrics, clinical transformation, and maximizing the effectiveness of internal processes. Among the independent vendors, Health Catalyst also has similar offerings.

G/L COST ANALYTICS

An important missing element in PHM and analytics generally is the impact of change on the cost structure of the organization. Conventional financial analytics tools focus on budgetary performance and cashflow. Linking the costs reflected in the general ledger (G/L) to claims and EHR data is a complex data problem that none of the vendors in this report have accomplished broadly. For now, few provider organizations have needed or asked for this level of understanding.

Understanding how much it costs to improve quality, increase reimbursement, or decrease utilization should be a factor in any HCO's consideration of payer contracts or provider affiliations. Retrospectively, it could be used to understand the cost of pursuing given quality levels. If one set of providers consistently meet their quality objectives at high G/L cost, clinical leaders may decide the pursuit is counter-productive from a business perspective. On the other hand, if they achieve quality goals at low G/L cost, they may have the basis for a new set of best practices. This kind of information could also be used retrospectively to redesign clinical and administrative workflows and processes.

Benchmarking G/L cost data, as impossible as it sounds, would be a blockbuster application. If organizations had some basis for comparing their G/L costs to peer organizations, it might help the industry crystallize its thinking about a more balanced view of revenue and care quality. Any serious discussion about bending the cost curve, meaning the medical spending curve, should include some analysis of the actual costs incurred by providers. A realistic first step in this direction might be for vendors to support intra-organizational G/L cost benchmarking. Health Catalyst is a pioneer among the vendor in this report. Its Clinical Operations Resource Utilization System (CORUS) Suite will allow providers to relate G/L costs to reduce cost, utilization, or quality metrics. It will also provide a set of a pure G/L cost analytics.

CARE TRANSITION GAPS

Existing products don't show how care coordination breaks down across a network or community. Referrals that generate no appointments, unfilled prescriptions, missed appointments, patient education that never happens, documentation that never arrives, these are examples of missed care opportunities. All are characterized by the presence of data in one organization and the absence in another.

Without a system to track these coordination lapses, it is all too easy to attribute breakdowns in care to other providers. Care coordination analytics could help at two levels. Retrospectively, analytics could help identify gaps in coordination that have the highest impact on quality or utilization. It could describe whether the gaps were systemic or isolated to specific combinations of care partners. Prospectively, analytics could help predict provider and patient adherence to interventions that require cross-organizational coordination.

ANALYTICS DEVELOPER SUPPORT

Today, DevOps, cloud computing, microservices, containerization, agile development, and open APIs are making it possible to better integrate data from disparate silos into more unified workflows. Many of these technologies and ideas offer potential solutions to the functionality and usability problems of healthcare's various systems of record and systems of engagement.

HIT analytics have traditionally resulted from a monolithic approach to development. The fruits of this labor – large catalogs of reports and dashboards – serve many valuable purposes for a range of users and can be a revelation for clinical and administrative users. On the other hand, the size of these catalogs can be daunting for many users, restricting the utility of the underlying data and analytics. Moreover, the metrics and analytics that make up these reports are of limited use to other applications.

Microservices

Distinct application modules responsible for a single operation within a larger application ecosystem – have become an important way for enterprise and consumer developers to think about applications. They support code reusability in a way that monolithic and prior service-oriented approaches to application development did not. No formal standard or definition of microservices exists, but certain characteristics mark the development style. The approach delivers a collection of independently usable small functions distributed over loosely coupled organizations and computing environments. IT organizations access microservices through APIs wherever they reside: on-premise, remote-hosted, cloud-hosted, or across hybrid environments.

OPEN APIS

Open APIs are fundamental to better support for developers. FHIR is the obvious candidate for an industry-wide standard to underpin open APIs. One concern with the FHIR standard is it may have raised unreasonable expectations. It is unlikely that FHIR, by itself, will solve all the problems of health data interoperability.

FHIR, as currently conceived, is focused on something less than what the market will eventually need. The meaningful use common clinical data set and the use cases currently under contemplation by FHIR's standards developers need to be supplemented with a range of APIs that help programmers construct user interfaces, build better workflows, and access advanced functionality. FHIR provides easier access to patient clinical data but will likely need to be enhanced by other APIs to provide a truly comprehensive set of APIs.

Outside of informaticists or IT personnel in AMCs and large IDNs, FHIR isn't much more than a boilerplate line in RFPs or requirements documents. Most of the major HIT vendors have ratified FHIR in various ways. Prominent EHR vendors have announced programs that point to FHIR as a way for developers to access EHR-resident data. Several of the vendors in this report have announced that they intend to provide some level of support for FHIR. But vendor deliverables remain modest as of mid-2017.

ANALYTICS DEVOPS USE CASES

Benchmarking is an example of potential use cases for more modular or microservices-based analytics. Not all physicians are receptive to cost, quality, or utilization comparisons and such benchmarks are not universally available in the current crop of analytics products. Moreover, some vendors can benchmark quality and costs but not utilization, or vice versa.

However, if a set of cost, utilization, and quality benchmark data or algorithms were available via API calls, developers could enable EHRs to deliver this data tailored specifically to the physicians who request it. Over time, developers could experiment and make this data more palatable to skeptical physicians.

Another example could be care quality and coding gaps. Conventionally, gaps are identified in a report that someone reviews for corrective actions. The practice manager prepares each day's appointments based on this report.

Vendor Landscape: Ambulatory EHR vendors such as athenahealth, Cerner, eClinicalWorks, and Epic are in a better position than most to flag care gaps in EHR workflows. If gaps identification were implemented as microservices, they could be more widely leveraged than an entry in a report. Pharmaceutical companies or PBMs could offer adherence-related data or predictions to EHR vendors or to providers directly. Scheduling systems could receive data via a webhook-style API and incorporate the data into decisions about appointment length. Patient flow applications could use such data to decide staffing levels.

THE PROMISE OF REUSABILITY

Reusable code has so far eluded healthcare but microservices could change that. Every analytics vendor has developed what amounts to a unique algorithm for every quality metric they support in their portfolio. A vendor could offer the ability to deliver these metrics to the application of the HCO's choice over the network. The vendor could specify what data its API needs and describe how the resulting metric would be delivered. Vendors could even specialize in metrics based on clinical topics or payment programs.

Vendor Landscape: Several analytics vendors have product plans consistent with this approach – notably Cerner, Health Catalyst, and IBM Watson Health. Cerner and Health Catalyst have been talking about the potential of algorithms for a few years. Both intend to package analytics with data or functionality on a stand-alone basis. IBM Watson Health has similar plans but intends to use its cognitive computing capabilities. At this point, no analytics vendor has developed a fully fleshed-out analytics algorithm offering. Other, less well-known companies are pursuing some aspects of this approach, including Apervita, which hosts HCO data in the cloud, applies algorithms to that data, and makes the results available to the HCO via REST APIs.

FROM AGGREGATION TO PROVISIONING

One of the hallmarks of modern program development and integration is automation. Every vendor covered in this report is adept at sourcing, ingesting, cleansing, normalizing, and aggregating data for use by their applications. Each relies on ETL tools and techniques to accomplish aggregation and deal with EHR-derived and claims data. However, manual chart abstraction, even from structured data sources, remains a significant aspect of healthcare analytics.

Building and maintaining aggregated data stores is time- and resource-intensive. Implementers have to understand the intricacies of each data source. Updating these data stores with new data from systems of record requires a daunting level of timing and number of dependencies. In most cases, the resulting analytics data stores tend to be used for a finite set of applications. This purpose-built aspect will hold the field back unless vendors find a way to automate the building of these data stores.

On-demand provisioning of data for analytics along with integral synchronization from source data is a tall order at this point. The industry will ultimately have to introduce better tools for creating analytics-ready data stores despite the terminology complications and variability that bedevil healthcare data. The increasing popularity and acceptance of newer business intelligence (BI) tools is driving the need for more data and faster cycle times. Making data provisioning more realistic for user organizations could certainly help IT departments do more with less.

ANALYTICS PRODUCTS AND VENDORS

Chapter 3: Analytics Products and Vendors

VENDOR TYPES

We profile eighteen vendors this year (Table 3.1). To be included, a vendor must have at least three customers live on their solution and $1 million in revenue from their analytics solution suite. All of the vendors in this report have capabilities that support the analytics needs of PHM efforts.

The Advisory Board Company	Epic Systems Corporation
Allscripts	Forward Health Group
Arcadia Healthcare Solutions	Geneia LLC
athenahealth	Health Catalyst
Caradigm	HealthEC
CareEvolution	IBM Watson Health
Cerner Corporation	MCIS
Conifer Health Solutions	Optum
eClinicalWorks	Wellcentive, Inc.

Table 3.1: Vendors Profiled

By and large, vendors' analytics approaches reflect their experience in the market.

EHR vendors tend to offer robust support for the venues where they sell EHR products. As the path of least resistance for many HCOs and the vendors closest to workflows, EHR vendors are seen as the incumbents for a range of HIT application needs, including analytics. Within this group, Ambulatory EHR vendors focus on the specific needs of outpatient practices. Their support for practice-based quality and care gaps, cost and utilization is usually in lockstep with CMS and private ACO arrangements.

HIE/CNM vendors have particular expertise developing a cross-community clinical and claims record. Several of these vendors have built exchange networks for public exchanges and for healthcare enterprises. Their expertise with clinical data aggregation and normalization is strong. While this expertise does not always deliver a data resource that supports analytics well, it is a core skill that providers can leverage.

Payer-owned or oriented vendors tend to focus on the applications and data that payers value. These vendors are adept at identifying and using risk as it relates to medical spending in support of utilization management.

Independent vendors have a little more leeway to pursue market- and customer-focused product strategies. Independent vendors are less beholden to customers and have the flexibility to develop more innovative products that generate more revenue. Unsurprisingly, these vendors, as a group, tend to have strong product offerings

We have organized the profiled vendors into these four categories (Figure 3.1). Several vendors span categories based on their market experience or technology. IBM Watson Health, for instance, has product experience in clinical analytics from its Explorys acquisition and payer data expertise from its Truven Health acquisition. The EHR vendors, Cerner and Epic have a range of offerings to support interoperable health data for HIE/CNM efforts. Several vendors, such as Arcadia and CareEvolution, are good at EHR data and have a strong base of payer customers.

EHR	HIE/CNM	Payer	Independent
> Allscripts	> CareEvolution	> Arcadia	> Advisory Board
> athenahealth	> Cerner	> CareEvolution	> Arcadia
> eClinicalWorks	> Epic	> Conifer	> Caradigm
> Epic		> Geneia	> CareEvolution
> Cerner		> IBM Watson Health	> Forward Health
> MCIS		> Optum	> HealthEC
			> Health Catalyst
			> IBM Watson Health
			> Wellcentive

Figure 3.1: Analytics Vendor Types

CURRENT PRODUCT CAPABILITIES

Analytics solutions to enable population health management (PHM) are maturing but not all HCOs are well informed about their options. Many HCOs either do not have or cannot spare the skill and expertise required to implement an analytics solution given the pressure of competing priorities and resource constraints.

This chapter aims to help HCOs overcome some of those hurdles by comparing the analytics solutions offered by the most prominent vendors in the market. To set the stage, Figure 3.2 depicts our high-level conclusions about the product capabilities and vision demonstrated by the analytics vendors covered in this report.

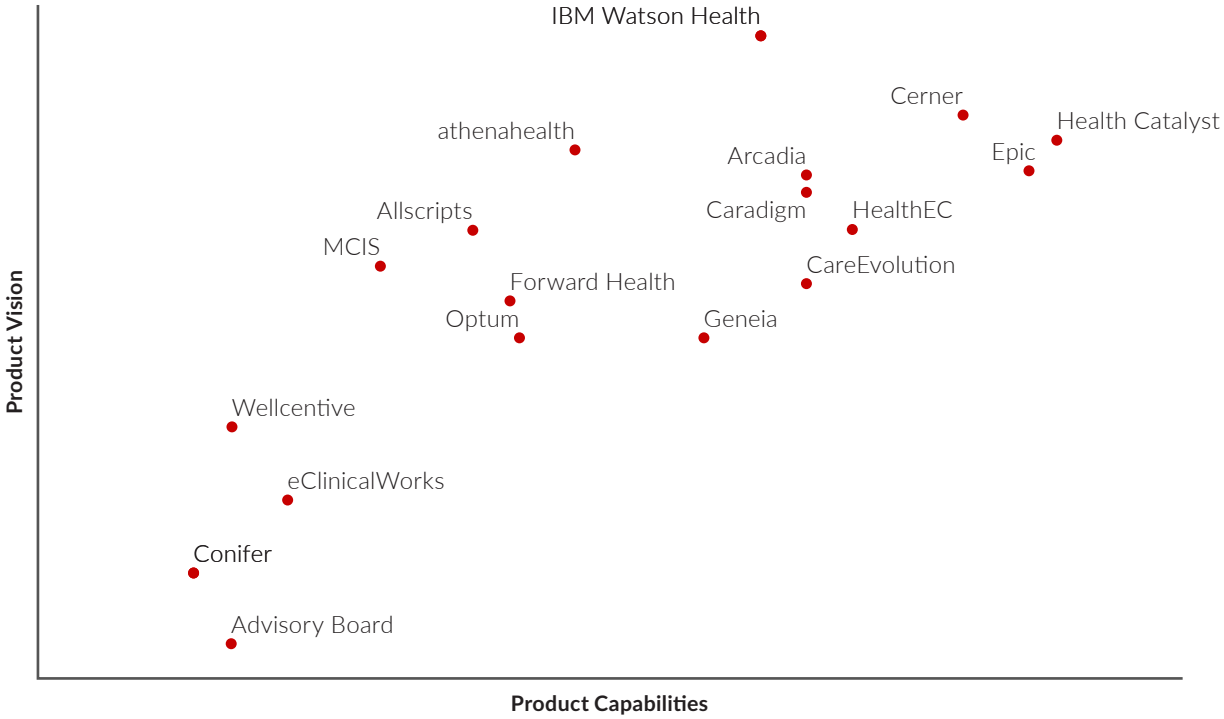

Figure 3.2: Vendor Product Capabilities vs. Product Vision

RECENT VENDOR PRODUCT ACTIONS AND DEVELOPMENTS

In the last year, most vendors have evolved their product sets. Some common changes have included better user interfaces, functional enhancements, and performance improvements. Usability has been as much of an issue with analytics as it has been with EHRs historically. (Table 3.2)

Vendor	Major Changes Compared to One Year Ago
Arcadia	> Backend moving to Hadoop/Spark and across-the-board factoring > Migrated to AWS > Bulk patient outreach for care management > Registry has at-a-glance view of coding opportunities for quality performance and risk adjustment
athenahealth	> Stronger focus on using analytics to get practices to adopt good care management > Improvements in quality metrics coverage > Developing services partners
Caradigm	> Standards-based (QDM and HQMF) Advance Computation Engine > Risk-adjusted some quality measures > Incorporates CAHPS data > New reporting options
CareEvolution	> Analysis of reasons for falling/rising risk scores > Analysis of relationship between risk scores and utilization over time
Cerner	> More data types including air quality and food sources > BI data model synchronized to HealtheIntent data model > Most extensive use of Tableau > Expanded FHIR support for data model > More configuration and data mart administration tools > More canned content/algorithms for risk scoring, normalization, quality measures > Stronger linkages with registry product (HealtheRegistries)
eClinicalWorks	> New HTML5/Angular front end > Analytics is cloud-based for all customers > Minimal functional change for users
Epic	> Added out-of-network utilization > Improved user interface
Geneia	> Expanded use of EHR-based data
HealthEC	> Expanded feature set with stronger linkage to care management application > Highly granular with improved presentation of detailed data
Health Catalyst	> Early advocate of using G/L cost data in analytics > Healthcare.ai initiative pushing machine learning ideas into the mainstream
Wellcentive	> Acquired by Philips > Added clinical data to LPR

Table 3.2: Recent Product and Market Actions

VENDORS CONSIDERED BUT NOT PROFILED

Having talked with a large number of vendors to prepare this report, we filtered out those that either still need time to mature or that approach analytics with a different focus than most of the profiled vendors. Among the vendors that we chose not to profile, three are nonetheless worth mentioning because their technologies reflect the most modern ideas of distributed computing. Apervita, Ayasdi, and Lumiata offer cloud-hosted, REST API-enabled products that can be adapted to a range of possible use cases and target applications.

APERVITA

Apervita embraces modern ideas of distributed computing and development with a multi-tenant PaaS. Data is brought into the Apervita cloud and reshaped on demand for the applications that use it. At run-time, Apervita binds raw data to a terminology that makes it computable. Connections to data are portable in the sense that connectors can be reused across multiple applications or ported for organizations. Analytical models share this idea of portability, as Apervita customers develop applications that execute analytics that are reusable for multiple purposes.

Apervita provides an analytics workbench that supports simple and complex development needs. It is aimed at analysts who may not be skilled programmers but who understand the underlying business or clinical needs and workflow. Product managers, medical informaticists, or care pathway specialists can make effective use of Apervita's workbench. While Apervita offers visualization tools, the company supports multiple consumption models for the resulting data and insights. Using web services, it has adapters to different delivery end-points. Results can be presented in-workflow in an EHR, on a BI dashboard, or in Excel, for example. It supports that kind of extensibility and localization that addresses the problem of disparate workflows.

Customers can share what they build, whether in the form of applications, analytic models, or data results, either commercially or for free. The company has a variety of different customers. One example is a state-based hospital association that developed data models and analytics that predict the likelihood of readmissions. The association makes this available to member hospitals who use it for readmissions reduction programs. Another example is a health system that uses Apervita in inpatient settings to predict the likelihood of decompensation. Rapid response teams and triage nurses use this to develop programs and interventions to stabilize the identified patients. The customer that developed this application relied on third-party clinical evidence to support the prediction's underlying algorithm.

Apervita's business model is different than most analytics vendors. Customers pay for what they use in computing and data resource, with the scale benefits of cloud computing costs.

AYASDI

Ayasdi has a different way to segment populations and build models for comparing alternative care pathways, which it describes as detailed sequence of interventions. Instead of the conventional approaches to segmentation (see table 2.1), Ayasdi uses machine learning to evaluate combinations of EHR, claims, and other patient data to discover subpopulations in an unsupervised manner without user bias. A user directs the application to discover groups of patients based on outcome-related metrics such as lowest episode cost, length of stay, or number and type of utilization events.

Once a population has been isolated, clinicians directly compare different care pathways, with an eye to the optimization of one or more outcomes. Ayasdi evaluates all patients with the target outcomes and computes the specific care pathway that produces the best outcome. It identifies what is different about that particular pathway compared to those derived from other groups of similar patients. Users can then model changes to the care

pathway to see how substitutions or sequencing changes alter the outcome. This allows HCOs to understand how best to adjust care processes using their own patient data. This tool is available as a web-based application utilizing REST APIs.

This application of machine learning technology provides a direct way to analyze differences in care delivery patterns for the purposes of optimizing care pathways that goes well beyond reporting on clinical variation. It helps tease out the factors that contribute to favorable outcomes that would be difficult for most clinicians to uncover on their own.

LUMIATA

Lumiata works with health plan organizations and their provider networks to help them better manage clinical, financial, and patient engagement risks. It first applies machine learning to data preparation (combining disparate sources of data, cleaning and standardizing into FHIR format, and creating an LPR). It then enriches the LPR with medical knowledge and models to predict how the health of a patient or population will change over time. Finally, it generates chase lists to support targeted interventions that can prevent or slow disease progression, manage clinical and financial risk, and deliver better outcomes.

Lumiata applies machine learning to claims and clinical data for a range of quality, cost, and utilization management purposes. It uses graph technology to represent knowledge gleaned from PubMed and other evidence sources to develop roughly 250 different pre-trained models. Lumiata builds a FHIR-native LPR consisting of claims, EHR, and other available data sources. The models are trained using this patient record. The upshot can be a risk score that predicts the progression of discrete or comorbid disease states. The product supports these predictions with clinical reasoning to enable organizations to engage physicians in a clinically-based conversation.

Lumiata's customers include organizations that manage payment risk, including sizable health plans and ACOs. In one instance, it contributed to a 48% increase in an ACO's quality performance. For risk scoring, it believes it can deliver far more accurate scores than conventional, industry-standard methods. Its implementation model allows the company to deliver lists for other applications, expose data via APIs, or build analysis into existing workflows.

The company wants to apply its technology beyond just clinical and financial risk. Lumiata is actively exploring the use of Social Determinants of Health (SDoH) data to help its customers better engage patients. Understanding the propensity of a patient or a population to adhere to interventions could help make PHM programs more effective. In addition, this kind of data can also supplement the clinical and claims record. Depending on the cohort and the condition, 20-30% of people will have no meaningful data in the record about a condition prior to its onset and diagnosis. Additional social data could help impute information with predictive value that could help delay or avoid such situations.

PRODUCT CRITERIA

We evaluated the profiled vendors' solutions in three categories of functionality: Analytics Data Store Creation and Access, Analytics and Insight, and Workflow and Engagement. The following section provides an overview of the capabilities in the market as well as commentary on how vendors are addressing market requirements.

ANALYTICS DATA STORE CREATION AND ACCESS

Cohort Definition

All of the products in this report have pre-defined filters for patient data. Conventionally called a "population explorer", these filters are the primary way for users and analysts to perform clinical, PHM, FFS, and other forms of data discovery. Many products also have pre-defined registries of sub-populations, usually based on specific health conditions. The goal is to let users segment a population based on certain criteria and then use that cohort data for other purposes. While most vendors support the ability to download these cohorts, Health Catalyst's product lets users create separate data marts based on these cohorts.

Feature Category	Common Features	Leading Vendors in Category
Cohort Builder	> Demographics > Disease > Results > Risk Score > Admit or ED Visit	Arcadia Caradigm CareEvolution Epic
Registries	> Conditions > Customer-defined	CareEvolution Cerner IBM Watson Health

Table 3.3: Cohort Definition Features

Leading vendors tend to offer more filters and those filters are applicable in multiple contexts within the application. Nonetheless, the current capabilities have limitations. The available filters may not always allow users to be as specific as they need to be, though analysts can use query tools to compensate. Increasingly, HCOs want clinical users to be able to build cohorts based on complex combinations of conditions, medical history, risk, and other factors (Table 3.3). As the number and variety of value-based contracts increases, this requirement will grow in importance.

Care management demands precise cohort definitions. HCOs are implementing care management programs that tend to cluster around risk and disease categories. But as these programs tackle complex co-morbid patients and bundled cohorts, organizations will need to further segment these cohorts and allocate patients to the most effective programs. Clinicians and care managers will want to segment and further sub-segment populations as their care management program progresses and they need to manage additional patient cohorts.

More precise cohort definitions could also improve reimbursement. Under FFS, HCOs want to uncover potential revenue opportunities. For PHM or other risk-based contracts, it is critically important to optimize risk adjustment. Either way, cohorts must be as complete as possible to capture revenue and risk opportunities. HCOs will also need complete cohorts to be able to define cohorts with near 100 percent accuracy.

Application of Cohorts Across a Product Set

Another aspect of the cohort definition challenge relates to how broadly a cohort can be used in different parts of the overall solution. In many cases, populations or registries defined for the purposes of quality reporting or care gaps are not always available for cost and utilization reporting, and vice versa. No product on the market today can connect costs and utilization to quality. HCOs cannot retrospectively see how a change in quality per-

formance affected utilization metrics, never mind predict how a change in quality performance would affect utilization prospectively. Providers justifiably want consistent cohort definitions, consistently applied, and available to any application.

ANALYTICS AND INSIGHT

Quality and Care Gaps

An important objective of existing clinical quality and care gap applications is to help HCOs maximize either value-based payments or traditional FFS reimbursements. ACOs measure quality and fill care gaps to optimize payment under MSSP or Pioneer ACO rules. Other HCOs qualify for increased payments under different P4P and FFS programs by meeting quality metrics. Revenue assurance remains a high priority for most HCOs and these products provide a way for them meet that goal by monitoring performance so they can optimize revenue.

With several exceptions, the products in this report are not used directly to report data to CMS for the purposes of existing quality reporting programs. They provide a way for clinicians to understand and monitor performance on an ongoing basis as opposed to an annual or quarterly basis but no vendor is fully prepared to support MIPS or APM performance monitoring. In one example of how vendors are preparing to bridge that gap in capabilities, IBM Watson Health has stated its intention to build dashboards to help HCOs compare which quality metrics under MIPS can lead to optimal reimbursement based on their own data.

Feature Category	Common Features	Leading Vendors in Category
Quality Metrics	> Drilldown to individual provider or patient > MSSP and PQRS quality metrics > Explanation of measure	Caradigm Epic
Care Gaps	> Evidence-based care gaps > MSSP care gaps	Arcadia athenahealth CareEvolution

Table 3.4: Quality and Care Gaps Features

In general, today's analytics products support a collection of evidence-based quality metrics and their associated care gaps. Every vendor has a slightly different inventory of quality metrics; HEDIS, MSSP, MU, and PQRS quality objectives with associated care gaps are the most popular. A growing number of vendors provide HCC coding gaps.

The most common way to present this information to users is with a drill down into an organization hierarchy with performance at each level. Many vendors provide an on-screen explanation of the quality metric, including numerator, denominator, exclusions and the authority that established it. Physicians compare their performance to a payer-established metric. Less common is direct comparison of an individual's performance against peer doctors in the same or different organizations, although supervisory clinical personnel can see such comparisons within an organization. For care gap information, users can drill down into a list of non-compliant patients within an attributed panel. Supervisory users see this data at the individual clinician or panel level.

The differences between vendors are often the result of their data expertise and history. Vendors with early payer experience may be better at claims-based quality reporting while vendors with early provider experience may be better at EHR-based quality reporting. The reality of the current market is that quality reporting and care-gaps identification requires well aggregated EHR and claims data combinations.

While MACRA promises to ease the reporting burden on many clinicians, the absolute number of quality measures continues to climb. For now, programmers and analysts define and deploy quality metrics. Over time, users will need to be able to accomplish this themselves in order to meet payer requirements or adhere to organization-specific quality programs. A handful of vendors provide a metrics builder suitable for use by super-users, including Arcadia, Allscripts, Geneia, and Wellcentive. Health Catalyst's roadmap includes support for a user-focused metrics builder.

Feature Category	Common Features	Leading Vendors in Category
Bundles	> BPCI quality metrics	Health Catalyst HealthEC

Table 3.5: Bundled Payments Support

Most vendors' quality-based reporting and analytics portfolio provide little to no support for bundled payments. Broadly speaking, few established quality or cost benchmarks for care management programs span venues and organizations. Of the vendors in this report, Cerner, Epic, Health Catalyst, and HealthEC offer some support for BPCI quality metrics. Many of the other vendors' roadmaps include better use of episode groupers that could translate into better support for reporting on bundled arrangements generally. Whether bundled payment arrangements will continue to be created and rolled out by payers is uncertain.

The emphasis on clinical quality reporting by payers is controversial among providers. Front-line physicians and clinical leaders are not convinced that filling care gaps or hitting quality metrics will increase quality. They see many of the metrics as more indicative of process compliance than care enhancing and largely irrelevant to their practice. Clinicians may also be reluctant to adopt another potentially burdensome IT tool that distracts from patient care out of concern that any productivity gained by reducing the need for clinical documentation under value-based care could be lost to increased time spent on documenting quality.

Care Gaps

Existing products help HCOs meet quality requirements under ACO and similar contracts. But HCOs pursue quality goals for other reasons as well. They ensure that the pursuit of lower costs does not jeopardize appropriate levels of diagnosis and treatment. They also help deliver better care. HCOs also strive to meet quality goals for accreditation or certification requirements.

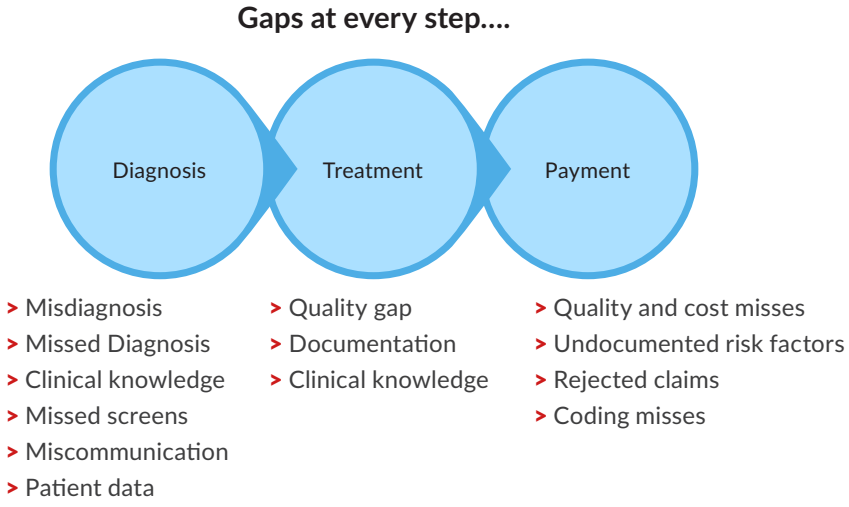

Figure 3.3: Gaps Analysis Scope

The products described in this report use a wide array of evidence-based quality metrics from many sources to find care and coding gaps. They address a subset of the potential gaps that can occur as patients move through the healthcare system.

While establishing a focus is a valuable first step, the problem of gaps is greater than the current capabilities can address (Figure 3.3). All patients, from birth to death, can be conceptualized as a series of addressable gaps. For healthy patients routine screenings that never happen constitute gaps in care. Healthy patients with indications for developing a chronic condition would have a more diverse and abundant set of gaps. The number and type of gaps increases with age and patient acuity. Analytics could play a greater role in identifying and consolidating these gaps and informing the right clinician or application.

Coding Gaps

Hierarchical condition coding (HCC) adjustment for the purposes of optimizing a patient's risk adjustment factor is more front-and-center than it was last year. Of the vendors in this report, seven provide some form of HCC coding gaps reports. (Table 3.6) Ambulatory EHR vendors and the independent vendors with lots of office-based physician customers are more likely to support this functionality than other vendors. Most of the remaining vendors include this feature on their roadmaps.

Vendor	CMS	HHS
Arcadia	✓	
CareEvolution		✓
Cerner	✓	
eClinicalWorks	✓	
Epic	✓	✓
Health Catalyst	✓	✓
MCIS	✓	✓
Wellcentive		✓

Table 3.6: HCC Coding Gaps

The workflow implications of this reporting capability are twofold. First, physicians need this information in their day-to-day workflow in order to capture the opportunity for an evaluation and management (E&M) event while the patient is in the exam room. These products identify the opportunity but have a more limited scope to deliver on it because most deliver the notice to a portal. Second, coders have a potentially significant role, in that they could use notification that E&M codes are needed and code for the activity so long as there is a factual basis in the documentation.

Cost and Utilization

Across all vendors, cost and utilization reports represent a substantial proportion of available functionality. These features are intended to help HCOs understand and manage spend and utilization (events and encounters) data. Broadly, vendors with experience working with payers and varying claims formats tend to have slightly more feature-rich offerings for analyzing cost and utilization.

The solutions in this report provide a wealth of information on costs. At the highest level, costs are broken down into medical and prescription spending. There are several ways to express these costs with the most common being total or per member per month (PMPM) spending. Other common breakdowns are by condition or by payer. Most provide a graphic representation of spending over time.

For utilization, most of these solutions provide data on hospital admissions and ED visits, reliable indicators of high levels of spending. Some will go a step further and identify hospitalizations and ED visits that could have been avoided if data in the clinical record had triggered an appropriate intervention. Some vendors then use this data to extrapolate goals or potential benchmarks for the next year. This focus makes sense given that these are costly interventions and rightfully demand attention. It is slightly less common for analytics products to provide information on readmissions. When it comes to distinguishing between avoidable and necessary utilization, few vendors have been able to provide this kind of information.

To date, no vendor offers functionality that helps identify other forms of excess utilization (e.g. imaging, lab, or antibiotic overuse, polypharmacy, prescription seeking). We expect that HCOs will be seeking better ways to categorize and manage overutilization along with more detail on the relationship between outcomes and utilization.

Care Management and the Analytics Vendor

Every product in this report can contribute useful insights that could help HCOs establish and run care management programs. Many of them are used to identify a target population based on certain criteria (high risk, rising risk, likelihood of adherence to a care management intervention, conditions, care gaps, etc.) and refer patients individually or in bulk to a care management program.

Feature Category	Common Features	Leading Vendors in Category
Costs	> Total Medical or Rx > PMPM by provider or provider group > PMPM by payer	CareEvolution Epic HealthEC IBM Watson Health
Utilization Categories	> Hospitalization and ED visits	Forward Health HealthEC
Out of Network Utilization	> OON spend by panel > OON spend by physician > OON events by visit type	athenahealth Forward Health Health Catalyst

Table 3.7: Cost and Utilization Features

The variety of different goals and approaches to care management (e.g., disease specific, complex comorbid patients, risk buckets, risk bands, by practice) makes it difficult for analytics vendors to be all things to all people. Roughly half of these vendors provide a companion care management product and a number of these solutions were evaluated in our report: 2017 Care Management Market Trends Report.

The EHR vendors, for example, usually offer care management functionality inside their EHR. Most vendors can provide some level of professional services to support HCOs as they establish care management capabilities. Some go one step further by augmenting their care management products with clinically credentialed care managers or care navigators. Several vendors, including Wellcentive and Caradigm, believe that the clinical expertise needed for care management programs should be a core competency of the HCO and urge their customers to keep this activity in-house. Other vendors are more neutral on this topic.

While there may be some exceptions, most provider organizations are not well equipped to develop analytics that evaluate the effectiveness of care management on their own. There really is no simple way to tease out the effects of care management on quality, costs, and utilization. There are also a number of different organizations that can offer care management technology with clinical services, including payers, payer-provider collaborations, dedicated care management vendors, and EHR vendors.

Risk and Risk Scores

Few clinicians can look at a raw risk score and extrapolate actionable information about a patient or population. Risk scores based on spending have traditionally been of most use to actuaries and payers. As provider organizations assume risk in their contracts, however, many clinicians are getting a crash course in risk scores and their

uses. Most clinicians may not understand that risk scores are derived mostly from claims data and are often a better indicator of financial risk. Clinicians also are unlikely to understand or be interested in how risk scores are calculated and how they are best used. They are more receptive to longitudinal rather than point-in-time risk scores. In short, vendors should be developing role-based and context-driven risk identification and presentation that clinicians can use at a patient or cohort level rather than point-in-time prospective or concurrent risk scores.

To add true value in a clinical setting, risk scores need to be tailored to the way clinicians think about differential outcomes and clinical variability. For instance, in some circumstances an elevated risk score could be a result of an anticipated increase in low cost utilization. The same absolute risk score may also point to higher utilization that presages serious and costly medical problems. Different users might look at the same risk score from different perspectives. Risk scores can also challenge physician's gut instinct about patient risk.

Feature Category	Common Features	Leading Vendors in Category
Risk Scores and Predictions	> Hospitalization Risk > Prospective Risk Score > Concurrent Risk Score > HCC RAF > ED Risk	Caradigm CareEvolution HealthEC Wellcentive

Table 3.8: Risk Features

While many of these vendors provide general risk scores (i.e. prospective, concurrent, etc.), clinicians seem more interested in specific predictions (probability of death, probability of hospitalization). Many vendors provide hospitalization or re-hospitalization risk, fall risk, or ED visit likelihood. In general, concrete risks are more instructive and useful than general presentations of risk. While risk scores are a good start, users will be looking for a range of more specific predictions.

BI Tools Continue to Add Value

Almost every product we reviewed for this report allows users to download data for subsequent analysis in Excel or using a BI tool. Practitioners of data warehousing and BI consider Excel the poorest choice for most analytics purposes. Nonetheless, users continue to lean on Excel despite the admonitions of vendors and internal HCO IT staffs.

To remedy this, virtually every vendor in this report offers traditional BI tools such as Business Object or IBM Cognos. The newer generation of BI tools from Tableau and Qlik are, in most cases, also supported. These tools are proving their worth in data discovery, reporting, and visualization. As good as the newer tools are, they require product knowledge and data skills that the majority of clinical users lack. These tools have significant appeal for some users. Even the smallest practices often have users who want access to powerful reporting tools. As the number of clinical and business users increase, the volume of requests to IT for help with report building also increases. Several vendors offer separate report-building service offerings.

Further, these tools offer the opportunity for enhanced control by users at the expense of report and dashboard proliferation. Analysts and super-users often build large numbers of canned reports or dashboards geared to the specific requirements of a variety of users. Many HCOs have told us that report proliferation is counter-productive. Some vendors acknowledge this issue and have pulled back from building more BI tool-based reports and instead have added more functionality in their front-ends.

Benchmarking Performance

While many physicians consider benchmarking data inaccurate, incomplete, or irrelevant, HCOs are increasingly interested in discovering how practice variation impacts outcomes. To this end, they have several benchmarking options: Performance relative to historical performance, comparison of individual physicians within the same organization, and comparison to a regional and national goal are a few examples. Some solutions will also risk-adjust individual performance.

But benchmarking has a limited scope in most solutions today. All of the vendors in this report support comparisons of quality and cost for the purposes of evaluating performance under ACO and value-based contracts. They allow an organization and individual physicians to compare their performance to minimums set forth in a contract. Direct, head-to-head comparisons between individual physicians and organizations is less common. Although many vendors can support this capability, such comparisons are implemented based on customer preference. None of the analytics products specifically addresses comparison of FFS revenue opportunities across individuals or organizations.

Comparisons are not always possible across the domains of cost, quality, and utilization. A few vendors, Advisory Board, Epic, Conifer, and IBM Watson Health support all three domains but not always with the same patient cohorts. Over time, consistent definitions of cohorts could make it possible to see benchmarks in all domains for the same population.

In general, ambulatory EHR vendors are more likely to provide more benchmarking information in their reports. These vendors can provide head-to-head comparisons of physicians for HCOs that agree to share such information. Depending on the vendor and the customer's preference, physicians can compare their performance against others on a local, regional, or national basis. While ambulatory EHR vendors tend to have less feature-rich offerings overall, they outshine both the hospital EHR vendors and the independent analytics vendors in this area.

WORKFLOW AND ENGAGEMENT

Analytics users need a consistent and unified set of interaction tools to engage with these solutions and the most successful vendors go to some length to address the whole user experience. This starts with the interface (physical layout and content and sequence of screens), but also incorporates the workflow and any integration with existing applications.

	Benchmarking Domain		
	Quality	**Cost**	**Utilization**
Benchmarks show	> Compliance	> Expenditures	> Encounters and other Events
Common metrics	> MSSP, PQRS, MU, HEDIS	> Total medical/ prescription spend > PMPM	> Hospitalization > ED Visits > Office Visits
Less common metrics	> BPCI or CJR quality > Post-discharge care processes	> Rolling PMPY > FFS revenue uplift opportunities	> Post-acute events

Table 3.9: Benchmarking Reporting Features

In general, vendors have improved their user interfaces over the last few years. Arcadia, Caradigm, and Epic are notable in this respect. These companies embraced user-centered design and deliver most, if not all, functionality in a unified set of screens that can adapt to most workflows.

From a workflow perspective, these products are mostly delivered in portals. Allscripts, Cerner, and Epic deliver functionality within their respective EHRs or alternatively, through a clinician portal. Ambulatory vendors athenahealth and eClinicalWorks deliver some functionality in their clinician portal, and some in their EHR. A few vendors, notably IBM Watson Health and Optum, deliver functionality across multiple products, effectively via multiple tabs in a browser for users of the entire product set.

VENDOR PROFILE GUIDE

Each of the following vendor profiles has three sections.

1. Company profile including an overall letter grade for *Product* and *Market*, company location, analytics-based revenue, target market, and the company's top three differentiators. We also include an estimate of the company's 2015 revenue directly related to its analytics activities.

2. Product capabilities and portfolio and our rating of the company's *Product Capabilities* and *Product Vision*.

3. Marketing strategy and ability to execute against that strategy along with our rating of the company's *Marketing Execution* and *Market Vision*.

VENDOR GRADES AND RATING

This report includes the following Product and Marketing grades for each vendor.

- The grades for *Product Capabilities* and *Market Execution* provided in each vendor profile are based on the rating criteria described at the end of this chapter. These ratings roll up into the letter grades given in Table 3.10.

- The grades for *Product Vision* and *Market Vision* are based on our subjective assessment of the scope of the vendor's view of its potential product capabilities and its potential impact on the market, respectively. These grades are also given in Table 3.10.

With the *Product Vision* letter grade we score the level of innovation of a vendor's product vision in comparison to other offerings. We considered several factors, including product roadmap, forward-looking applications, and the vendor's efforts to expand its solution to serve emerging market needs. A narrative explaining the offering and how it is related to the vendor's broader product strategy follows each set of product ratings.

PRODUCT CAPABILITIES

The *Product Overall* letter grade combines our grades for *Product Capabilities* and *Product Innovation*, indicated at the beginning of the Product Section. *Product Capabilities* make up the bulk of the product rating and are based on criteria for commonly sold and implemented capabilities. Our evaluation is based on generally available functionality. We did not include criteria for advanced capabilities for which there is no broad-based demand in the market. All *Product Capabilities* are rated with a Harvey Ball. Ratings range from an empty to full circle based on the solution's ability to meet the criteria listed. Each profile contains a Product Criteria Ratings table with a Harvey Ball rating of each of the product capabilities.

Vendor	Product Capabilities	Product Vision	Market Execution	Market Vision
Advisory Board	C	C	B-	C-
Allscripts	C+	B-	C	C+
Arcadia	B	B	B+	B-
athenahealth	B-	B+	B	B+
Caradigm	B	B	B	B
CareEvolution	B	B-	B-	B+
Cerner	A-	B+	B+	B
Conifer	C-	C	C+	C
eClinicalWorks	C+	C	C	C
Epic	B+	B	A-	B-
Forward Health	B-	B-	C+	B
Geneia	B-	C+	B-	C
Health Catalyst	A-	B+	B+	B+
HealthEC	B+	B-	C+	B-
IBM Watson Health	B	A-	B	A-
MCIS	C+	B-	C	C+
Optum	B-	C+	B+	C+
Wellcentive	C	C+	B-	C

Table 3.10: Vendor Grades

These criteria represent our forward-looking view of the capabilities that the market could use today. Our essential conclusion is that this technology will eventually do a lot more than it currently does. Most vendors are rated with an empty, one-quarter, or one half Harvey ball because these represent fairly mainstream capabilities. The more progressive vendors receive three quarters or full Harvey Balls if their functionality is more advanced than what is considered mainstream. No vendor achieves a full Harvey Ball since we believe that customers could immediately use such functionality.

We organize *Product Capabilities* into three categories: Analytics Data Store Creation and Access, Analytics and Insight, and Workflow Integration and Engagement. To derive the *Product Capabilities* letter grade, we weighted certain product criteria higher or lower given their relative importance in the market at this stage of maturity. For example, we ranked the ability to use clinical data slightly higher than claims data and weighted the ability to comingle both clinical and claims data sets even higher.

Analytics Data Store Creation and Access

These criteria measure how well vendors acquire and combine clinical, claims, and other sources of data in their analytics portfolio. It assesses how well the combination of data serves these applications given that different vendors have a legacy of clinical or claims data. (Table 3.11)

Analytics Data Store Creation and Access	
Clinical Data Contribution	○ Clinical data available in applications for reference
	◔ Minimum inclusion of EHR data to support vendor's applications
	◑ Broad spectrum of community and hospital clinical data
	◕ All venue types in a community
	● Includes all pertinent structured and NLP-derived unstructured data
Claims Data Contribution	○ Minimum inclusion of claims required to support application
	◔ Substantial number of payers and plans
	◑ Comprehensive inclusion of cross-venue, cross-network claims
	◕ Framework for ingesting payer and plan formats
	● Dynamic incorporation of any payer or plan
Analytics Data Store	○ Base for current applications
	◔ Conventional data warehouse of claims and EHR data
	◑ Data warehouse with user controlled subsidiary marts
	◕ Data warehouse with claims, EHR, and other data
	● Full exploitation of SQL and alternative databases
Analyst and Developer Support	○ Export data or reports
	◔ Standard BI tools
	◑ API program with FHIR support
	◕ Active algorithm program
	● Significant app store ecosystem

Table 3.11: Criteria for Analytics Data Store Creation and Access

Analytics and Insight

Analytics and insight criteria measure the extent to which a vendor supports the mainstream PHM analytics sought by most HCOs. We include the major applications for care gaps, physician benchmarking, network leakage and quality reporting (Table 3.12).

Analytics and Insight		
	Benchmarking	○ Payer-based quality and cost targets
		◔ Comparisons within an organization
		◑ Comparisons outside the organization
		◕ Comparisons to similar outside organizations and panels with health outcomes
		● Cross-venue outcomes comparisons
	Population Discovery and Definition	○ Minimum inclusion of claims required to support application
		◔ Substantial number of payers and plans
		◑ Comprehensive inclusion of cross-venue, cross-network claims
		◕ Framework for ingesting payer and plan formats
		● Dynamic incorporation of any payer or plan
	Quality Reporting and Gaps	○ Base for current applications
		◔ Conventional data warehouse of claims and EHR data
		◑ Data warehouse with user controlled subsidiary marts
		◕ Data warehouse with claims, EHR, and other data
		● Full exploitation of SQL and alternative databases
	Cost and Utilization	○ Export data or reports
		◔ Standard BI tools
		◑ API program with FHIR support
		◕ Active algorithm program
		● Significant app store ecosystem
	Network Analysis	○ Minimal
		◔ Out-of-network events and spend by panel, visit type, physician, or organization
		◑ Out-of-network events by clinical indicators or quality or by risk category
		◕ Predictive scoring for OON utilization by patient, panel, or clinical program
		● Goal-based network modeling for revenue optimization
	Predictive Analytics	○ None
		◔ Event or cost predictions
		◑ Some cost and quality metrics projection reporting
		◕ Predicts cost and quality across a network, panel, or organization
		● Cost and quality impact on clinical outcomes by patient and panel
	Functional Scope	○ Purpose-built reporting application
		◔ Supports reporting for basic value-based arrangements
		◑ Supports reporting for more than quality, cost, and utilization
		◕ Supports analytics across multiple venues
		● Multiple application categories and organization combinations

Table 3.12: Criteria for Analytics and Insight

Workflow Integration and Engagement

This criterion evaluates how each solution enables clinicians to act based on data. EHR vendors have a narrow home-field advantage in this respect. They can incorporate analytics into their own EHR workflows. Other vendors mostly deliver this functionality through a HIPAA-compliant portal. (Table 3.13)

Workflow and Engagement	
Workflow and Engagement	○ Portal-based or functionality across multiple applications
	◔ Portal-based, unified application
	◑ Unified application accessible from EHR
	◕ Analytics embedded in some applications
	● Analytics embedded in multiple applications

Table 3.13: Criteria for Workflow and Engagement

MARKET STRATEGY

Without a robust sales, marketing, and support strategy, a product rarely succeeds in the market. Analytics applications are maturing but not all providers are well informed of the options. Moreover, implementing an analytics solution requires skills and expertise that many HCOs either do not have or cannot allocate given competing priorities.

Marketing Execution	
Analytics Market Acceptance	◔ 3-10 Customers
	◑ 11-45 Customers
	◕ 46-65 Customers
	● More than 65 Customers
Analytics Market Momentum	◔ New Entrant
	◑ Static
	◕ Gaining momentum
	● Strong momentum with 10 or more new HCOs in 2015
HIT Brand Recognition	◔ Not well known
	◑ Recognized as an analytics vendors
	◕ Well recognized as an analytics vendor with broader HIT capabilities
	● Leading brand in HIT analytics
Services Scope	◔ IT implementation services
	◑ Can provide clinical or business advisory services
	◕ Comprehensive spectrum of IT, business, clinical, and strategic services
	● Full outsourcing

Table 3.14: Criteria for Market Execution

The Market Overall letter grade at the top of each profile combines the letter grades for *Market Execution* and *Market Vision* indicated at the beginning of the Market Section. *Market Execution* measures how well a vendor is executing within the current market. To arrive at this ranking, we consider factors such as flagship customers, technology partnerships, and customer acquisition pace.

All elements in *Market Execution* are rated with a Harvey Ball. Ratings range from an empty to full circle based on the completeness of a vendor's solution in meeting the criteria listed. Each profile contains a table called Market Criteria Ratings, which provides the Harvey Ball rating for each of the criteria. These include *Analytics Market Acceptance*, *Analytics Market Momentum*, *Brand Recognition*, and *Solution Scope*. While each of these criteria is important for a vendor's overall success in the market, *Analytics Market Acceptance* and *Analytics Market Momentum* are the clearest indicators of success and therefore weighted more heavily.

The *Market Vision* letter grade is a measure of how well each vendor's market vision aligns with emerging market needs. We also considered factors such as how well vendors articulate their vision of the future, target market(s), and go-to-market partnerships. The rating section is followed by a narrative review of the vendor's marketing approach and strategy, including where they seem to be succeeding and where they may face some challenges.

Figure 3.4 provide our high-level conclusions about the market execution and vision demonstrated by the analytics vendors found in this report.

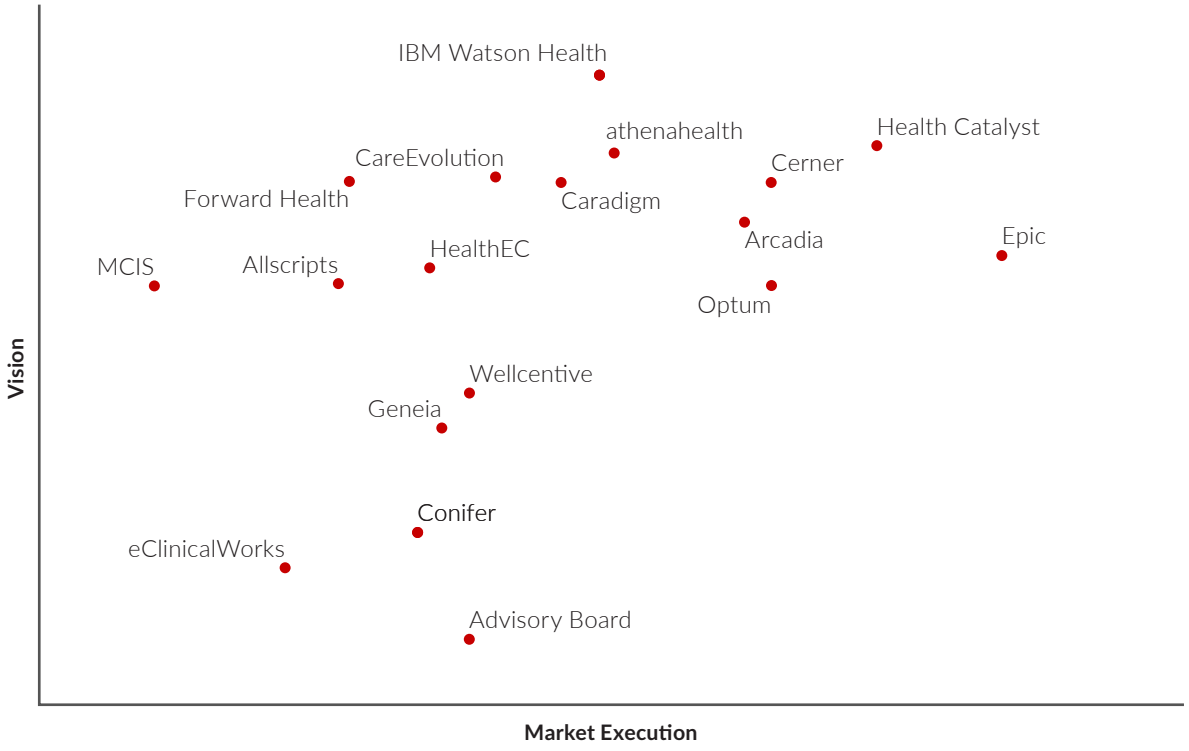

Figure 3.4: Market Execution versus Vision

VENDOR PRODUCT RATINGS

Vendor	Clinical Data Contribution	Claims Data Contribution	Analytics Data Store	Analyst and Developer Support	Bench-marking	Population Discovery and Definition	Quality Reporting and Gaps	Cost and Utilization	Network Analysis	Predictive Analytics	Functional Scope	Workflow and Engagement
Advisory Board	◔	◔	◔	○	◔	○	◔	◔	◔	◔	○	○
Allscripts	◑	◔	◔	◑	◔	◔	○	○	○	◔	◑	◔
Arcadia	◑	◑	◑	◔	◔	◑	◑	◔	◔	◔	◑	◔
athenahealth	◑	◑	◔	◔	◑	◔	◔	◔	◑	◔	◔	○
Caradigm	◑	◑	◑	◔	◔	◑	◑	◑	◔	◑	◔	◔
CareEvolution	◔	◑	◑	◔	◔	◔	◑	◑	◔	◑	◑	◔
Cerner	◑	◑	◕	◔	◑	◑	◔	◑	◔	◔	◑	◑
Conifer	◔	◔	○	◔	◔	○	◔	◔	◔	◔	○	○
eClinicalWorks	◔	◔	○	◔	◔	○	◔	◔	○	◔	◔	◔
Epic	◑	◑	◕	◔	◑	◑	◑	◑	◔	◑	◑	◑
Forward Health	◔	◑	○	◔	◔	◔	◔	◑	◑	◔	◔	◔
Geneia	◑	◑	◔	◔	◑	◔	◔	◑	◑	◑	◔	◔
Health Catalyst	◑	◑	◕	◑	◑	◑	◑	◑	◑	◔	◑	◔
HealthEC	◑	◑	◔	◔	◑	◔	◑	◑	◑	◑	◑	◔
IBM Watson Health	◑	◕	◔	◔	◑	◑	◔	◑	◔	◑	◔	◔
MCIS	◔	◔	○	◔	◔	◔	◔	◔	○	◔	◔	◑
Optum	◔	◑	◑	◔	◑	◔	○	◔	◔	◔	◔	○
Wellcentive	◔	◑	○	◔	◔	◔	○	◔	○	◑	○	○

Table 3.15: Vendor Product Ratings

VENDOR MARKET RATINGS

Vendor	Analytics Market Acceptance	Analytics Market Momentum	HIT Brand Recognition	Solution Scope
Advisory Board	◕	◑	◑	◔
Allscripts	◔	◔	◕	◑
Arcadia	●	◕	◑	◑
athenahealth	◑	◕	◑	◑
Caradigm	◑	◑	◑	◕
CareEvolution	◕	◑	◔	◑
Cerner	●	◑	◕	◕
Conifer	◕	◑	◔	◔
eClinicalWorks	◔	◑	◔	◔
Epic	●	●	◕	◕
Forward Health	◑	◑	◔	◔
Geneia	◔	◑	◔	◕
Health Catalyst	●	◕	◑	◕
HealthEC	◑	◑	◔	◑
IBM Watson Health	◕	◑	◕	◑
MCIS	◔	◔	◔	◔
Optum	●	◑	◕	◕
Wellcentive	◕	◑	◑	◔

Table 3.16: Vendor Market Ratings

These criteria represent our forward-looking view of the capabilities that the market could use today. Our essential conclusion is that this technology will eventually do a lot more than it currently does. Most vendors are rated with an empty or one-quarter Harvey ball because these represent fairly mainstream capabilities. The more progressive vendors receive half or three quarter harvey balls if their functionality is more advanced than what is considered mainstream. No vendor achieves a full harvey ball since we believe that customers could not immediately use such functionality.

The Advisory Board Company

Product Overall _____ **C**
Market Overall _____ **C+**

Company

Headquarters: Washington, D.C.
Website: www.advisory.com
2016 Revenue: $16-20 Million (est.)

Year Founded: 1979
Ownership: NASDAQ Listed
Classification: Independent

Top Three Differentiators:

1. Trusted strategic advisor
2. Focus on hospital and affiliates
3. Good visibility into EHR data

Product

Product Capabilities _____ **C**
Product Vision _____ **C**

Product(s): Crimson Population Risk Management, Crimson Quality Reporting, Crimson Care Management
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔ Clinical Data Contribution	◔ Quality Reporting and Gaps
◔ Claims Data Contribution	◔ Cost and Utilization
◔ Analytics Data Store	◔ Network Analysis
○ Analyst and Developer Support	◔ Predictive Analytics
◔ Benchmarking	○ Functional Scope
○ Population Discovery and Definition	○ Workflow and Engagement

The Advisory Board Company's view of analytics involves identifying care improvement goals, building a data resource to enable cross-continuum visibility, and using that data engage physicians in delivering better financial and clinical outcomes. Its solutions enable risk identification, risk-adjusted provider performance benchmarking, cost and utilization analysis, and care management.

Crimson Population Risk Management (CPRM) is based on a longitudinal claims record. It supplements claims data with EHR data to present care-gap analyses in support of MSSPs. CPRM is generally aimed at helping physicians identify opportunities for care management in their panels. The company plans to add more and different

kinds of clinical and other data to this data store. Using its national base of de-identified customer data, it compares each panel to what is considered a well-managed panel based on Milliman risk scores and ZIP code. It provides physicians a good understanding of the cost and risk drivers in their attributed panels. It also provides a range of registry functions, including segmentation for analysis and outreach.

The CPRM dashboard provides a view of overall PMPM spend and utilization as well as chronic disease spend, a list of savings opportunities organized into categories, and quality metric attainment. Users can drill down to discover areas where spending, utilization, or quality are inconsistent with industry norms or internally defined goals. Users can change perspective to different care settings and see trend lines. The solution includes filters that provide summary information (e.g. line item pharmacy spend per PCP underneath a graph of pharmacy spend across a whole organization). At any point, users can drill into detailed patient- or provider-level data to understand a population's clinical and risk characteristics. In the next year, CPRM will include data that provides a better view of network utilization to pinpoint network leakage. It also will incorporate some pre-adjudicated claims to help make CPRM data more current.

Crimson Care Management is a comprehensive tool primarily focused on enabling communications across organizations and care teams. It provides a basic complement of patient clinical and claims data that supports referrals, intake, and team interaction. It can ingest ADT messages for readmissions analyses. It allows care teams to perform and document assessments and set goals. Its functionality allows clinicians to perform and document assessments as the software suggests care plan goals, patient objectives, and care team tasks.

Crimson Quality Reporting provides a range of quality reporting tools for common programs like HEDIS, ACO, and PQRS at group and individual levels. It uses an aggregated and de-duped data source consisting of claims, EHR data, lab results, and ADT.

Market

Market Execution ____ **B-**
Market Vision ____ **C-**

Target Market(s): Hospitals and Health Systems, ACOs, payers
Pricing Model: One-time fee plus subscription
Flagship Customers: Dignity Health, Adirondack Health Institute
Partners: Health Language, 3M

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

The Advisory Board Company provides strategic guidance and performance improvement solutions to an extremely large base of HCOs. Analytics for PHM is just one of its solution areas. It convenes a substantial number of councils and roundtables, which helps in the development of clinical, financial, and operational best practices for the healthcare industry. It leverages the collective wisdom of these best practices into its Crimson product set.

Crimson solutions are based on a membership model. Members pay an initial fee that reflects the effort involved in the site build, data interface mapping, data loads and testing, and the hardware/network infrastructure. Annual fees are tailored to reflect the ongoing support and services required by each member. This pricing gives members access to the technology by an unlimited number of users, unlimited access to consulting services and technical support, as well as comprehensive training services. Members also have access to Advisory Board's community of over 5,000 HCOs that use some aspect of the company's services.

The Crimson set of products, assembled from various acquisitions, make heavy use of claims data. It does not currently support its entire product set with a single, cross-community, LPR. Instead, each solution relies on its own data store with some cross-pollination between offerings.

The Advisory Board's reputation in healthcare as a trusted advisor is strong. The early part of 2017 was a challenge for the company. It has never expended significant resources on marketing. While it rightfully has positioned itself as a strategic advisor that happens to sell software-based solutions, the appeal of this positioning is questionable in a market seeking technology excellence. Nevertheless, the company's loyal customer base of hospital and health systems continue to rely on this technology day-to-day.

Strengths: **Deep hospital expertise**

Qualifiers: **Company direction in flux**

Allscripts

Product Overall C+
Market Overall C+

Company

Headquarters: Chicago, IL
Website: www.allscripts.com
2016 Revenue: $1-3 million (est.)

Year Founded: 1986
Ownership: NASDAQ Listed
Classification: EHR Vendor

Top Three Differentiators:

1. Strong offering for ambulatory practices
2. Superior connectivity to diverse EHR data sources
3. Clinical quality editor for clinicians

Product

Product Capabilities C+
Product Vision B-

Product(s): Allscripts CareInMotion, Allscripts dbMotion, Allscripts Population Health Analytics
Dominant Deployment Model: SaaS

Product Criteria Ratings

◑	Clinical Data Contribution	○	Quality Reporting and Gaps
◔	Claims Data Contribution	○	Cost and Utilization
◔	Analytics Data Store	○	Network Analysis
◑	Analyst and Developer Support	◔	Predictive Analytics
◔	Benchmarking	◑	Functional Scope
◔	Population Discovery and Definition	◔	Workflow and Engagement

Allscripts' PHM analytics portfolio is a relative newcomer to this market. The company has well established clinical and financial analytics offerings for its hospital customers called Clinical Performance Manager and EPSi. It overarching solution for PHM, CareInMotion, combines cross-community data connectivity and aggregation, analytics, care coordination, and patient engagement. Clinical and claims data from around a community are aggregated into a CDR using dbMotion, which can ingest data from roughly 380 EHRs, including such majors as Cerner, Epic, eClinicalWorks, and NextGen. Claims data is matched to this CDR using conventional ETL tools. Its analytics tool, Population Health Analytics (PHA), provides a range of cost, utilization, and quality reporting options for physicians and practices.

PHA categorizes populations into cohorts with an eye to finding opportunities for care management based on conditions and rising risk. Currently, PHA segments cohorts for six different chronic disease categories, patients at risk of readmission, and patients in VBC contracts such as Medicare MSSP. For each of these cohorts, the tool

provides a relevant set of care gaps based on evidence-based quality metrics. For the six chronic disease conditions, it uses EHR data (typically problem lists, labs, or medication orders) or claims data (diagnoses) to identify patients who have the chronic condition and belong in the cohort.

Users select a cohort to focus on by choosing some combination of payer, practice, provider, patient demographic, illness severity (risk-adjusted), and a time period. PHA then segments the resulting cohort into risk levels (low, medium, high, and very high) that incorporate all of the chronic conditions present. Clinical quality metrics relevant to each condition are available for exploration graphically or in tables. Users can drill into risk-sortable lists of patients along with their care gaps. At any point, clinicians can refer patients or groups of patients to care management programs.

For MSSP patients, PHA presents the pertinent quality metrics. Physicians can see care gaps prioritized based on their potential revenue impact. PHA has a similar presentation of HEDIS measures for other patients. It has an OLAP-style query interface for self-service exploration of lab and medications data. Later this year, it will enhance this with encounters, diagnoses, and procedures. It also plans to offer a similar OLAP-style query tool for claims data. This offering will include a quality metrics editor suitable for use by clinical end-users.

Market

Market Execution C
Market Vision C+

Target Market(s): IDNs, Hospitals and health systems, ACOs, medical groups
Pricing Model: PMPM
Partners: American Medical Association, Microsoft

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Allscripts is marketing this product primarily to Allscripts Touchworks and Professional customers. The company has a diverse customer base of practices and hospital systems. While this set of products is relatively new, the company has analytics expertise based on its hospital customers. Its view of the role of analytics is broader than the cost, quality, and utilization reports in this product set.

Allscripts, at the suggestion of the American Medical Association and the American Diabetes Association, has used PHA to evaluate the costs of pre-diabetic patients. It effectively analyzed the variety of different care pathways experienced by pre-diabetic patients. The point of this exercise was to provide feedback to payers about which reimbursement targets can slow the progression of diabetes. It helped to identify common patterns of disease progression that would allow payers to incent providers to alter their processes to more effectively intervene with each pattern.

Looking ahead, Allscripts sees wider opportunities for the applications of analytics in clinical and other healthcare settings. Primarily it is looking to include different data sources such as SDoH, extracts from clinician notes, and G/L costs to its existing store of claims and EHR data. In addition, it is also looking to include genomics data

where appropriate. The addition of any of these new data types will expand the range of possible applications that Allscripts CareInMotion can field. In particular the company looking to improve on its current applications with better outbreak surveillance, enhanced risk stratification, clinical process improvement, and better tools for comparative effectiveness analysis.

Strengths: **Solid data interoperability for heterogeneous EHR communities**

Qualifiers: **Focused on the Allscripts customer base**

Arcadia Healthcare Solutions

Product Overall B
Market Overall B

Company

Headquarters: Burlington, MA
Website: www.arcadiasolutions.com
2016 Revenue: $30 million
Year Founded: 2002
Ownership: Private
Classification: Independent

Top Three Differentiators:

1. Strong yield of clinical data based on direct database access
2. Good marriage of clinical data to claims
3. Strong support for multi-EHR communities of ambulatory providers

Product

Product Capabilities B
Product Vision B

Product(s): Arcadia Data Connect with various modules
Dominant Deployment Model: SaaS

Product Criteria Ratings

◑ Clinical Data Contribution	◑ Quality Reporting and Gaps
◑ Claims Data Contribution	◔ Cost and Utilization
◑ Analytics Data Store	◔ Network Analysis
◔ Analyst and Developer Support	◔ Predictive Analytics
◔ Benchmarking	◑ Functional Scope
◑ Population Discovery and Definition	◔ Workflow and Engagement

Arcadia aggregates clinical and claims data across communities of HCOs and health plans to support a set of applications that address provider's needs for insight into FFS and risk-based patient populations. It supports quality, cost, and utilization management as well as a range of tools to help increase the accuracy of the risk adjustment factors and coding applied to provider reimbursement. Its approach to sourcing clinical data is different than most vendors. Arcadia's Data Connect accesses EHR databases directly to source most of its clinical data. The company believes it extracts more meaningful information this way than relying entirely on HL7 transactions and CCDs. As a result, the company makes a strong case that it delivers more accurate and timely risk scores and quality metrics because it has more and better data. The company also has strong data quality discipline and provides proactive resolution to quality issues.

Users access Arcadia's applications through a web portal with a full complement of reports and dashboards that support ACO, HEDIS, P4P, PCMH, and other quality metrics. As payer requirements change, the company can quickly develop new sets of quality or other metrics based on a natural language engine that does not require computer scientists to develop measure grammar. These applications also provide cost and utilization manage-

ment functions. It added integral support for the John Hopkins ACG grouper for risk modeling and population stratification in 2016. It also identifies diagnoses that need physician attention to keep HCC RAF accurate and up-to-date.

Arcadia's unified patient registry allows providers to explore over 80 condition-specific registries. Users can also segment and explore each registry based on a variety of sub-criteria. One of its more important functions is to point to information gaps between claims and the underlying EHRs. The application provides a side-by-side comparison, by patient, of open vs. closed risk. Closed risk in this case refers to risk that has been documented in claims which is also supported in the EHRs. Open risk is risk apparent from the clinical record which has no associated diagnosis in claims. For example, a prescription for insulin in an EHR with none of the diagnoses codes associated with diabetes in the claims would contribute to the open risk score. It also points to clinical concepts (GI, liver, lung, metabolic, etc.) which contribute to this mismatch between the claims and the aggregated record. This information is used to address quality issues and to support documentation to yield more accurate risk adjustments from payers. It began delivering notifications with notes of coding gaps into relevant EHRs.

The company hosts this offering on AWS, supporting better operational and performance management for each of its customers. It also refactored its entire product set to improve performance in data aggregation, backend processing, and front-end user experience. It offers a rudimentary care management tool that supports assignment of patients to care managers and care manager documentation of tasks and interactions with patients. It includes bulk patient outreach features that lets care managers generate texts, emails, or robo-calls to patients to address adherence, quality, or coding gaps. HCOs can track progress on these as well.

The company's product roadmap includes improving support for inpatient quality metrics and care episodes, and a cohort builder that supports hotspotting along multiple dimensions (rising risk, engagement level, social determinants). While it already provides database-level access to Arcadia Connect data for BI products, it plans to improve on this as well as its patient registry with integrated BI support.

In 2017, it is planning to enhance its existing contract dashboards, which provide basic overviews, to permit modeling of how performance on metrics could change given certain decisions. It will move many backend functions to a NoSQL base leveraging AWS' significant support and scale for such efforts. It also plans to release an update to the care management functionality focused on care team operations.

Market

Market Execution ____ **B+**
Market Vision ____ **B-**

Target Market(s): Health plans, IDNs, ACOs, IPAs/PHOs
Pricing Model: PMPM or PPPM
Flagship Customers: Beth Israel Deaconess Care Organization, Steward Healthcare, Accountable Care Partners PPS (NY), MaineHealth, Sentara Healthcare, Moda Health, Value Care Alliance, Silverton Health, Yakima Valley Farm Workers Clinic, Excellus Blue Cross
Partners: Informatica, Microsoft

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Arcadia has a technologically sophisticated and vendor-agnostic set of solutions that has driven steady success with marquee provider and health plan customers. The company reports strong market interest in the last year, responding to roughly twice the number of RFPs compared to the previous year. This has translated into solid growth in bookings and the number of customers. The company's success stems from its deep understanding of community-based ambulatory EHR and claims data, Arcadia leverages its core competency – data integration that matches EHR data from across a community to the corresponding claims – in support of a wide variety of FFV and FFS efforts. Its offerings address the needs of decision-makers at every level of a payer or provider organization.

The company began as a systems integrator with some payer and provider clients. It is now broadening its work with health plan and payer customers. The value to payers and plans is that Arcadia's expertise with EHR data can increase the accuracy of risk scoring and quality measurements. Arcadia enables these organizations to offer a free or low cost portal to providers in their network for cost, utilization, risk stratification, and care management.

The company experienced strong bookings growth in 2016. Most of its growth has been organic. It acquired Sage Technologies of Rockford, IL in June 2015 in a bid to enhance its market position in managed care and grow its professional services capabilities. The company competes for managed care and DSRIP contracts in several states. The company is also contemplating a turnkey offering for small independent practice reporting. It is also exploring whether there is market interest in de-identified access to its clinical/claims data on 20 million lives.

Strengths: Strong marriage of EHR data with claims data

Qualifiers: Care management functionality evolving

athenahealth, Inc.

Product Overall B
Market Overall B

Company

Headquarters: Watertown, MA
Website: www.athenahealth.com
2016 Revenue: $3-5 million (est.)
Year Founded: 1997
Ownership: NASDAQ Listed
Classification: EHR Vendor

Top Three Differentiators:

1. Strong linkage between analytics and care management
2. Software is complemented by performance monitoring and coaching
3. EHR-independent

Product

Product Capabilities B-
Product Vision B+

Product(s): athenahealth Population Health
Dominant Deployment Model: Cloud

Product Criteria Ratings

◑	Clinical Data Contribution	◔	Quality Reporting and Gaps
◑	Claims Data Contribution	◔	Cost and Utilization
◔	Analytics Data Store	◑	Network Analysis
◔	Analyst and Developer Support	◔	Predictive Analytics
◑	Benchmarking	◔	Functional Scope
◔	Population Discovery and Definition	○	Workflow and Engagement

athenahealth Population Health is a comprehensive PHM technology and services offering. It helps athenahealth customers improve quality scores, reduce medical spend in different categories, increase the percentage capture of spend, improve ROI for care management interventions, and optimize RAF scores. It consists of a set of dashboards and reports that supply cost and utilization metrics as well as a quality registry and a care management application. The services include some pre-planning and technical implementation, change management, adoption, patient outreach, and ongoing performance management coaching.

athenahealth supports these applications with paid claims data and supplements them, particularly the quality registry and care management application, with EHR and other clinical data from across a community. The EHR-independent athenahealth Population Health incorporates data from many non-athenahealth EHR brands.

athenahealth begins with an analysis of the provider organization's business goals and available data sources to develop an implementation plan. In addition to data sources, athenahealth defines the physician and organization hierarchy, attribution rules, as well as physician and service locations as either in or out of network.

athenahealth Population Health then distinguishes between out-of-network utilization to a competitor vs. OON utilization to a non-competitor provider. Individual physicians access reports that show information about their panels and risks, efficiency metrics, and quality performance compared to benchmarks. The quality registry provides data on quality performance for risk-based contracts, while MIPS reporting is available in its EHR. Access to reports and dashboards is role-based; managers can drill down to individual clinicians and the physicians can drill down to lists of patients.

Additionally, athenahealth also offers all clients access to its "Sandbox" analytics environment, which enables deeper, ad hoc analysis beyond what can be completed through the standard report library in the web application. With this access, client organizations can analyze and run queries against their aggregated data, transfer files in and out of the environment securely, and load additional data sets to complement the data processed and provided by athenahealth Population Health. athenahealth Population Health is heavily focused on helping providers improve care management workflows as well as quality scores. athenahealth's care management platform provides a comprehensive view of patient activity, and is layered with services such as patient outreach and scheduling support. Multimodal patient outreach permits providers to not only contact patients to close quality or care gaps, but it will also schedule appointments for affected patients. This outreach is further extended with athenaWell, a web and mobile app that connects patients to their care manager or physician and is integral to its care management outreach efforts.

Today, athenahealth not only helps its customers increase quality metric performance, but also helps them retain attributed lives and optimize RAF scores. On the utilization front, it will enhances its customers' ability to drive more in-network utilization and decrease hospitalizations, ED utilization, and readmits. It also leverages events like ADT messages to push timely notifications to physicians, care managers, and other users.

The company plans to expand use of athenaWell to support patient self-management among rising risk populations. Further automation of care management workflows is planned, including patient enrollment in care management. A refreshed reporting library will allow clients to publish custom reports to the web.

Market

Market Execution ____ **B**
Market Vision ____ **B+**

Target Market(s): ACOs, IDNs, Hospitals and Health Systems, Medical Groups
Pricing Model: PMPM or percentage of shared savings
Notable Customers: Tandigm Health, Privia Healthcare
Partners: Milliman, First Databank

Market Criteria Ratings

- ◑ Analytics Market Acceptance
- ◕ Analytics Market Momentum
- ◑ HIT Brand Recognition
- ◑ Solution Scope

athenahealth began marketing its analytics offering several years ago as a quality management tool for all of its customers. The company has since expanded the scope of the offering to better equip practices with the ability to act on the cost, quality, and utilization issues that analytics identifies. The company continues to offer re-

sults-based contracts with customers, based on achieved savings. It regards the analytics as a first step in getting patients into care management and patient engagement programs that drive improved cost and quality outcomes.

Few HIT companies have embraced open APIs and third-party developers to the extent that athenahealth has; it has one of the strongest API programs in HIT. That said, athenahealth Population Health is not API-enabled just yet. Like all PHM technology-based solutions, the emphasis is on receiving and using inbound data. Its willingness to work with other companies to build its solution portfolio is more obvious on the services side of this offering. It plans to improve this solution with partners that can offer clinically qualified care managers. The idea is to leverage their technology and services offering with additional services that allow their customer to scale an effective and successful program.

athenahealth's roadmap includes analytics that better show the effect of care management on subsequent costs and utilization. As mentioned, it will also begin to more closely link its athenaWell web and mobile app with the care management application to ensure continuity across care management contacts with each patient, and allow organizations to expand care management efforts to rising risk populations.

In the next year, athenahealth also plans to significantly expand the number of data categories accessible in its Sandbox analytics environment. The company expects to enable exporting of claims, quality, and care management data feeds to allow clients to perform analytics and reporting in-house, as well as expand its analytics tool set to allow more sophisticated analysis of the data.

Strengths: **Strong commitment to open technology and developing an ecosystem**

Qualifiers: **Contract modeling could complement this solution**

Caradigm

Product Overall _____ **B**
Market Overall _____ **B**

Company

Headquarters: Bellevue, WA
Website: www.caradigm.com
2016 Revenue: $11-14 million (est.)

Year Founded: 2012
Ownership: Private
Classification: Independent

Top Three Differentiators:

1. Clinical and claims aggregation expertise
2. Strong emphasis on quality analytics
3. Cohesive, user-friendly application

Product

Product Capabilities _____ **B**
Product Vision _____ **B**

Product(s): Caradigm Intelligence Platform with Cohort Designer and Advanced Computation Engine, Utilization and Financial Analytics, Quality Improvement, and Risk Stratification
Dominant Deployment Model: SaaS

Product Criteria Ratings

◑ Clinical Data Contribution	◑ Quality Reporting and Gaps
◑ Claims Data Contribution	◑ Cost and Utilization
◑ Analytics Data Store	◔ Network Analysis
◔ Analyst and Developer Support	◑ Predictive Analytics
◔ Benchmarking	◔ Functional Scope
◑ Population Discovery and Definition	◔ Workflow and Engagement

Caradigm's modular analytics offering consists of a set of interrelated tools for clinical and administrative end users. The entire product set is adaptable to a variety of value-based and FFS clinical programs. Broadly, it permits risk-bearing organizations to identify quality and coding gaps and act on them in order to maximize quality and revenue.

The central element is the Caradigm Intelligence Platform, a data aggregation platform that combines clinical and claims data into an LPR that feeds all of its applications for analytics and care management. Users access the application via a portal and can drill into each patient's complete record. Alternatively, Caradigm integrates them into clinical workflow with Knowledge Hub, a general-purpose way to allow users to access patient-specific data from across a set of healthcare applications. Knowledge Hub is presented as a floating window to an EHR user. In the context of these analytics products, Knowledge Hub informs clinicians about quality and coding gaps in their panels.

Cohort Designer is a self-service discovery tool that provides a large number of clinically oriented query terms with an integral report writer. Data from these patient cohorts can be saved as reports, exported to Excel, or used in other aspects of the product set. Users can blend this data from the LPR with care gap information to point out subsets in the cohorts more likely to respond to interventions designed to generate savings.

Quality Improvement supports reporting for HEDIS, PQRS, MSSP, MIPS, and custom measures. Caradigm offers a tool for measure development, the Advanced Computation Engine, which permits clinical users to define quality metrics. Users can see performance for any given quality metric together as well as participation rates in programs designed to increase performance on that metric. Clinicians can drill into care gaps within each condition cohort and assign patients to care management programs designed to address the gaps or bring the patient into adherence. Each patient list is specific to the filtered criteria, but the product also indicates the total number of open gaps unrelated to those criteria. In this sense, clinicians retain a holistic view of cohorts and patients.

Utilization and Financial Analytics makes extensive use of all-payer claims and provides reports that describe utilization events, network usage and a variety of cost categories over time.

Risk Stratification enables HCOs to identify patients who would benefit from care management or other patient campaigns. It creates segmented patient lists using clinical factors, identifies patients at risk and streamlines enrollment into programs. It can incorporate its customer's choice of risk scores, including third-party offerings such as Milliman Care Guidelines MARA.

Since these products are integral to Caradigm's care management offering, there is a strong focus on a host of evidence-based care guidelines. These products provide data so care managers can monitor progress toward the goals of the care management intervention based on these guidelines. Caradigm's product roadmap in 2017 includes further expansion of the risk-stratification product.

Market

Market Execution ____ **B**
Market Vision ____ **B**

Target Market(s): ACOs, IDNs, Provider-sponsored Payers
Pricing Model: PMPM
Flagship Customers: Billings Clinic, Greenville Health System
Partners: Microsoft, Eliza, HLI, Insignia, Milliman Care Guidelines, NextGate

Market Criteria Ratings

- ◑ Analytics Market Acceptance
- ◑ Analytics Market Momentum
- ◑ HIT Brand Recognition
- ◕ Solution Scope

Caradigm addresses the PHM needs of integrated networks of providers – sharing risk across different organizations. It sees the analytics tools described above as integral to its care management product. Caradigm not only identifies the highest-cost or highest-risk patients, it also identifies patients that are more likely to respond

favorably to interventions. By identifying potentially adherent patients, it can help its HCO customers realize potentially higher savings overall.

From its start as a joint venture of GE and Microsoft, it has developed the software discipline needed to aggregate clinical, claims, and other data from across care venues and organizations. While it is primarily a population health solutions vendor, also it has considerable expertise in and still enjoys solid sales with its identity and access-management products.

Caradigm has traditionally received the most interest from hospital and health system customers. The company has seen strong growth over the last year with increasing interest from ACO-type providers, CINs, and provider-based health plans. In general, it focuses on organizations with greater than 25,000 lives at risk. It has had success selling into independent long-term care facilities, provider-sponsored health plans, and IDNs. Its analytics offerings have been well received in the market, and its related care management and patient-engagement offerings have also seen additional adoptions.

Strengths: **Strong filter-based cohort builder and quality measure builder**

Qualifiers: **Evolving claims analysis**

CareEvolution

Product Overall B
Market Overall B

Company

Headquarters: Ann Arbor, MI
Website: www.careevolution.com
2016 Revenue: $8-12 million (est.)
Year Founded: 2003
Ownership: Private
Classification: Independent, HIE/CNM

Top Three Differentiators:

1. Strong offering for payers, providers, and payer-providers
2. Sophisticated analysis of health and payment trends and causality
3. Deep experience with payer claims data

Product

Product Capabilities B
Product Vision B-

Product(s): HIEBus, Galileo, Beacon, CareCoordinate
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔ Clinical Data Contribution	◑ Quality Reporting and Gaps
◑ Claims Data Contribution	◑ Cost and Utilization
◑ Analytics Data Store	◔ Network Analysis
◔ Analyst and Developer Support	◑ Predictive Analytics
◔ Benchmarking	◑ Functional Scope
◔ Population Discovery and Definition	◔ Workflow and Engagement

CareEvolution believes that clinical analytics and care management are a unified solution to the problem of finding and managing patient cohorts with markers for rising or falling risk. Its product, Galileo Analytics, provides a solid foundation for effective care management with hotspotting — essentially identifying patients that pose a risk for high costs and wasteful utilization (such as low acuity or non-emergent ED visits) – with a focus on identifying high-risk patients with modifiable risk factors. It also supports the ability to detect when falling risk scores have more to do with coding than an actual improvement in the patient's health. Analytics also provide an evidence base — derived from the provider organization's own patient data — for decisions about deploying effective care-management programs.

CareEvolution combines claims with EHR data and the LPR in HIEBus to support a range of PHM analytics. Population Health Navigator is a general-purpose cohort discovery capability that can help clinical and administrative managers explore utilization patterns, quality and care gap performance, and patient profiles. It has reporting packages that identify higher utilizers of hospital-based services and higher risk cohorts, any of whom can be

entered into care management. Out of the box, CareEvolution's product describes the number and type of care gaps, utilization events, conditions, and risk profiles to establish which patient should be considered for care management. It also has strong capabilities for identifying ambulatory-sensitive hospital utilization.

CareEvolution can help clinical users dig into whether falling risk scores indicate that a patient is getting better, is a coding artifact, or is a harbinger of cost or utilization spikes. In particular, it provides an "infinite" lookback in the clinical record to find HCC-related diagnoses that are no long part of the HCC RAF calculation. These patients can be placed into an outreach care management program to ensure that risk score reflect their actual clinical condition.

It has utilization analysis that uncover the causes of PMPY variability for patients in specific care management programs. It breaks down PMPY by provider, by utilization category, and by risk score. It also lets users compare a static population (which follows the same population over time without regard to adds or drops) and a dynamic population (which reflects adds and drops). The goal is to find contributors to variability that the PMPY trendline possibly obscures. It also helps identify whether risk score variability is being affected by care management activities. A better understanding of that variability (up or down) could inform decisions about additional or modified care management activities.

It also provides a post-acute care dashboard that breaks down spending by discharge care venue. Taken together, these utilization analytics provide an in-depth way for risk managers, clinical managers, and power users to uncover causes of utilization and cost variability.

Market

Market Execution ____ **B-**
Market Vision ____ **B+**

Target Market(s): Health Plans, ACOs, Payers, Hospitals
Pricing Model: Subscription
Flagship Customers: Catholic Health East, Anthem
Partners: Truven Health, Molina Healthcare, Arbormetrix

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

CareEvolution's analytics value proposition is experience- and technology-based. It has a relatively small number of large customers that have integrated its solutions deeply into their clinical and business processes. Its data integration capabilities are an important part of its past success as an HIE vendor and current success providing population health solutions. The application of this data integration technology for analytics and care management has been relatively smooth.

Its solution set is aimed at the important requirements of three categories of user. Medical leadership uses its analytics tool, Galileo, to support decision-making about the deployment of care resources and to understand

measure performance over time. Practice managers or care management supervisors can use Galileo or Beacon to make decisions about how to deploy care managers. Care managers can access CareCoordinate and the ThinEMR to view patient history and administer day to day care management including task and goal assignment. All of these users are enabled to manage what CareEvolution regards as an integrated and continuous business and clinical process.

CareEvolution has a relatively small customer set with a robust mix of large payers, provider organizations, public HIEs, and research organizations. This base of experience gives the company good insight into how to help risk-bearing providers operationalize analytics as these organizations migrate slowly away from FFS approaches to delivering care and care management programs.

CareEvolution, compared to many similar vendors, has that rare combination of high prices and high customer satisfaction. Word of mouth has been an important driver of its slowly expanding roster of customers. Its approach to marketing is unconventional. That said, it has had a longstanding channel partnership with Truven Health for its Unify cloud-based solution for MSSPs, as well as being a technology provider to Molina Medicaid and ArborMetrix.

Strengths: **Sophisticated analysis of claims and clinical data goes far beyond reporting**

Qualifiers: **Relatively small number of large customers**

Cerner Corporation

Product Overall B+
Market Overall B+

Company

Headquarters: Kansas City, MO
Website: www.cerner.com
2016 Revenue: $12-16 million (est.)
Year Founded: 1979
Ownership: NASDAQ Listed
Classification: EHR Vendor, HIE/CNM

Top Three Differentiators:

1. Enterprise-level data warehouse serves many analytics purposes
2. Population record consists of disparate data sources, including outside EHRs and claims
3. Breadth of analytics product set

Product

Product Capabilities A-
Product Vision B+

Product(s): Cerner HealtheIntent, HealthEDW, HealtheAnalytics, HealtheRegistries, HealtheCare
Dominant Deployment Model: SaaS

Product Criteria Ratings

◑	Clinical Data Contribution	◔	Quality Reporting and Gaps
◑	Claims Data Contribution	◑	Cost and Utilization
◕	Analytics Data Store	◔	Network Analysis
◔	Analyst and Developer Support	◔	Predictive Analytics
◑	Benchmarking	◑	Functional Scope
◑	Population Discovery and Definition	◑	Workflow and Engagement

HealtheEDW is an enterprise-class data warehouse built on the HealtheIntent data platform. Raw data from some 100 clinical, financial, and other sources is deposited in HealtheIntent. This data store includes not only Cerner Millennium, but 30 other EHR vendors and more than 55 claims and payer data sources. The data is cleaned, linked to a patient, and standardized to 55 common terminologies, including ICD-10 and SNOMED, to create a cross-continuum population record.

The population record in HealtheIntent supports a variety of analytics use cases, such as risk scoring, quality management, community care management, patient engagement, revenue cycle management, claims analytics, and alternative payment model management. Cerner exposes the data via secure web access or EHR integration through APIs and SMART containers. As a major EHR vendor, Cerner sees more clearly than most vendors that users regard their application portfolio less as a discrete set of functions than as a continuous element of their day-to-day activities.

For advanced analytics, HealtheIntent aggregates and prepares the data for loading into HealtheEDW on the Vertica database. End users interact with this data through HealtheAnalytics. Cerner has integrated Business Objects and Tableau into the offering to deliver prebuilt reporting and dashboard functionality as well as data discovery and visualization capabilities for end users. Cerner also offers third-party content - including 3M, MARA, and Truven - for its HealtheAnalytics customers. This content can provide CMS benchmarks, quality measures from other organizations, risk adjustment methods, clinical concept coding and representation, code mapping, groupers, and reference data. For example, Cerner's cost and utilization package offers reporting derived from claims and enrollment data. At its core, this package is a set of standard reports and Tableau dashboards that compare measures like PMPM or network leakage across providers, practices and plans. Customers select an initial set of content packages and can also license more over time.

Customers can also use Business Objects or Tableau to develop their own reports and dashboards. The data model supports cohort exploration along a large number of clinical, administrative, risk, and utilization/cost criteria. For analysts, HealtheEDW tools support SQL-based discovery of the data, including the ability to query data to create new data marts, ingest new data sources, apply transforms, and build custom metadata that can be used across multiple reports and dashboards.

Market

Market Execution B+
Market Vision B

Target Market(s): Large IDNs, AMCs, CINs, ACOs, Employers, Federal and State Governments
Pricing Model: Setup fee and PMPM
Flagship Customers: Advocate Health Care, Memorial Hermann Health System, Hackensack Meridian Health, University of Missouri Health, Agnesian Health Care, Adventist Health
Partners: SAP Business Objects, Tableau, HP Vertica, Hadoop, 3M, Truven, Milliman

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Cerner HealtheIntent is marketed globally and is a strong offering for hospital and health system customers. This offering is directed at the PHM needs of HCOs, but it is noteworthy that all of the company's products have some level of PHM functionality. Cerner has signed around 120 customers, with roughly 100 currently live. This includes its first client outside the U.S., Wirral University Teaching Hospital NHS. Cerner has also sold HealtheIntent outside of its Cerner Millennium customer base. For example, it recently inked a deal as a subcontractor to HPE with the Kansas Department of Health and Environment for HealtheIntent in the state's Medicaid system and is live at Geisinger Health System, a longstanding Epic EHR client.

Cerner offers HealtheIntent as a web-based service to its customer on a PMPM basis. Cerner's roadmap for HealthEDW includes enhancing statistical functionality, adding more content packages such as contract mode-

ling, and continuing to build better workflow integration. The company also plans to enhance user's ability to develop new KPIs and quality measures. Cerner is also looking to mainstream the use of non-traditional data types, such as air quality and food sources, in anticipation of customer demand for different ways to evaluate care needs and build new care models.

Strengths: Clean, normalized data used in Cerner applications exposed via APIs for developers.

Qualifiers: Focused on larger HCOs and clinician networks

Conifer Health Solutions

Product Overall C
Market Overall C+

Company

Headquarters: Frisco, TX
Website: www.coniferhealth.com
2016 Revenue: $6-9 million (est.)

Year Founded: 2008
Ownership: Private
Classification: Payer

Top Three Differentiators:

1. Practical tools for care manager productivity and effectiveness
2. Good claims analytics
3. Keeps focus on costs and utilization

Product

Product Capabilities C-
Product Vision C

Product(s): ConiferCore Population Health Intelligence
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔ Clinical Data Contribution	◔ Quality Reporting and Gaps
◔ Claims Data Contribution	◔ Cost and Utilization
○ Analytics Data Store	◔ Network Analysis
◔ Analyst and Developer Support	◔ Predictive Analytics
◔ Benchmarking	○ Functional Scope
○ Population Discovery and Definition	○ Workflow and Engagement

Conifer Health's ConiferCore provides a complete set of analytics and care management functionality. The product shows clinicians the risk profile of their panels, along with a comprehensive set of evidence-based care protocols to help manage that risk. Clinicians and care teams can then focus on increasing adherence to the protocols. This integrated approach to care management allows HCOs and others to pursue PHM and financial goals.

ConiferCore is based on a consolidated patient claims record and supports risk stratification, utilization analytics, benchmarking, some quality reporting, registries, and care management. ConiferCore risk scores each patient and categorizes them based on a combination of Conifer Health-supplied triggers and third-party groupers. Each customer can create its own risk categories based on the characteristics of its patient panels. Users can compare each patient or panel to a benchmark derived from Conifer Health's wider customer base. As part of the risk

stratification process, Conifer Health can estimate prospective utilization based on past utilization and current clinical indicators. The product uses this estimated utilization to calculate potential savings that can stem from care management interventions. Patients can also be referred to a care management program or added to registries from the risk stratification screens.

ConiferCore provides adherence reports derived from variety of evidence-based care guidelines. These reports generate care gaps, many of which are based on established clinical quality programs. Conifer Health can also develop customized quality measures for customers seeking to establish quality programs that go beyond what is required by payers and quality bodies.

Conifer Health leverages these analytics in its care management functionality and services. It offer its customer nurse care managers, in addition to technology, to round out its offer. Any notes that a care management encounter generates are available to other care team members. Conifer Health's care management functionality supports multi-modal patient encounters and breaks down the interactions into episodes. It records the time nurse care managers spend on each task or episode. This feature provides the basis for evaluating the effectiveness and efficiency of the care management interventions.

Across the entire application portfolio, ConiferCore supports reporting at three different levels – standard reports that users can run, ad hoc reports in which users can apply pre-defined filters, and OLAP-style reports. In the latter two categories, users have the ability to create a new registry based on these reports. The range and depth of these reporting options is significant and address the needs of the various user groups involved in care management.

Market

Market Execution _____ **C+**
Market Vision _____ **C**

Target Market(s): Health Systems, Hospitals, Physician Groups, Employers, Unions, Payers
Pricing Model: PMPM
Flagship Customers: Yale New Haven Health System, KentuckyOne Health Partners, Adventist Healthcare,
Partners: Aon, Beecher Evergreen, Validic

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Conifer Health Solutions, a Tenet subsidiary, is a prominent vendor of financial and clinical performance solutions to health systems, hospitals, physicians, health plans, and employers, with a particular strength in cost and utilization performance. All told, it has data on over 5 million patients from around the U.S.

Conifer's Value-Based Care organization focuses on the needs of HCOs transitioning to risk-based contracting with the ConiferCore set of solutions. It aims to help bring some risk management and actuarial capabilities to physicians and physician organizations. Its customers often combine its software technology with nurse care management services. These services are designed to help HCO customers deliver effective care management programs that can result in well-managed utilization for risk-based providers or enhanced revenue for FFS-based providers.

ConiferCore provides these analytics with significant care management capabilities. It delivers these services at scale with a proven ability to generate ROI for providers. This offering, from an analytics perspective, is intended primarily to serve the needs of care managers and their supervisory personnel. It supports the kind of planning required by medical leadership to make data-driven decisions about the potentially most productive use and deployment of care management resources.

Conifer Value-Based Care Solutions is leading Conifer's effort to bring the total inventory of patient data to bear on PHM challenges. Through technology, services and consulting, Conifer leverages its experience in population health management, clinical integration, financial risk management, and health plan operations. It has customers at various points on the path to value-based reimbursement, from CINs and ACOs to other risk-bearing providers, with some commercial and government payers.

Strengths: **Success in value-based contracts through deep expertise and supporting technology**

Qualifiers: **Use of clinical data in applications continues to grow**

eClinicalWorks

Product Overall C+
Market Overall C

Company

Headquarters: Westborough, MA
Website: www.eclinicalworks.com
2016 Revenue: $10-15 million (est.)

Year Founded: 1999
Ownership: Private
Classification: EHR Vendor

Top Three Differentiators:

1. Established HIT player
2. Geared to needs of busy community-based physicians
3. Agile deployment

Product

Product Capabilities C+
Product Vision C

Product(s): eClinicalWorks Population Health Management
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔ Clinical Data Contribution	◔ Quality Reporting and Gaps
◔ Claims Data Contribution	◔ Cost and Utilization
○ Analytics Data Store	○ Network Analysis
◔ Analyst and Developer Support	◔ Predictive Analytics
◔ Benchmarking	◔ Functional Scope
○ Population Discovery and Definition	◔ Workflow and Engagement

The eClinicalWorks product, Population Health Management Solution (PHM), is a cloud-based, vendor-agnostic analytics offering for organizations and clinicians that participate in risk-based contracts and/or value-based care delivery models. PHM provides analytics and care management functionality, which can be purchased together or separately. Either way, it is fully integrated with the eClinicalWorks EHR product. Data for analytics comes from clinical records, payer claim feeds, C-CDA data, device, social and patient-generated data when available. The company built this offering in 2011 to be fully web-based and recently refactored the Windows EXE version of its EMR to be fully web-based as well.

Broadly, this offering helps physicians with quality, cost, and risk reporting. Physicians see the number and type of care gaps scheduled for current and upcoming office visits and are informed of patients with missing data. It also provides information on appointment metrics and the time required by referral partners to respond to requests. Information generated in the Population Health Analytics solution can be viewed using a variety of data visualizations. Users can access the major categories of quality reports and filter the results based on several criteria. When users clicks a particular quality measure, they are presented with summary information about an entire population, along with the list of attributed providers assigned to that group of patients. If the user then

clicks on a specific provider, the provider's entire attributed cohort appears. The offering includes a large number of general-purpose reports for costs, quality, utilization, risk, and conditions. In general, users can apply a variety of filters and explore data about their patient panels and care gaps, generate registries, or export patient lists.

The company is a Certified PQRS Registry for EPs and group practices. It supports the import of data from remote EHRs to complete the data needed for MSSP quality reporting. The company can exchange data on CommonWell and Carequality. The Population Health Analytics platform supports HEDIS measures, CPCI, ACO measures, and has a MIPS dashboard that includes PQRS, Meaningful Use, and PCMH, as these programs have now been consolidated under MIPS. It has also started supporting reports and dashboards for bundled or episodic payment mechanisms including CMS-sponsored existing bundles and potential new bundles. These dashboards show events and costs over time related to the care episode.

PHM gives clinicians a view into any care gaps and high utilizers that exist in a panel. eClinicalWorks EHR users receive this information directly in their EHR along with click access to more detailed information in the patient record. For non-eClinicalWorks EHR users, the product offers a web-based SSO-mediated interface.

eClinicalWorks regards PHM and its care management functionality as complementary to each other and to the EMR. It supports multiple ways to enroll patients in care management programs, including both provider- and payer-generated enrollments. It also supports multi-modal patient interactions. eClinicalWorks PHM Care Management offers risk scoring and stratification of enrolled patients. It can generate a blended care plan based on each patient's conditions and risks and offers 27 out-of-the-box care plans for chronic conditions. Detailed information about care team members, care plans, assessments, goals, barriers to care, tasks, and reminders can be displayed as well as summaries indicating degrees of completion. eClinicalWorks has teams of physicians and nurses vetting the evidence-based assessments. eClinicalWorks integrates third-party content like patient education in the EMR, and is working to integrate with care plan content partners. The PHM solution supports the ability to compare the performance of care managers on outcomes and productivity.

Market

Market Execution C
Market Vision C

Target Market(s): ACO, CIN, FQHCs, IDNs, PCMH, CCM, Behavioral Health,
Pricing Model: PMPM
Flagship Customers: Coastal Medical ACO, Amarillo Medical Legacy ACO, West Florida ACO, Emerald Physicians, Northern Physician Organization, Northern Ohio Medical Specialists.
Partners: None

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

eClinicalWorks is well established as an ambulatory EHR vendor, with more than 125,000 providers and nurse practitioners using the eClinicalWorks EMR/PM solution. It has been working toward expanding its product line with eClinicalWorks 10i Acute Care EHR targeted at small hospitals.

This analytics offering is targeted at its installed base of customers as well as to ACOs/CINs and entities that participate in value-based care or are involved in risk-based contracts with their payers. The company also provides consulting services to customers to help them understand how analytics work and how it can be used to improve clinical workflows and drive optimal patient outcomes at reduced cost. This offering is a good way for providers to enable programs like ACO, CIN, and PCMH, and to support chronic care management reimbursement from CMS.

The technology of its analytics offering is one way that eClinicalWorks differs from its community-oriented competitors. The company stages and normalizes the data in Microsoft SQL Server and mirrors it to in-memory database for most of the queries and user interactions. This high-performance option is made possible by the economies of scale of a multi-tenant, cloud-based offering. This same architecture makes it possible to support referrals inside the eClinicalWorks user base. Another potential differentiator is the fact that eClinicalWorks deploys its PHM in days and weeks as opposed to months by some of its competitors.

eClinicalWorks offers its global customer base of physicians and HCOs a truly comprehensive solution. The company claims that over 5,000 provider organizations and more than 60 ACOs have adopted PHM. While the company's successful EHR and PM are its leading solutions, we believe that few eClinicalWorks customers leverage the significant value of PHM's underlying patient data for anything other than the care gaps and quality reporting applications themselves. As more customers begin using eClinicalWorks PHM for care management and start participating in value based payment models, we anticipate their appetite for clinical analytics will increase.

Strengths: **Integrated EHR, analytics, and care management offering**

Qualifiers: **Customer may not have access to all pertinent commercial claims data sources**

Epic Systems Corporation

Product Overall _____ **B+**
Market Overall _____ **B+**

Company

Headquarters: Verona, WI
Website: www.epic.com
2016 Revenue: $16-19 million

Year Founded: 1979
Ownership: Private
Classification: EHR Vendor, HIE/CNM

Top Three Differentiators:

1. Comprehensive PHM offering
2. Enterprise-class data warehouse adaptable to multiple needs
3. Uniform user experience across diverse product set

Product

Product Capabilities _____ **B+**
Product Vision _____ **B**

Product(s): Healthy Planet, Cogito, Caboodle, Care Everywhere, Stargate, Cognitive Computing Platform
Dominant Deployment Model: On-premises or Epic-hosted

Product Criteria Ratings

◑	Clinical Data Contribution	◑	Quality Reporting and Gaps
◑	Claims Data Contribution	◑	Cost and Utilization
◕	Analytics Data Store	◔	Network Analysis
◔	Analyst and Developer Support	◑	Predictive Analytics
◑	Benchmarking	◑	Functional Scope
◑	Population Discovery and Definition	◑	Workflow and Engagement

Epic's PHM initiative, Healthy Planet, includes Cogito – a comprehensive approach to supporting the needs of analytics users. Its data model encompasses transactional data (Chronicles), an operational data store, and an EDW (Caboodle). It uses these data sources to supply reporting and analytics to a wide range to a variety of user types. Healthy Planet also has an integral care management application that relies on Cogito data. For non-Hyperspace users, Epic provides the same data and functionality via its EpicCare Link (Healthy Planet Link) clinician portal. Cogito is broader than PHM since Epic customers use it to improve clinical, financial, administrative, and operational workflows and processes in other contexts as well.

Caboodle consists of an LPR populated by clinical, claims, and other local and remote data sources. It use Epic Care Everywhere to ingest Epic and non-Epic data from participating provider organizations. All of this data is

linked and aggregated at the patient level and attributed to the correct provider. Epic provides visibility into the status and performance of customer data feeds with a product called Stargate.

Cogito has multiple options for end-users, reflecting a commitment to provide functionality matched to the inclinations of different types of users, which it characterizes as data tourists, farmers, or miners. For those less versed in technology, it provides a set of dashboards in Hyperspace that demand little more than the ability to click on links. These dashboards provide a set of condition registries, cost and utilization metrics, quality and care gaps, and patient experience analytics. Users can drill down into each category based on their panels. It combines metrics of interest to a clinicians in clinics and in hospitals. For instance, it supports MSSP quality reporting and HCC coding gaps and provides information on readmissions and other kinds of hospital and non-hospital utilization events. It also offers up a wealth of benchmarking data when such data is available and the organization has elected to use it.

For users more familiar with the underlying data, SlicerDicer provides an OLAP-style interface for deeper discovery and analysis. For the most data-oriented users and analysts, all of the data in Caboodle is also accessible using third-party BI tools. Regardless of which option a user chooses, the applications provide the ability to identify distinct cohorts of patients, risk-stratify them, and enrolls patients into care management programs designed to engage providers and patients.

Epic has also evolved it Predictive Analytics module into a more full-featured offering called the Cognitive Computing Platform. It allows HCOs to leverage any data source, including external data and free text, with machine learning algorithms. This general purpose offering can be applied not only clinical purposes such as predictions about sepsis or asthma but also for more administrative purposes such as staffing levels.

Epic Cogito supports the analytics functions needed in the various elements of Healthy Planet. But it is also a general-purpose data warehouse and is being used more widely to support important clinical programs and financial goals that may not directly relate to value-based healthcare.

Market

Market Execution A-
Market Vision B-

Target Market(s): AMCs, Health Systems, Clinics
Pricing Model: Included for Epic EHR customers with data feed fees and PMPY to include non-Epic EHR lives
Flagship Customers: Kaiser, Johns Hopkins University, Duke University, Walgreen, CVS Health
Partners: Surescripts, Chartis Group

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Epic is a dominant HIT vendor with solutions for a wide range of HCOs. While many of the largest AMCs and health systems are customers, it also boasts the largest number of MU-compliant EPs in the industry. The company's flagship EHR is arguably more widely used, in more venues, than any other commercial product. The company is leveraging Healthy Planet to not only complement its EHR solutions but also to attract potential customers outside of its traditional base, including payers, employers, and a variety of post-acute providers.

Healthy Planet is the company's offering intended to help its customers make the transition to value-based care. In the last year, the company has enhanced this offering and Cogito in several ways. It increased the size of its development staff substantially. There is also more emphasis on financials and revenue cycle than in the past. It more fully incorporates outside data sources using Care Everywhere.

For customers seeking additional resources for data integration, the Healthy Planet Data Aggregations Partners Program consists of a list of Epic-approved companies that perform EHR extraction and aggregation. It also enhanced functionality related to the social care aspects of PHM. Epic now hosts Healthy Planet and its constituent products for customers seeking an outsourced implementation, an offering it calls Healthy Planet Constellation.

All told, Epic has grown its installed base of production customers nearly 300% since 2015. About one-third of customers currently use predictive analytics models, which are shared across the Epic community.

Epic may have been a little late to the market with Healthy Planet but Cogito but has made up for lost time with strong adoption in its EHR install base. Epic EHR users can easily learn and begin using Cogito given the integrated nature of both the underlying data and the applications themselves. Epic customers also benefit from the services the company provides, which includes strategic planning for value-based care, technical planning and guidance, and project management. The company is demonstrating a strong commitment to helping its customers master value-based healthcare.

Strengths: **Strong combination of quality, costs, and utilization from across a community**

Qualifiers: **Not an option for independent medium to small HCOs**

Forward Health Group

Product Overall B-
Market Overall B-

Company

Headquarters: Madison, WI
Website: www.forwardhealthgroup.com
2016 Revenue: $3-5 million (est.)
Year Founded: 2009
Ownership: Private
Classification: Independent

Top Three Differentiators:

1. Strong visualization of out-of-network encounter on a patient or cohort basis
2. Geared to needs of clinicians focused on care rather than software
3. Relatively fast time to implement reporting applications

Product

Product Capabilities B-
Product Vision B-

Product(s): Population Manager, Population Monitor, Population Compass
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔	Clinical Data Contribution	◔	Quality Reporting and Gaps
◑	Claims Data Contribution	◑	Cost and Utilization
○	Analytics Data Store	◑	Network Analysis
◔	Analyst and Developer Support	◔	Predictive Analytics
◔	Benchmarking	◔	Functional Scope
◔	Population Discovery and Definition	◔	Workflow and Engagement

Forward Health Group (FHG) combines data from EHRs and claims to help physicians and care teams spot gaps in care, identify at-risk patients and outliers, compare physician performance, analyze organizational performance, and improve physician and patient engagement.

At its highest level, Population Manager allows users to see a list of evidence-based quality metrics with adherence in a panel. It displays comparisons to other panels or providers within the organization. Users can also filter the display based on organization or provider, quality measures, gaps, conditions, or panels.

PopulationCompass takes a unique approach to network utilization analysis. The dashboard starts with a patient or cohort, displayed as a bubble. Users can select encounter types to display and adjust a time slider along the bottom of the screen. As the user increases the timeframe, bubbles appear that show utilization events color-coded to indicate the network where the services were delivered. Hovering over any bubble gives the relevant charges. Users can toggle the bubbles to show either the number of encounters or the total charges. Detailed

information about the patients, encounters, and charges are displayed under the visualization. This graphical approach to the visualization of OON utilization differs markedly from the conventional tabular depiction of this kind of data.

This visualization approach works differently when applied to cohorts. Users first filter to select the cohort, specialty, and timeframe they are interested in seeing. The application then displays bubbles that indicate the aggregate number of referrals to other color-coded providers or organizations along with information about charges and the identity of the referred to entity. Additional layers of color coding can indicate hotspots of out-referrals. This application enables HCOs to quickly understand referral patterns and makes it possible to ask informed questions about why the patterns exist.

It also provides a graphical display of bundles. On a per-patient basis, it shows costs for bundles against the projected reimbursement amount. Service locations are color-coded for each patient. Users can alter the display from a patient basis and cluster or sort the charges according to different criteria to find patterns.

Market

Market Execution ____ **C+**
Market Vision ____ **B**

Target Market(s): IDNs, Physician Groups, Payers and Plans
Pricing Model: PMPM
Flagship Customers: Penn Medicine, University of Illinois Hospital and Health Sciences System, HealthLinc, Riverside University Health System, Arrowhead Regional Medical Center, Fresenius Medical Care of North America
Partners: Leavitt Partners

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Forward Health Group cut its teeth on a public quality reporting system for the Wisconsin Collaborative for Healthcare Quality, a statewide initiative to collect, combine, and display health data. This application collects data from across the state and shows, by provider, quality performance on metrics that span multiple quality domains.

Unlike all of the other products in this report, this application is intended for patients. The company leveraged this experience and focused on quality reporting applications for its provider customers. It is a qualified PQRS registry, as well as a CMS-approved Qualified Registry and a Qualified Clinical Data Registry (QCDR).

Strengths: Strong out of network visualization

Qualifiers: Restrained use of clinical data

Geneia

Product Overall _____ **B-**
Market Overall _____ **C+**

Company

Headquarters: Harrisburg, PA
Website: www.geneia.com
2016 Revenue: $3.5 million (est.)
Year Founded: 2012
Ownership: Private
Classification: Payer

Top Three Differentiators:

1. Combines analytics and clinical services to actively manage populations in value-based relationships
2. One integrated, secure platform built specifically for the purpose of managing populations
3. Proven to lower cost and utilization, and optimize quality measures

Product

Product Capabilities _____ **B-**
Product Vision _____ **C+**

Product(s): Theon, @Home, The Geneia Institute
Dominant Deployment Model: SaaS

Product Criteria Ratings

◑ Clinical Data Contribution	◔ Quality Reporting and Gaps
◑ Claims Data Contribution	◑ Cost and Utilization
◔ Analytics Data Store	◑ Network Analysis
◔ Analyst and Developer Support	◑ Predictive Analytics
◑ Benchmarking	◔ Functional Scope
◔ Population Discovery and Definition	◔ Workflow and Engagement

Geneia LLC is an analytic solutions and clinical services company that helps clients improve outcomes, lower costs, and increase quality performance. It focuses on simplifying the evolution to value-based care and driving collaboration between health plans, providers and employers. Geneia works with HCOs that need to better identify and manage risk, rising risk, utilization and costs, and improve performance in value-based arrangements.

Geneia's solutions aim at improving alignment, data sharing, and collaboration among payers, providers, and employers. This vision extends to its product suite, where Geneia delivers advanced analytics and care management with a set of modular applications called the Theon platform that uses a consolidated set of clinical, claims, and device data. The platform modules support clinical risk profiling and stratification, cost and quality reporting, provider benchmarking, and risk adjustment optimization.

Clients use Theon's Care Optimizer module to understand and manage risk, utilization, and cost at the population level and compare to industry, organizational, and peer benchmarks; Care Collaborator module to identify and close care gaps; and Care Engager for value-based cost and quality performance data for employer reporting.

Geneia utilizes clinically-focused dashboards that potentially integrate as many as 25 different sources of information and present open care opportunities aggregated by provider and patient. Role-based access ensures each user sees patient records based on the organization's policies with full information on plan coverage. Each customer organization establishes reports that users access from the landing page. The reports provide an overview of the patient panel and cohorts such as recent discharges, new patients, and open quality opportunities.

Users can drill down into the patient panel to identify sub-cohorts based on costs, utilization, risk, propensity to engage, demographics, and clinical indicators. Users can build watch lists based on these filters to monitor progress. They can also drill down to the patient level and see a summary timeline of events.

Theon allows organizations to easily track, measure and improve quality performance with a focus on HEDIS, Medicare Star ratings, MACRA, PQRS, and more. It also allows users to explore the patient panel based on utilization events. It shows the effect of outliers on different areas of spend and compares to peer organizations. Users can refine these lists with filters to focus on coding opportunities, generic substitution, and quality improvement.

In addition to identifying high-risk patients (RAF or CRA), Theon helps focus resources based on a patient's propensity to engage in a care management program. It can also send PDF documents with a supplemental data payload to the organization performing care management. This human-readable document can also be ingested by care management software. Theon also offers an alternative way to use this data with a set of dashboards that summarize cost categories, utilization events, and quality reports. These dashboards allow the organization to identify and quantify potential savings as a first step to actually achieving those savings. It provides Tableau support for customers seeking to extend functionality and options Theon provides with its standard reports and dashboards.

Geneia's @Home remote patient monitoring program is integrated with the analytics and care management and helps chronically ill patients and their care teams better monitor and manage their health using FDA-approved wearable devices. Theon ingests and consolidates near-real-time biometric device data patients for use by nurses and CNAs who can then determine appropriate interventions and treatments.

Geneia offers clinical and consulting services to support providers in their transition to value-based care and implementation of alternative payment models. The company employs population health consultants who work directly with clients to better align clinical interventions using data from the Theon.

The roadmap includes the ability to recognize priority-of-care opportunities or coding issues from the standpoint of revenue as well as risk. The ability to calculate a patient's propensity to enroll in a condition or disease management program is available but has yet to be implemented by clinical teams. In addition, the company will introduce predictive models such as opioid dependency and specialty pharmaceutical use, as well as the ability to perform real-time calculation and recalculation of quality measures and risk.

Market

Market Execution	**B-**
Market Vision	**C**

Target Market(s): ACOs, Payers, Hospitals, Physician Practices
Pricing Model: PUPM plus integration charges
Flagship Customers: Capital BlueCross, Excellus Blue Cross Blue Shield, Physicians Alliance Ltd., Lehigh Valley Business Coalition on Healthcare
Partners: Cognizant/TriZetto, Vertica, Navigant, Tableau, SAS, Mirth, Amazon

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Geneia is owned by Pennsylvania-based payer Capital BlueCross, and most of its customers are health plans, brokers, or employer groups. The company was founded to help bring risk and utilization analytics rigor to risk-bearing payers and HCOs. Geneia has had some success with post-acute providers with its Theon platform and @Home remote monitoring program, which gathers and consolidates device data for use by nurses and CNAs.

Geneia has built its solution set from the ground up to consist of a single platform and a single data structure shared transparently yet securely across constituents. The company has experience in the design, implementation, and support of risk arrangements and care delivery; its solutions support more than 2 million patients in ACOs. The company has its own direct sales force, made up primarily of veterans of provider-side HIT, to drive new business.

Unusually for an HIT vendor, Geneia offers education and training to anyone, not just direct users of its technology. The Geneia Institute, staffed primarily by physicians and nurses, supplements Geneia's value proposition for healthcare transformation with training that gives clinicians the skills to manage care at the population level. It provides courses in population health and the use of data in complex clinical relationships.

Geneia has a strong appeal for payers and health plans. Geneia's approach was validated when it achieved NCQA Case Management and Patient- and Practitioner-Oriented Disease Management Accreditation for five clinical programs in August 2016.

Its traditional focus on payer-led care management means that its appeal to HCOs is somewhat unproven but growing. Along with adding health plan clients, Geneia is currently expanding its market footprint to include more provider organizations. It is primarily targeting hospital-based HCOs and their associated ACOs or CINs, as well as large physician groups and employer groups. As the company gains visibility, its ability to fully leverage the combined clinical and claims record across a care community will be an important enabler.

Strengths: Payer agnostic approach supports complete set of claims data for analysis

Qualifiers: Still gaining experience with provider organizations

Health Catalyst

Product Overall B+
Market Overall B+

Company

Headquarters: Salt Lake City, UT
Website: www.healthcatalyst.com
2016 Revenue: $24-30 million (est.)
Year Founded: 2008
Ownership: Private
Classification: Independent

Top Three Differentiators:

1. Multiple use cases and applications
2. Long-term view of role of analytics
3. Flexible architecture for analytics development

Product

Product Capabilities A-
Product Vision B+

Product(s): Health Catalyst Data Operating System, Health Catalyst Improvement Applications
Dominant Deployment Model: On-premises or Cloud

Product Criteria Ratings

◑ Clinical Data Contribution	◑ Quality Reporting and Gaps
◑ Claims Data Contribution	◑ Cost and Utilization
◕ Analytics Data Store	◑ Network Analysis
◑ Analyst and Developer Support	◔ Predictive Analytics
◑ Benchmarking	◑ Functional Scope
◑ Population Discovery and Definition	◔ Workflow and Engagement

Health Catalyst's data warehousing solution for healthcare enterprises is the base for an array of applications. It currently ingests data from EHRs, claims, HR applications, general ledger cost accounting applications, and patient satisfaction surveys, among other sources. It has sixteen different algorithms for cohort stratification and offers its customers the ability to combine them – risk models, utilization, chronic conditions, medications, and social determinants – each with a different weight, depending on the clinical or financial objectives. Its application portfolio is too extensive to describe in this profile, but the company goes far beyond the cost, utilization, and quality metrics described in this report.

The company's roadmap is equally comprehensive. Precise Registries will be a major improvement to its cohort builder and will be available across its entire set of user-facing applications. Out of the box, it will offer condition, hospital-focused, pediatric, and financial registries. The company also plans to introduce a registry builder. Precise Registries will allow users or developers to deploy newly created registries with pre-existing measures and filters. The company expects that this tool will be used in many contexts. For example, it could be used to create

registries of patients with a particular risk of developing a condition that could then be deployed in a care management program. It will also have SMART on FHIR support to deliver content and data to other applications. Health Catalyst already includes G/L-based cost accounting metrics in some applications and plans to make this data more widely available across all of its products in 2017.

Health Catalyst's roadmap include better support for extending its data models, Azure support, and API-enablement of data elements. Over a slightly longer term, the company is planning to incorporate Hadoop as an option for data storage. It is partnering with Regenstrief Institute to offer NLP text analytics. It is also planning to introduce an episode builder that would help expand HCOs to go beyond the CMS-specified episodes and contract more freely with other payers. Café, slated for 2017 release, will be a benchmarking tool to support cost, utilization, and quality comparisons across different organizations.

It plans to help identify, intervene, prevent, and predict all-cause harm events with a dashboard containing all-cause harm trigger metrics currently under consideration by CMS and descriptions of the type and number of harms as well as their severity and cost. It also plans to offer the ability to develop composite risk scores and specific event risk scores.

The Measure Business Library will deliver content management system-like capabilities for measures. Users can explore existing measures to avoid variability/duplication etc. It will also let users develop new or refine existing measures. Leading Wisely will be a new approach to reporting/dashboards. It includes not only reporting of important metrics but also notifications of trends that may be occurring in the relevant patient panels to clinicians and users who can take corrective action.

The company is also focused on the practical applications of machine learning. It has invested in plans to deliver tools that make machine learning useful to more users. To this end, it has open-sourced a set of R and Python tools it developed for data scientists called healthcare.ai.

Market

Market Execution B+
Market Vision B+

Target Market(s): Hospitals and Health Systems, CINs, ACOs, Physician Groups, and Other HCOs
Pricing Model: Subscription
Flagship Customers: Stanford, Allina, Partners Healthcare, Texas Children's, Indiana University, Mission Health, Piedmont
Partners: Texas Children's, Partners Healthcare, Allina Health, Qlik

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Not content with simply offering a broadly applicable data warehouse, the company has put forward a way to think about data that is more expansive than a data warehouse, an HIE, and a clinical data repository combined:

The Healthcare Data Operating System. It will include virtually any relevant data type and support both transactional and analytical API-based access for conventional and machine-learning enhanced applications. The company's goal is broader than the production of reports and dashboards and focuses on delivering timely and actionable data to any user, in any workflow. In addition to this expanded idea of data, Health Catalyst intends to merge the understanding from quality, cost, and utilization analytics with other data including G/L-based cost accounting and safety applications to help HCOs optimize clinical and financial performance across multiple dimensions.

Long known as one of the most effective marketers in all of HIT, Health Catalyst believes that data and analytics will do big things in healthcare. A lot of its appeal to customers is that the transformation occurring in healthcare — from FFS to VBR — is and always has been integral to Health Catalyst's core focus on identifying variance in process improvement. It makes this case more assertively than most vendors, particularly to appeal to physicians employed or affiliated with hospitals and health systems. Its technical value proposition centers on the confidence inspired by its data and data warehousing expertise.

The company's product portfolio encompasses not only PHM analytics but also a range of clinical, financial, and operational applications. It offers roughly 100 applications that it can sell to current and prospective customers. For PHM, these applications include offerings for readmissions reduction, sepsis management, central line infection reduction, appendectomies, and many others. The company is playing a long game in the sense that programs like PQRS or MU come, go, and evolve, so the HCO should focus more on understanding the clinical, financial, and operational consequences of hitting these and other metrics. In other words, it aims its solution at enhancing the long-term financial viability of its customers.

Strengths: **Strong vision for better analytics across the healthcare enterprise and willingness to experiment**

Qualifiers: **Working on better options for post-acute venues**

HealthEC

Product Overall B
Market Overall B-

Company

Headquarters: Piscataway, NJ
Website: www.healthec.com
2016 Revenue: $8-12 million (est.)
Year Founded: 2011
Ownership: Private
Classification: Independent

Top Three Differentiators:

1. Provides strong business perspective for physicians and clinicians
2. Integrated care management
3. Expansive product model

Product

Product Capabilities B+
Product Vision B-

Product(s): HealthEC PHM
Dominant Deployment Model: SaaS

Product Criteria Ratings

◑ Clinical Data Contribution	◑ Quality Reporting and Gaps
◑ Claims Data Contribution	◑ Cost and Utilization
◔ Analytics Data Store	◑ Network Analysis
◔ Analyst and Developer Support	◑ Predictive Analytics
◑ Benchmarking	◑ Functional Scope
◔ Population Discovery and Definition	◔ Workflow and Engagement

HealthEC's PHM suite combines analytics with care management, creating a comprehensive business view of costs, utilization, and quality for value-based contracts. This set of analytics is highly focused on the fiscal nuts and bolts of creating and operating P4P and risk-based programs in communities where physicians are free to align with a variety of partners.

This suite is not only a tool for utilization, cost, and quality management but also for informing strategies to refine and improve physician network and payer contracts ranging from modified FFS to full risk arrangements, as well as analyzing provider and specialty access and adequacy within a network. For example, its network analytics functions provide information on patients who receive care out of network, and identifies providers who could become valuable members of the customer's physician network. It lets HCOs use data on all patients when they negotiate any kind of P4P contract by arming them with good data on their past performance on quality metrics, costs, utilization, and risk scores. It enables provider organizations to conduct informed conversations and negotiate reasonable targets with prospective payers. A recent enhancement includes the ability to monitor payer contract performance, analyze reimbursement, and evaluate claims adjudication efficiency and accuracy.

HealthEC analytics tool has attribution functions that reflect CMS, other government, and commercial payer guidelines, but it permits the organization to ensure that all patients are appropriately attributed to a physician. It includes beneficiary management functions that allows the provider to track and maintain patients as they change carriers. HealthEC's analytics tool supports a flexible organization model in which individual users can be assigned multiple roles across multiple contracts. Role-based access determines the options presented on each menu, as well as access to the underlying data. While more directly applicable to the integrated care management functionality, the HealthEC solution also incorporates collaboration tools including webinar hosting, committee communications and education.

HealthEC is a Qualified Clinical Data Registry (QCDR) with CMS. The analytics tool plays a critical role in the company's performance reporting capabilities, determining compliance with various requirements including MIPS, GPRO, Comprehensive Primary Care Plus (CPC+), Oncology Care Model (OCM) Registry, State-based Health Homes and others. The analysis is used to identify baseline performance, inform HealthEC's Advisory Services to help clients establish plans to improve metrics, monitor the effects of change, and submit data to the appropriate agency.

Each user is presented with a role-based dashboard and a targeted set of KPIs that summarize cost, quality or utilization performance versus some benchmark. The multi-dimensional data model supports drilldowns and filters to explore performance at the practice and physician levels, with detailed information on panel size, risk scores, utilization events, and the conditions present in panels. OLAP-style analysis of patients provides organization-specific costs and utilization down to category, provider, patient, ICD or CPT code, DRG code, supply, test, or medication levels. This capability also supports special-purpose drilldowns to explore high cost patients, disease-specific groups of patients, and some episodes, including BPCI. Analytics also drives many elements of the suite's care management functionality, including the generation of daily worklists for care coordinators, identification of gaps in care, scheduling of interventions, and generation of alerts.

HealthEC relies on a combination of the Hopkins grouper and proprietary algorithms at a panel level and generally groups each cohort into three categories, ranging from high-cost/high-risk for complex patients down to well patients. Within each condition cohort, it re-stratifies using its own risk algorithm. It also has a summary report of cohorts by RUB. Medications adherence reports based on Surescripts data can also be used to support decisions about the composition of formularies. Finally, it provides a full complement of payer-based quality reporting. Users have access to reports or dashboards and can also export either to a PDF or a CSV for subsequent analysis.

The company also provides analytics for its care management tools that allows physicians to evaluate the effectiveness of care management interventions. All of the financial and utilization reports and dashboards rely mostly on claims data, while disease registries, care coordination and quality measures all also rely on clinical data. HealthEC's associated care management applications use the combined claims and EHR data more extensively.

Market

Market Execution ____ **C+**
Market Vision ____ **B-**

Target Market(s): ACOs, Payers, MSO/IPAs, CINs, IDNs
Pricing Model: PMPM and PPPM
Flagship Customers: Shore Quality Partners, Princeton Physicians Organization, DC Primary Care Association, The Physician's Integrated Network, Centene
Partners: LabCorp, Covance, Johns Hopkins, Centene

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

HealthEC provides a range of clinical and financial HIT solutions targeted at the needs of individual clinicians and HCO leaderships. In addition to this offering, it has a claims clearinghouse that processes over 4 million claims per month and has contributed to building several HIEs, giving it extensive experience with healthcare data. HealthEC has grown through word-of-mouth and its channel relationship with LabCorp, but has recently added a sales and marketing team. Much, but not all, of its growth has been concentrated in the mid-Atlantic states. But the company operates across the country and remains a solid offering for any provider in its target market.

Its combination of comprehensive, cross-community analytics with a functional care management application has given HealthEC a solid foothold in the analytics for PHM market. HealthEC has also expanded into the payer market with major contracts under white label agreements serving large Medicaid/dual-eligible and commercial populations; the platform is currently being used to manage a developmentally disabled patient population as an accountable organization in the Medicare sector.

The range of services and expertise it provides in a typical engagement is broad and relevant to the needs of its target market. It has an unusually strong focus on the business implications of PHM analytics. This solution proves its value not just as a way to achieve benchmarks, but also as a way to support decisions about networks and resources in competitive provider markets.

Strengths: Strong focus on business ramifications of costs, utilization, and quality for HCOs

Qualifiers: Market footprint in the Northeast and mid-Atlantic regions, as well as Alabama, Georgia and Missouri

IBM Watson Health

Product Overall B+
Market Overall B+

Company

Headquarters: Armonk, NY
Website: www.ibm.com
2016 Revenue: $8-12 million (est.)

Year Founded: 1911
Ownership: NYSE Listed
Classification: Independent, Payer

Top Three Differentiators:

1. Deep claims analysis capabilities
2. Broad product and services portfolio
3. Cognitive computing capabilities

Product

Product Capabilities B
Product Vision A-

Product(s): EPM Suite , Advantage Suite
Dominant Deployment Model: SaaS

Product Criteria Ratings

◑	Clinical Data Contribution	◔	Quality Reporting and Gaps
◕	Claims Data Contribution	◑	Cost and Utilization
◔	Analytics Data Store	◔	Network Analysis
◔	Analyst and Developer Support	◑	Predictive Analytics
◑	Benchmarking	◔	Functional Scope
◑	Population Discovery and Definition	◔	Workflow and Engagement

IBM Watson Health offers products and services that combine cognitive computing, advanced analytics, and data to address diverse information and technology needs across all of healthcare. Broadly, its goal is to provide data-driven insights to help HCOs illuminate and categorize risk at a patient and population level. As a result, the HCO will be enabled to efficiently manage population health, deliver more efficient care, engage patients as individuals, and optimize business performance.

Its current analytics portfolio supports the ability to measure and compare performance indicators based on aggregated episodes and clinical events. The product set relies on over 3,000 pre-configured health measures to support data exploration. It also provides a range of predictive capabilities geared to conditions, utilization, events, costs, and episodes. This underlying technology acquires data from an exhaustive list of EHRs, payers, and other data sources. For now, each of the constituent products relies on its own data store. The company's roadmap (described in the Market section below) includes a consolidated, multi-purpose data store for IBM Watson Health.

Based on its legacy Truven Health Analytics products, the company provides dashboards for exploration of cost, quality, and utilization data and trends. Every claim line can serve multiple uses for the purpose of service line categorization and grouping. Customers have a wide range of options for depicting costs, cost categories, and utilization for risk-bearing HCOs as well as FFS-based HCOs. The company offers exhaustive benchmarking with de-identified patient data from its MarketScan Research Databases. This helps direct attention to the contributing factors of cost and utilization variation. The dashboard also provides a good way to tease out the effects on costs and utilization of high-cost claimants and estimates savings if disease progression is slowed. The company offers additional dashboards based on its legacy Explorys product that provide population profiles, historical utilization, risk and projected utilization, and clinical performance. Customer-definable registries support filtered exploration based on the clinical record and integrate with IBM Watson Care Manager for follow-on care management programs.

Market

Market Execution B
Market Vision A-

Target Market(s): Employers, Payers, Integrated Delivery Networks and Systems, Hospital Health Systems, Clinically Integrated Networks, Health Plans, Government
Pricing Model: PMPM, PUPM
Flagship Customers: Mercy Health System, Orlando Health, Bon Secours, IASIS
Partners: Siemens Healthineers, Medtronic

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

IBM Watson Health combines technology from IBM Watson and the company's HIT acquisitions over the last few years: Explorys, Phytel, and Truven Health. Each of these predecessor companies brings particular product and data expertise, while the overall goal is to provide support for HCOs transitioning to PHM. Incorporating products from multiple acquisitions into a product portfolio with wider ambitions is a complex undertaking. IBM is making steady progress harmonizing these products. For instance, it is consolidating its user interfaces to provide consistency for different kinds of users. The company has an extensive functional roadmap for its analytics portfolio as well as a clear idea of the portfolio's role in the wider IBM Watson Health value proposition and PHM generally. Broadly, this roadmap includes support for more data, better functionality, and enhanced packaging of both.

Explorys formerly supplied each physician with a population assessment document that described the demographic, risk, utilization, and prospective utilization characteristics of their panels. The company is planning to convert this to a set of dashboards built with the IBM Watson Analytics visualization front-end product. This will provide a potentially more productive way for non-technical clinical users to understand the data on their panels and risks.

The company's plan for a consolidated approach to data is the most notable feature of its roadmap. Increased access to non-traditional data sources, including SDoH data, free-text in clinical notes, and public data sources has a high priority in the company's product plans. Leveraging IBM's Unified Data Model for Healthcare, it will provide an enterprise-class data warehouse to support all of the IBM Watson Health's analytics portfolio.

The company is also building a de-identified benchmarking and research database that combines EHR and claims data, which it will offer to life sciences and other interested customers. The company believes that such a resource will also help its provider customers understand the respective value and limitations of claims and EHR data. Potential uses could be not only for clinical research but also for testing or validating different cognitive methods and algorithms for use in day-to-day clinical practice. Predictive models can be more accurate when based on the combination rather than on the individual data types. The company is testing the combined models for validity, incremental value and market applicability.

IBM will support the consumption of data and methods by other applications from other companies. It describes this capability as Flexible Analytics. Due to market demand, the company has decomposed its analytics methods to make them available individually and in need-based packages to augment clients existing data warehouse and business intelligence tools. Such methods also include relevant reference data sets.

IBM Watson Health leverages its data resources to deliver what it calls actionable risk models. It estimates the likelihood of specific events in addition to providing generalized risk scores. These models will be based on sizable datasets to provide enough evidence and transparency to foster trust by users. It also plans to continuously refine the models based on new data and new insights into the factors that impact the prediction. It believes that specificity will allow HCOs to decide whether to act preemptively. When they do act, it will allow them to focus on the most important factors affecting risk.

The company also plans to apply IBM Watson Health's cognitive computing capabilities to this data. It believes that its augmented intelligence can help find relationships in large and disparate data sources much faster than with conventional methods. It is already using Watson-based NLP in its care management applications to extract data from notes that the application collects over time.

Strengths: **Cost and utilization benchmarks**

Qualifiers: **Integration across diverse products continues to progress**

MCIS, Inc.

Product Overall B-
Market Overall C+

Company

Headquarters: Marshfield, WI
Website: www.mcis.com
Classification: EHR Vendor

Year Founded: 2014
Ownership: Private

Top Three Differentiators:

1. Deep integration with EHR and care management
2. Close to turnkey solution
3. Uncluttered product geared to busy clinicians

Product

Product Capabilities C+
Product Vision B-

Product(s): MCIS Insights
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔	Clinical Data Contribution	◔	Quality Reporting and Gaps
◔	Claims Data Contribution	◔	Cost and Utilization
○	Analytics Data Store	○	Network Analysis
◔	Analyst and Developer Support	◔	Predictive Analytics
◔	Benchmarking	◔	Functional Scope
◔	Population Discovery and Definition	◑	Workflow and Engagement

MCIS offers a complete solution for ambulatory practices focused on the needs of physicians and teams delivering care to patient cohorts with complex chronic conditions. Currently the product focuses on six common chronic disease conditions and four wellness categories. A radar (or bar) chart with a set of relevant evidence-based quality metrics and trend lines is the starting point for drilldowns into more detailed data. Each shows progress on compliance with the quality measure. Users can toggle between the summary data and patient lists for each cohort. Each patient list can be HCC risk-adjusted to better understand individual patients as well as overall cohort status. Filtered query supports cohort discovery based on commonly used clinical data elements. MCIS has incorporated a large set of measures, including PQRS, MU, and other evidence-based metrics. It also provides benchmarking data for these metrics based on statewide performance. These analytics are well integrated, from user interface and data standpoints, with the company's EHR, care management applications, and patient portal. The data is also accessible to BI front ends.

From a roadmap standpoint, MCIS plans to include features that will enhance its benchmarking reporting on a risk-adjusted basis with peer comparisons and comparative analysis. A bubble chart will show performance relative to median with bubble sizes adjusted to reflect the risk profile of the patient cohort, i.e. the larger the bubble, the higher the risk of the patient population. The company has several options to include claims data to support utilization reporting: ED visits, hospitalizations, urgent care visits, and network leakage. It can integrate with any BI tool to access its data. Predictive analytics will be available at point of care.

Market

Market Execution ____ **C**
Market Vision ____ **C+**

Target Market(s): Practices seeking integrated EHR, practice management, analytics, and patient portal
Pricing Model: PMPM
Flagship Customers: Marshfield Clinic Healthcare System
Partners: Microsoft

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

MCIS, Inc., is the IT organization of Marshfield Clinic Health System. The company offers a comprehensive solution consisting of an EHR with integrated analytics and care management, and a well-received patient portal. The MCIS Clinicals product is the next generation of its legacy EHR, CattailsMD. While not entirely turnkey, the company expedites the learning curve for clinicians and staff with a well-designed set of products that has benefited from modern ideas of user-centered design. In addition, it offers integration services and training for practices seeking to develop care management or population health programs.

This cloud-based offering is designed to help physicians focus their efforts on the patients where the opportunity exists to make an impact on the health of an overall panel. While it addresses care and payment needs on a patient-by-patient basis, it helps practices make the transition to processes where population level health and care quality are important considerations.

The company is still relatively small and operates mostly in the upper Midwest. From a product standpoint, its offering compares on an equal basis with larger ambulatory vendors with national footprints. MCIS is currently focused on transitioning its current customer base at Marshfield Clinic Health System to MCIS Clinicals while evaluating its growth plans for MCIS Clinicals in the broader market.

Strengths: Strong offering for small to medium practices looking for comprehensive functionality

Qualifiers: Conversion of legacy analytics into MCIS Clinicals

Optum

Product Overall B-
Market Overall B

Company

Headquarters: Eden Prairie, MN
Website: www.optum.com
2016 Revenue: $25-30 million (est.)
Year Founded: 1983
Ownership: NYSE Listed
Classification: Payer

Top Three Differentiators:

1. Strong portfolio of analytics products
2. Claims data expertise
3. Comprehensive services for IT and line-of-business

Product

Product Capabilities B-
Product Vision C+

Product(s): Optum One
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔	Clinical Data Contribution	○	Quality Reporting and Gaps
◑	Claims Data Contribution	◔	Cost and Utilization
◑	Analytics Data Store	◔	Network Analysis
◔	Analyst and Developer Support	◔	Predictive Analytics
◑	Benchmarking	◔	Functional Scope
◔	Population Discovery and Definition	○	Workflow and Engagement

Optum One provides a unified analytics and care management offering. This claims-centric offering uses risk as its primary lens into patient cohorts and as the organizing criteria for managing patient's needs. Optum One analyzes its claims and EHR-derived data to identify various risks, build and maintain patient registries, perform assessments, develop care plans, and monitor performance metrics. Its goal is to support the efforts of clinician networks to accurately predict risk and manage care gaps so that they can respond appropriately and effectively to the needs of patient cohorts.

Optum's population analytics module assembles a patient record consisting of clinical and claims data. Optum is developing a general-purpose data ingestion and aggregations product to more effectively deal with clinical data. Clinical leaders can use this resource to monitor performance metrics to identify the sickest and costliest patients in their collection of panels. Broadly, the idea is to identify and address various evidence-based care gaps and, in the process, pinpoint patient subsets driving elevated population risk and increase care quality. HCOs can also track clinician performance at an individual and organizational level and to benchmark this performance against other HCOs. This allows an organization to quantify and understand risk, as well as see spend

as it happens, including leakage based on diagnoses, risk profiles, and common utilization patterns. At any point, uses can drill down into a graphical representation of actuarial and risk data.

Once the population analytics module narrows the list of clinical factors that are driving increased hospitalization, that knowledge can be generalized to build lists of patients for referral to a relevant care management program. Clinicians can build exportable registries of patients more generally to address a variety of gaps in care or condition-based programs. Clinicians can associate tasks or task lists with specific care management programs.

Optum One also supports patient and community outreach in a variety of ways. Care coordinators can generate mailings or initiate telephonic outreach programs. They can also directly request appointment from connected EHRs or PMS along with the reason for the appointment request. The sponsoring organization can build and upload communications templates to ensure consistency in patient communications. Outbound communications can be sent in batches.

For nurse care coordinators, Optum One includes patient- or panel-level dashboards with risk assessments, quality metrics on a pass/fail basis, and a list of gaps in care to address at next office visit. At the point of care, it can then presents physician with a list of the care gaps.

Market

Market Execution B+
Market Vision C+

Target Market(s): UnitedHealth, Large HCOs
Pricing Model: Subscription
Flagship Customers: Mayo Clinic, Brown & Toland
Partners: Audax Health

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Optum's portfolio of solutions for healthcare providers is far more extensive than just its clinical analytics solutions. The company offers a range of revenue cycle-related and pharmacy solutions to health plans and providers. Optum One is based on the technology of Humedica, the company it acquired in January 2013, coinciding with the launch of Optum Labs.

Humedica brought roughly 50 provider customers of varying sizes with it, representing an even mix of IPAs and IDNs. Since then, Optum's focus and positioning has been squarely on large provider organizations. It does not appear to have added large numbers of provider organizations to its customer roster in the last year or so. However, it has enlarged its footprint in many of its customers, especially within its parent organization. A significant number of the vendors in this report regard Optum as a primary competitor.

In the last year, Optum has focused on better integration between its claims-based risk tools and the care coordination module of Optum One. At one point, Optum intended to create an Optum One ecosystem to support an application marketplace for third parties. This effort has not produced tangible results thus far in terms of deliverable applications. But Optum is making progress with its own set of offerings.

Optum's reputation in the market, and the basis for its ability to charge relatively high prices, is tied to a perception that it is significantly better at ingesting — and reconciling within a patient record — claims and other kinds of payer data. While it is unlikely that this ability will be commoditized anytime soon, most vendors are making good progress, and Optum may find itself less able to price in the same way.

Optum provides a robust set of solutions for providers seeking to base their population health strategy on risk-based metrics. It promises to be payer- and EHR-agnostic while offering technology excellence. While, compared to most vendors, Optum is probably slightly less capable of assembling a comprehensive clinical quality reporting program, it remains a force in the analytics market.

Strengths: **Perceived as strong in technology and expertise across the market**

Qualifiers: **Claims-centric offering with growing clinical expertise**

Philips Wellcentive

Product Overall C+
Market Overall C+

Company

Headquarters: Alpharetta, GA
Website: www.wellcentive.com
2016 Revenue: $17-21 million

Year Founded: 1933
Ownership: NYSE Listed
Classification: Independent

Top Three Differentiators:

1. Strong claims-based offering with growing ability to include EHR-sourced data
2. Highly configurable offering for physicians
3. Broad software portfolio

Product

Product Capabilities C
Product Vision C+

Product(s): Philips Wellcentive, Philips Telehealth eIAC, aCAC, eTrAC
Dominant Deployment Model: SaaS

Product Criteria Ratings

◔	Clinical Data Contribution	○	Quality Reporting and Gaps
◑	Claims Data Contribution	◔	Cost and Utilization
○	Analytics Data Store	○	Network Analysis
◔	Analyst and Developer Support	◑	Predictive Analytics
◔	Benchmarking	○	Functional Scope
◔	Population Discovery and Definition	○	Workflow and Engagement

Wellcentive offers analytics applications that address the needs of HCOs moving to value-based care and reimbursement. These solutions are part of Philips' Population Health Management portfolio. This offering addresses the care needs of cohorts across the continuum and for the range of risk profiles.

Philips Wellcentive builds a patient record composed of clinical and claims data from across a community. The company has amassed significant experience integrating data sources from private and governmental payers, as well as providers in all of the major care venues. It normalizes disparate clinical vocabularies from the aggregated data to support analytics and care management. End-users then see a consistent set of terms. Its varied applications use a late-binding approach to maximize the range of potential uses of the patient record.

At its highest level, an overview report provides customer-specified information, presented in tabular or visualized form, related to provider panels by payer type, including PMPM spend on a per-payer basis. Information can filtered and exported for further analysis. HIPAA-compliant export of data enables users to perform their own analysis using tools of their choice. Alternatively, data can be exported to an organization's data warehouse or mart.

Dashboards support the major quality programs and provide filters that support drill-downs from organizations to individuals, time periods, and patient cohorts. The company's approach to dashboards allows each user to customize a set of the metrics, visualizations, and data into a collection of widgets. Users can drag and drop different widgets as well as apply organizational- and time-based filters to the data shown. Each widget on the screen also supports drill-down into detailed data, clinical, cost, risk, or utilization, if applicable. It assigns risk scores to each patient using ACG or the customer's choice of methodology. It will use HCC risk scores and provide dashboard that identify coding opportunities for MA and other patients.

Analytics serve two purposes for care management. It helps the HCO identify patients for care management program. It also provides many of the same reports and dashboard to care managers and supervisors. Either way, this set of applications represents an integrated approach to analytics and care management.

Wellcentive has demonstrated its strength in organizations moving toward VBR. At the same time, it has significant value for FFS providers. Philips Wellcentive is NCQA 2014 PCMH Pre-validated for 21.87 auto-credit points and practice support function status for an additional 82 factors, maintains Meaningful Use 2 certification, is a Qualified Clinical Data Registry (QCDR), and offers several alternatives for MIPS, CPC+, and other quality programs.

As we said last year, Wellcentive provides a solid base for HCOs seeking to develop a clinical quality and performance improvement programs. It has good options for developers and analysts charged with building and running the program. It also provides an easy-to-use option for front-line clinicians and their support staffs.

Market

Market Execution ____ **B-**
Market Vision ____ **C**

Target Market(s): Health Systems, CINs, Multispecialty Practices, IDN, Payers
Pricing Model: PMPM, PPPM, or enterprise license
Flagship Customers: Affinia Health Network - Lakeshore, CHRISTUS Health, Evergreen Health Partners, Children's Health Alliance
Partners: DST, Milliman

Market Criteria Ratings

- Analytics Market Acceptance
- Analytics Market Momentum
- HIT Brand Recognition
- Solution Scope

Philips is a storied health technology brand focused on improving health and enabling better outcomes across the continuum. The company leverages advanced technology to deliver integrated solutions focused on diagnostic imaging, image-guided therapy, patient monitoring and health informatics, as well as in consumer health and home care.

In 2016 Philips acquired Wellcentive, whose products and services focused exclusively on the journey to value-based care. Physician-founded, Wellcentive sells a role-based, SaaS-delivered solution that supports quality improvement efforts for a range of delivery organizations. Wellcentive will chart its own product roadmap for

the next few years and remain vendor-agnostic with respect to data sources. Ultimately, it will be more closely aligned with Philips Healthcare and integrated into Philips HealthSuite, a cloud-based ecosystem of devices, apps, and digital tools intended to support personalized health and continuous care. Wellcentive could very well begin to ingest data from wearables, scales, pulse oximeters, and PACS-related devices from Philips and other vendors.

While its solutions are strongly focused on clinical quality reporting for ambulatory networks, the company takes a broader view of HCO requirements. It sees analytics as a precursor step and enabler of care management and other forms of care coordination involving multiple HCOs. Analytics offerings are just one of the tools that its customers can use to make the transition to VBR. At the same time, Wellcentive understands that provider-led care management is relatively new and that HCOs are still hesitant about this new technology. The company urges its customers to provide care management services in-house. Care management is a fast-growing part of Wellcentive's business.

Wellcentive has demonstrated its strength in organizations moving most aggressively toward VBR. At the same time, it retains a significant value proposition for FFS providers with offerings like PQRS reporting. The company has grown to the point that it relies more heavily than in the past on its own direct sales force to continue its market momentum.

Wellcentive continues to grow its organization and its technical capabilities. This year it saw strong demand for its care management functionality. This workflow aspect of PHM significantly enhanced Wellcentive's market appeal among its customer base. All in all, Philips could make good use of Wellcentive's technology and expertise as it expands the market appeal of HealthSuite outside of radiology.

Strengths: **Solid longitudinal patient record consisting of claims and EHR data**

Qualifiers: **Data source and HIT vendor agnostic with strong pull from Philips HealthSuite**

About the Author

BRIAN MURPHY

Brian Murphy joined Chilmark Research as an industry analyst in August 2012 and brings a wealth of experience to the table. He is an outspoken advocate for true interoperability being the key to unlocking the potential of health IT and has centered the majority of his research efforts with Chilmark around this subject. He also currently heads research for the Analytics domain.

Brian has worked in the IT business for over 25 years, beginning his career in the field-sales organization of IBM. He then joined Yankee Group as an analyst, where he managed an enterprise software service and led research on the dynamics of the database market. Leaving Yankee, Brian joined Eclipsys prior to its acquisition by Allscripts in 2010. At Eclipsys, Brian worked with product managers to refine and harmonize value propositions in light of the organization's broader goals.

Brian is a graduate of both Harvard College and Suffolk Law School. When not thinking about health IT, he's a runner and armchair Boston historian.

Appendices

APPENDIX 1: SCOPE AND METHODOLOGY

To compile this report, Chilmark Research combined extensive primary and secondary research techniques to create a composite profile for each vendor. Primary research was divided into two distinct steps, beginning with soliciting targeted vendors for their involvement in the research. Of the vendors profiled in this report, only Optum and Verisk declined to participate. Rather than omit these two important vendors, or perform only the standard secondary research, we were able to gather data on these companies through interviews with HCOs, competitors, and former employees.

We asked participating vendors to complete a detailed questionnaire whose purpose was to collect qualitative and quantitative information about the company and the markets it serves. Questions included among others: 2016 revenue and projected 2017 revenue, number of employees, primary market, number of healthcare entities currently using its solution, and more in-depth questions regarding solution features and functions. As this is a maturing market, many vendors were reluctant to share some metrics regarding their business for competitive reasons. In such situations, we provide estimates based on knowledge of the market, common operational metrics, and a vendor's overall position in the market.

Upon receiving the completed questionnaire, we conducted a follow-up interview with each vendor. These in-depth telephone interviews typically lasted 60 minutes and were for a demonstrations and to clarify responses to the questionnaire. This portion of the research effort also focused on topics that cannot easily be captured within the context of a written questionnaire including competitive positioning, product roadmap, partnership strategy, and which solution features are most attractive to prospective customers.

Chilmark Research performed a final analysis of the vendors via secondary research and telephone interviews with end users and consultants that have advised on, deployed, or used a vendor's system. This information was compiled to provide the in-depth reviews and ratings of the profiled vendors. Prior to publication, all vendors were given an opportunity to review their profile narratives (not rankings) for fact checking. Their comments and feedback were considered and where relevant, incorporated into the final profile narratives.

In compiling this extensive report, Chilmark Research maintained absolute objectivity throughout the entire research process (sometimes to a vendor's chagrin) and it is our sincere hope that this report brings greater clarity to this developing market.

APPENDIX 2: ACRONYMS USED

Acronym	Explanation
ACG	Adjusted Clinical Groups
ACO	Accountable Care Organization
AMC	Academic medical center
API	Application programming interface
APM	Advanced alternative payment model
BI	Business intelligence
BPCI	Bundled Payment for Care Initiative
CCD	Continuity of care document
CCDA	Consolidated CDA
CCJR	Comprehensive Care for Joint Replacement
CCLF	Claims and Claim Line Feed
CCM	Chronic Care Management
CHF	Congestive heart failure
CIN	Clinically integrated network
CMS	Centers for Medicare and Medicaid Services
CNM	Clinician Network Management
COPD	Chronic obstructive pulmonary disease
CPIA	Clinical Practice Improvement Activities
CPT	Current Procedural Terminology
CQM	Clinical quality metric
CVD	Cardiovascular disease
DRG	Diagnosis-related group
DSRIP	Delivery System Reform Incentive Payment
EBM	Evidence-based medicine
ED	Emergency department
EDW	Enterprise data warehouse
EHR	Electronic health record
EMR	Electronic medical record
ETL	Extract, transform, and load
FFS	Fee-for-service
FHIR	Fast Healthcare Interoperability Resources
GPRO	Group Practice Reporting Option
HCC	Hierarchical Condition Category
HCO	Healthcare organization

Acronym	Explanation
HEDIS	Healthcare Effectiveness Data and Information Set
HHS	Health and Human Services
HIE	Health information exchange
HIT	Healthcare information technology
HL7	Health Level 7
HQMF	Health Quality Measure Format
HRA	Health risk assessment
ICD	International Classification of Disease
IDN	Integrated Delivery Network
IQR	Inpatient Quality Reporting
IRF	Inpatient rehabilitation facility
IT	Information technology
JDBC	Java Database Connectivity
JSON	JavaScript Object Notation
LOINC	Logical Observation Identifiers Names and Codes
LTPAC	Long term and post-acute care
MA	Medicare Advantage
MACRA	Medicare Access and CHIP Reauthorization Act
MDS	Long-Term Care Minimum Data Set
MIPS	Merit-based Incentive Payment System
MRT	Medicaid Redesign Team
MSSP	Medicare Shared Savings Program
MU	Meaningful use
NCQA	National Committee for Quality Assurance
NQF	National Quality Forum
ODBC	Open database connectivity
OLAP	Online analytical processing
OLE	Object linking and embedding
ONC	Office of the National Coordinator
OON	Out of network
P4P	Pay for performance
PAC	Post-acute care
PBM	Pharmacy benefits manager
PCMH	Patient-centered Medical Home

Acronym	Explanation
PEPM	Per employee per month
PMPM	Per member per month
PMPY	Per member per year
PPPM	Per provider per month
PPS	Performing Provider System
PQRS	Physician Quality Reporting System
RCM	Revenue cycle management
RDBMS	Relational Database Management System
REST	Representational state transfer
RUB	Resource utilization band
SDoH	Social determinants of health
SNF	Skilled nursing facility
SNOMED	Systematized Nomenclature of Medicine
SOA	Service-oriented architecture
SOAP	Service-oriented access protocol
SQL	Structured query language
TJC	The Joint Commission
VBC	Value-based care
VM	Value-based payment modifier
VBP	Value-based Purchasing
VBR	Value-based Reimbursement
XCA	Cross Community Access
XDS	Cross-enterprise document sharing
XML	Extensible Markup Language

Acronyms Used

745 ATLANTIC AVENUE, 8TH FLOOR

BOSTON, MA 02111

WWW.CHILMARKRESEARCH.COM

INFO@CHILMARKRESEARCH.COM

PH: 617.615.9344