The fundamental goal of analytics is to transform data from its obscure, raw form into clear information and actionable insights. Closed-Loop Analytics™ methodology means turning data into action. It bridges the gap between data that tells end users (e.g., physicians and nurses) what's happening with a patient or population, and data that tells these end users how they can intervene.

When analytics are deployed effectively, they contribute to informed interventions and, thereby, better outcomes. In 2013, Gartner released an article discussing the progression of analytics, and how more sophisticated usages can yield powerful insights and empowered end users.

This article describes the value of a Closed-Loop Analytics approach in the healthcare industry—how, by making analytics and new tools and capabilities more accessible at the point of care, closed-loop methodology provides better decision support for better outcomes.

From Descriptive to Prescriptive

A modified version of Gartner’s progression model (Figure 1) describes analytics in its simplest form. The analytics at the top are often descriptive and may help summarize large volumes of information or highlight the maximum or minimum values in a large volume of data.
Basic descriptive analytics are typically used as quality reporting measures to governing bodies, such as the Joint Commission or Medicare. Familiar measures might include the percentage of patients being readmitted or the number of elderly patients having falls in a facility. Both these descriptive measures summarize a characteristic of a larger volume of individuals. In either case, basic analytics still rely on human interpretation or input to generate a relevant decision or insight.

![Adapted from Gartner Report July 2015](image)

Figure 1: Modified version of Gartner’s full analytics progression model

Analytics also allow us to dive deeper, allowing not just a high-level understanding of data, but, potentially, initial causal insights. Gartner calls this category “diagnostic.” This term is broader than the traditional medical use of the term diagnostic; it’s not always referring to a diagnosis a doctor might make for a patient, but rather telling us why specific events may have happened. At this level, analytical tools and processes evolve to enable a more advanced understanding of data. Being able to look at combined descriptive analytics, or even multiple measures in relation, can provide that diagnostic capability.

Examples of this level of analytics includes information such as factors contributing to a hospital acquired condition (e.g., a catheter-associated urinary tract infection [CAUTI]). Here, evaluating which patients have a catheter in place, the duration of the catheter, the duration of inpatient hospital stay, history of UTI, etc., can combine to provide a diagnostic capability otherwise difficult to obtain.

Analysts can often apply this understanding in several iterations, with the goal of reducing the amount of human interpretation or input necessary to get to the valuable, actionable insight.
Two Key Challenges for a Closed-Loop Analytics Approach in Healthcare

Though beneficial in understanding the evolution of analytics and accurate in many industries, Gartner’s model isn’t 100 percent accurate for healthcare, given two of the industry’s unique challenges:

1. **The pervasive use of electronic documentation in healthcare is relatively new.**

   Widespread use of EHRs has largely occurred within the past eight years. Meaningful use policy advanced the adoption of Certified Electronic Health Records Technology (CEHRT), but health systems have used these records only as documentation systems or systems of record. Most healthcare organizations are barely completing descriptive- and diagnostic-level analytics because the priority has been for quality or policy reporting requirements—not necessarily more targeted performance or outcomes improvement.

2. **Most analytics in healthcare stop at the point of insight or information.**

   In healthcare analytics, there’s seldom a tie to a direct action (medical intervention). Healthcare data is often subject to data lag because sources are built in such a way that they are often a day or more behind. As a result, analysts use retrospective data, thus limiting the potential to turn data into meaningful action at the point of care.

   For example, if an organization has just become a Medicare Accountable Care Organization (ACO) through the Medicare Shared Savings Program, it must monitor and improve several quality measures, based on a risk-stratified patient population that Medicare determines. One of the measures stipulates avoiding unnecessary hospital admissions for patients with diabetes. In response, the organization’s process will look like this:

   - A first order of analytics might be descriptive in nature, such as a report or dashboard that tracks all patients who have diabetes and have had a hospital admission since the beginning of the reporting period.

   - A second order of analytics, that is diagnostic in nature, might begin to delve into the data to understand events leading up to the hospital admission, such as if the patient has an active prescription for insulin, if they’ve been contacted by a nurse or care manager within the past 90 days, or if they’ve received proper patient education on administration of their insulin.

   Analytics are powerful in informing and providing insight on a patient population in this way, but analytics alone don’t yet yield interventions. Retrospective analytics that don’t translate into action or intervention remain instructional or informational. They describe an event and how to prevent it in the future, but they rarely explain immediate actionable insights.

Using Closed-Loop Analytics Methodology Turns Insight into Action

A Closed-Loop Analytics approach bridges the gap between insight and action by leveraging analytics to transform data into an immediate action. It’s already commonplace in industries outside of healthcare:
Google’s prescriptive search or Netflix’s prescriptive recommendations are examples of using Closed-Loop Analytics methodology—meaning analytics being deployed in a real-time fashion with an immediate action for the end user.

Closing the loop in healthcare, however, has been more difficult. Healthcare often requires more timely data and integration with workflow systems, such as the EHR. These workflow systems have historically been difficult to interoperate with. This is because the tools and systems that have developed to handle the power necessary to do more advanced analytics have evolved separate from the EHRs themselves. This barrier to interaction between the two systems has forced any integrated capability to require analytical development on the EHR side or analytical tools to develop integration pathways with the EHR. Both these routes have been historically difficult, as most enterprise EHRs are not built on modern frameworks that allow for easier integration.

Recent improvements in technology and interface standards, as well as modern policy (such as the 21st Century Cures Act) that better supports data interoperability goals, are creating a significant opportunity for Closed-Loop Analytics in the healthcare industry. Two goals around the adoption of Closed-Loop Analytics in healthcare are reducing data lag and making analytics immediately actionable:

1. **Reducing data lag**: Better technology with modern application program interfaces (APIs) and a quickly improving interface messaging standard (e.g., HL7 and FHIR) that’s evolved from the previous gold standard (HL7) is not only allowing faster transmission of data, but also producing triggered actions within workflow tools.

   As users achieve this primary goal, analytical tools can evolve so that insights are more proximal (near real-time) to an opportunity for intervention. In the earlier Medicare example, this would involve transitioning analytics from a retrospective insight into surveillance-based insight. Instead of an annual report on admissions simply for submission to Medicare, daily analytics point to patients currently at risk and potential gaps in care or maintenance, which hospitals can address proactively.

2. **Immediately actionable analytics**: This second goal has three subcomponents:
   - Eliminating barriers to accessing analytics.
   - Delivering an integrated summary analytics that can drive a workflow.
   - Delivering integrated analytics that are within a workflow.

Studies have shown that to implement a change in best practice, delivering an insight or intervention at the point of care can be over 15 times more effective than education alone. In fact, a meta-analysis of 88 papers evaluating clinical decision support systems (CDSSs) showed that new interventions were almost three times as effective when presented at the point of decision making.

**Access Makes Insights Valuable**

Analytics enables point-of-care insight, but only if analytics are effectively distributed. Historically, end users accessed analytics through static reports or dashboards buried on the intranet. For most end users, the value of the insight must outweigh the effort it takes to get to the insight, so the former involved process wasn’t viable.
As healthcare, along with other industries, becomes increasingly systems dependent, technology (such as the EHR) generally drives workflows. By simply providing analytics within the workflow tool, a Closed-Loop Analytics approach decreases barriers to utilization—thereby increasing the value of the insight.

Utilized Analytics Are Effective Analytics

The number one component of effective analytics is for people to use them. Utilization often depends on accessibly and value. Closed-Loop Analytics methodology not only makes analytics accessible by putting insights in front of the end user—rather than buried in an organization’s intranet— but also makes use of tools and capabilities (such as machine learning, natural language processing [NLP], and predictive analytics) that turn insights into action. For health systems and their patients, this means near real-time decision support and, more importantly, better care and outcomes.

About the Author

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Jeffrey Wu's background is founded in healthcare IT after spending 6 years at Epic managing and implementing Epic’s suite of surgical products. He then moved into the analytics space by joining Qlik as Qlik’s senior solutions architect in the healthcare space. Following his experience at Qlik, Jeffrey completed a Masters of Public Health in epidemiology and biostatistics at the University of Wisconsin–Madison, focusing on outcomes analysis for UW Health’s population health initiatives including their reporting process within their MSSP-ACO. Jeffrey joined Health Catalyst to help transform their analytical tools into more real-time and actionable products, integrated with workflow systems such as the Electronic Health Record.
ABOUT HEALTH CATALYST

Health Catalyst is a next-generation data, analytics, and decision support company committed to being a catalyst for massive, sustained improvements in healthcare outcomes. We are the leaders in a new era of advanced predictive analytics for population health and value-based care, with a suite of machine learning-driven solutions, decades of outcomes-improvement expertise, and an unparalleled ability to integrate data from across the healthcare ecosystem. Our proven data warehousing and analytics platform helps improve quality, add efficiency and lower costs in support of more than 85 million patients and growing, ranging from the largest US health system to forward-thinking physician practices. Our technology and professional services can help you keep patients engaged and healthy in their homes and workplaces, and we can help you optimize care delivery to those patients when it becomes necessary. We are grateful to be recognized by Fortune, Gallup, Glassdoor, Modern Healthcare and a host of others as a Best Place to Work in technology and healthcare.

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