Health Care Analytics
Enabling the Performance Improvement Conversation

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Health Care Analytics: Enabling the Performance Improvement Conversation

Purpose-built analytics allows HCOs to pursue dynamic, productive, and high-impact performance improvement conversations that drive action and create value.

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Introduction

Analytics is often considered a panacea when it comes to fixing health care, whether you're working in the fee-for-service space, the value-based care space, or both. Emerging technologies like "big data," "artificial intelligence (AI)," and "machine learning" merit our attention, however, **today's** business imperatives demand that we take advantage of practical solutions **today** in order to drive future performance.

When the Advisory Board Company recently surveyed 146 C-suite executives from health care organizations (HCOs) in the United States, two-thirds of the respondents said their top priorities were reducing costs and preparing their organizations for sustainable cost controls. They believe these issues can't wait to be addressed. Action is necessary now, **today**, not two to five years from now when those emerging technologies begin to deliver on anticipated value propositions in health care.

While the need for cost containment is clear, how to achieve it is complex and must consider factors such as practice variability, unnecessary utilization, inefficient resource utilization, and provider productivity. The key to accomplishing these important initiatives is analytics. Analytics can help identify opportunities for improvement and reinforce behaviors through the performance improvement conversation. To do this, a holistic, accessible, and trusted view of all relevant data is required.

Why Health Care Analytics Has Underdelivered

Analytics in health care has underdelivered, due in large part to the fragmented nature of health care services and data. Overcoming that deficit has become even more urgent with the shift from fee-for-service incentives toward value-based care. Here are five reasons why.

1. **Health care has been organized in silos:** Traditionally each department, even within a single HCO, operated as an independent profit center incentivized by the fee-for-service reimbursement model. Therefore, each department was primarily focused on departmental volumes and efficiency with little motivation to share information aimed at improving value systemwide. Not only has this silo mentality driven up costs, but it also can yield unintended consequences. For example, reducing length of stay (LOS) to improve hospital efficiency can reduce hospital cost and free up beds, but reducing LOS too aggressively can lead to readmissions and even deaths.

2. **Health care is inherently more complicated than most industries:** Health care lies at the intersection of science and art: It's evidence-based yet highly personal, and its data is voluminous, complex, distributed, and interdependent. The volume of health care data is expected to increase by 48 percent annually, according to a report from EMC and the research firm IDC. The report pegs the volume of health care data in 2013 at 153 exabytes (1 billion gigabytes). At the projected growth rate, that figure will swell to 2,314 exabytes by 2020.

The rapid increase in available data has only made the job of providing meaningful analytics more daunting. While it's vital to base care-team coordination, clinical decisions, and patient engagement on evidence-based medicine and long-term data, the disparity, complexity, and poor quality of data

make it difficult to aggregate, normalize, and enrich data sets so they can support performance improvement.
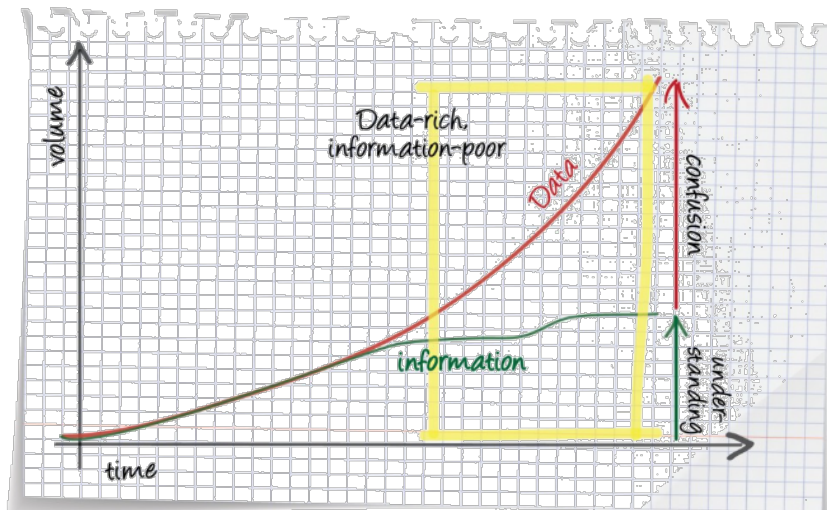
3. **Too few tweeners:** Tweeners are people who are experts both in data science and in the target business, and they're hard to find. There's a huge gap between what IT and data scientists know and what is required to improve performance within clinical specialties and across departments. For example, an emergency department (ED) cannot achieve superior turn-around times (TATs) and patient satisfaction if there are persistent bottlenecks for inpatient beds and ancillary services. Analytics can enable the conversation between services that can lead to creative ways to reduce TATs.

4. **Data is not fit for purpose:** Financial systems and electronic health records (EHRs) have been the principal data sources for HCO analytics. While HCO IT departments have become adept at moving data in and out of systems and between systems, loading it into a data warehouse is just the beginning of preparing data to be fit for purpose. Most initiatives come up short because all that warehoused data hasn't been effectively curated and harmonized with other necessary data to enable performance improvement. In other words, to be fit for purpose, the data needs to be transformed into information that care teams and administrators can use to create value.

5. **Centralized and EHR efforts have underdelivered:** Some may argue that using analytics strategically and holistically requires a top-down strategy. But, centralized, IT-driven analytics initiatives consistently fall short of expectations. Moreover, EHRs are designed to optimize structured, efficient workflow, not to provide insights and innovation, and therefore are ill suited for advanced performance analytics. EHRs don't have all the data needed for advanced analytics and don't have the scope of data to provide a 360-degree understanding of the operational, financial, clinical, and patient satisfaction factors that impact performance.

This underperformance may be why Gartner advocates democratization of business intelligence (BI) to satisfy users who aren't getting what they need from a centralized IT approach and consider implementing "complementary" BI to get analytic capabilities that are better, faster, and more centered on the end user. KLAS made a similar point in one of their BI research reports, saying organizations are adopting an "and" versus "or" strategy for departmental and application-specific needs.

Given the shift from fee-for-service toward value-based care and with the need to cut across organizational and data silos, health care analytics in its current state will likely continue to underperform.

The Current State of Health Care Analytics

In many environments, the search for actionable insights has created a situation referred to as "telephone ad hoc." It works like this: A person who spots an issue via a dashboard or report then phones an IT analyst to request an ad hoc report. This happens when a dashboard highlights a problem but does little to help identify its true root causes and what can be done.

A so-called data jockey or data wrangler then manually combines data from various sources to satisfy the request. Not only is this time-consuming and ungoverned, but the resulting report only answers the questions asked, often generating new questions, perpetuating an endless loop.

"After careful consideration of all 437 charts, graphs, and metrics, I've decided to throw up my hands, hit the liquor store, and get snockered. Who's with me?!"

Organizations lay the groundwork for performance improvement by crossing departmental boundaries and observing clinical variation, staff scheduling, patient safety, and how people are incented. This can't happen with the telephone ad hoc model, where each group comes to meetings armed with its own analytics, leading to a perpetuation of the organizational silo mentality. In this case metrics may be cynically viewed as unnecessarily complicated, self-serving, and irrelevant.

In order for cross-functional teams to overcome cynicism and to improve performance, they need a transparent, relevant, and dynamic performance that allows them to quickly understand causal factors and to develop action plans that offer the most impact.

A Word on Machine Learning and AI: Machine learning is what provides artificial intelligence (AI) what it needs to learn in order to work. Purists consider unsupervised machine learning as a best practice for understanding patterns in data and for clustering of groups without bias. On the other hand, supervised learning requires that data scientists establish certain hypotheses and decide which factors to target for analysis. Both approaches are theoretically sound and fine for research but have serious drawbacks when it comes to performance improvement, particularly in health care, where a clinician's judgment is highly valued and treating patients is very personal.

We suggest an approach that embraces the best of both worlds, putting control and knowledge management squarely in the hands of domain experts and those directly charged with executing the strategies and plans of the HCO. Then algorithms can be organically developed and put directly into diagnostic and prescriptive analytic workflows to improve performance.

How Analytics Can Drive Value

The Five Whys is a basic framework for understanding how analytics should work. In other words, asking "why" five times allows analysts to drill down deeper to extract more information to effectively support performance improvement.

Many solutions only support one or two levels of "why," answering questions where and when the problem is occurring. This may be done through hierarchical drill-downs on aggregate data -- for instance understanding where long turn-around times (TATs) have trended poorly -- and don't require a deep level of domain knowledge. With five levels of "why" you can tell a story that's deep and broad enough to identify causal factors that have the greatest impact. Here's an illustration of how the Five Whys work:

1. **Why are we experiencing an increase in our LWBS?** Length of stay (LOS) has been trending up over the past three months.

2. **Why is our patient LOS increasing?** Patient volumes have been increasing month over month for the past five months and the number of admitted patients being boarded more than four hours also is increasing.

3. **Why are more patients being boarded?** There is an increase in the volume of mental health patients consuming valuable resources and beds. Additionally, the time from when a patient is first seen by a clinician to when the clinician makes a decision has gone up.

4. **Why is there an increase in clinician decision times?** The number of patients per clinician hour has risen dramatically and TATs for ancillary services have been increasing.

5. **Why are patients per clinician hour and ancillary service TATs increasing?** Patient volumes have increased and shifted and clinician schedules have not

been adjusted to address this. Some clinicians have resorted to ordering tests for certain diagnostic subgroups during the busiest times just to get things started.

Only with this type of in-depth analysis -- based on harmonized cross-domain data -- can you tell a story comprehensive enough to have an effective performance improvement conversation.

The analytics must be trusted to support sensitive discussions of group and individual performance issues, including APPs, ESI levels, nursing shortages, ancillary service bottlenecks, and boarding. Armed with the complete story and with everyone on the same page, purpose-built analytics take you beyond the five levels of why and to the real prize, a discussion of which causal factors are modifiable and actionable, and what the potential impact is.

- **Which causal factors are modifiable, in other words actionable?** This is most important and where most analytics falls woefully short. For example, did ordering higher-than-normal CT scans during certain times lead to longer TATs during those time periods? If so, were certain physicians and/or diagnostic subgroups the most responsible? Can we have a conversation around reducing practice variation?

- **What is the potential impact of changing underperforming processes or modifying behavior on goals such as growth, profitability, reputation, risk, and quality?** Understanding the impact on goals across the health system creates a cross-organizational motivation to act to change behaviors associated with modifiable causal factors.

The Five Whys framework can be applied to many other problems, for example:

- Why has the average revenue per physician hour decreased?

- Why are the number of opioids being used above targets?

- Why have patient satisfaction scores fallen below industry averages?

With comprehensive data and the right tools, analytics directly drives value as illustrated below.

5	**Impact/ ROI**	• Increase Profits • Improve Quality • Improve Satisfaction
4	**Actions**	• Better Compliance • Fast Track • Dynamic Sched.
3	**Causes/ Effects**	• Longer TATs • Service Utilization • Psych. Patients
2	**Identify Issues**	• Clinical Variation • ED Crowding • Denials
1	**Monitoring**	• Clinical • Financial • Operational

What's Needed to Lay a Foundation for Performance Improvement?

Organic, Purpose-Built Performance Analytics: An analytics solution built for a specific purpose is organically improved through the collective wisdom and best practices of a community dedicated to similar goals. It makes just the right information available at the right time, highlights areas that need attention, supports the Five Whys, and creates an overall picture to identify high-impact actions.

This approach effectively combines computer intelligence with human intelligence to focus on what is most timely, relevant, and actionable. New analytics are created continuously as new learning, questions, and evidence-based practices emerge. To enable this medical intelligence, a solution must offer:

- A low barrier for broad participation: The solution should have no infrastructure requirements, a low subscription service model, an intuitive user interface, be HIPAA-compliant, and have a secure scalable cloud-based platform

- Domain- or community-specific content: New analytics are developed by the community at no incremental cost to the community

- A large volume of historical data for meaningful trending, pattern recognition, and benchmarking

- A wide variety of curated data (in the case of the emergency medicine this includes metrics on EHRs, billing, scheduling, payroll, patient satisfaction, and quality)

- Holistic, up-to-date, and trusted views of departmental metrics and underlying data, as well as related metrics from throughout the hospital.

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An Honest Broker: An organic, purpose-built performance analytics application requires an honest broker to effectively close the gap between data science and business domain expertise. This broker should provide the following services:

- Data acquisition services and solution accelerators for most source systems

- Data harmonization services for normalizing, cleaning, and enriching data

- A curated and purpose-built data repository that supports the Five Whys without the need for data jockeying. The repository should have enough episodes (10 million or more) to support statistically meaningful pattern recognition and benchmarking.

- Ongoing data quality services that rapidly identify data gaps and anomalies to ensure historical accuracy. This involves cross-referencing data across sources (for example EHR and billing) to continually check for discrepancies. Confidence in data integrity is a must when you're working on performance improvement.

- Ongoing user support to ensure trends are understood, opportunities for improvement are reviewed, and existing or organically developed new analytics are leveraged to identify and promote high-impact actions

- A highly adaptive process and an architecture that allows for the rapid inclusion of new algorithms and analytics

- Local customization to allow for differences in site priorities and processes

A User Experience That Bridges the Gap

In order to eliminate telephone ad hoc analysis, the solution should allow nontechnical business users to perform analytics at all levels of Why as trends and insights are revealed. Performance improvement becomes data-driven and evidence-based instead of anecdotal through the following intuitive capabilities:

- A Balanced Scorecard view of performance across domains, including operations, financial, quality, regulatory, and patient satisfaction

- Dynamic multi-select filtering segmented by, for example, diagnostic subgroups, complaints, or demographics

- Built-in correlation tools that statistically indicate the extent to which two or more variables fluctuate together

- Built-in what-if capabilities that look at various clinical scenarios to understand what may be creating a workflow bottleneck, cost variance, or a drag on productivity

- Purpose-built, nonhierarchical drills that link directly to data needed for proper root-cause analysis and that present a complete picture of metric performance

- Breadcrumbs to describe the parameters of each analytic (for example, diagnostic subgroup, abdominal pain, patients 45-64, where a CT was performed)

With this type of user experience and rich, multidomain, normalized data sets, cross-functional teams can paint a comprehensive picture from many perspectives to understand what is happening, why it's happening, and what high-impact action can be taken.

The Benefits Are Significant

For those who use advanced analytics to pursue the highest value opportunities, the return on investment can be significant. The following illustrates the benefits achieved by a cross-organizational effort to reduce ED crowding.

After a comprehensive review of patient flow, particularly during peak times, all areas of the organization were analyzed to identify the best opportunities to improve throughput. These included clinical variation, lab and radiology turnaround times, staffing, dynamic scheduling, inpatient bed availability, the impact of psychiatric patients, and segmentation of patient flow by ESI level.

ED crowding is a challenge experienced in most emergency departments. Stakeholders require advanced analytics to identify the best ways to reduce crowding to impact LWBS, patient-per-hour rates, and patient boarding times, which can generate the financial benefits highlighted in the chart above. Most hospitals run on razor-thin operating margins of 2 or 3 percent, and face downward pressure on reimbursements, with costs rising faster than revenues. So, hospital administrators are very interested in providing the tools and motivation for teams to work together to make the changes needed to realize these types of gains.

The Impact of Reducing ED Crowding
Average Adult ED Census By Hour. During 120 Highest Boarding Days in 2017

Legend: Total Bed Capacity — Active Census — Boarded Census — Effective Capacity: 85%
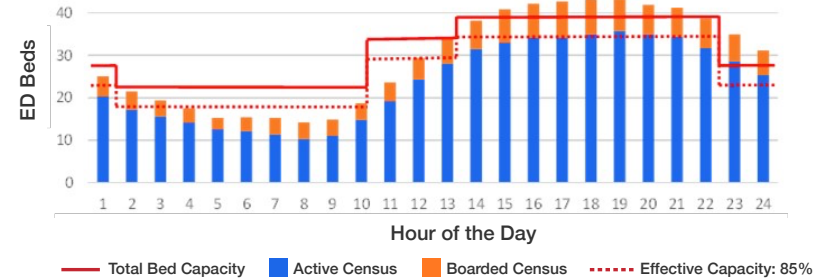
2017 Boarding Experience	Average Boarding Time (minutes)	Total Patient LOS (minutes)	Hours of ED Crowding (per day)	LWBS
120 Best Days	105	203	5.4	1.4%
120 Worst Days	239	268	13.3	3.7%
Average	163	232	8.9	2.3%
Correlation (r=)	0.924	0.771	0.553	0.479

Impact of eliminating 120 Worst Days and Operating at "Average"

- 20 Fewer Admitted Patient Care Hours per Day
- 7.4 Additional Patient per Day Capacity
- Improved Quality of Care
- 20 LWBS Patients Retained Monthly

	Practice's Annual $ Potential	Hospital's Annual $ Potential
Add'l Patient per Day Capacity	$351,000	$4,347,000
LWBS Patient Revenue Recovery	$31,671	$317,927
TOTAL	$382,671	$4,664,927

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Summary

Today's imperatives in health care are complex and to stay viable, HCOs must be relentless in their pursuit of performance and process improvement. New business and regulatory priorities require that HCOs and departments within HCOs break out of their silos and work collaboratively to achieve interdependent goals.

Enabling the performance improvement conversation and fully realizing the potential for analytics requires that we close the gap between data science and the type of data curation and analytics that drive value. This more advanced type of analytics is supported by trusted, timely, and transparent information that breaks down organizational barriers and supports productive performance improvement conversations.

The following graphic offers a useful way of thinking about the relationship between the core capabilities necessary for enabling the performance improvement conversation and realizing the full potential for analytics and value in health care. Armed with a solid foundation (the items in blue) HCOs can pursue dynamic, productive, and high-impact performance improvement conversations (the items in green) that drive action and value across their organizations.

VALUE

IMPLEMENT

ACTION

FORMULATE

DECISION

APPLY

INTELLIGENCE

COMMUNICATE

KNOWLEDGE

ANALYZE

INFORMATION

PROCESS

DATA

ACQUIRE

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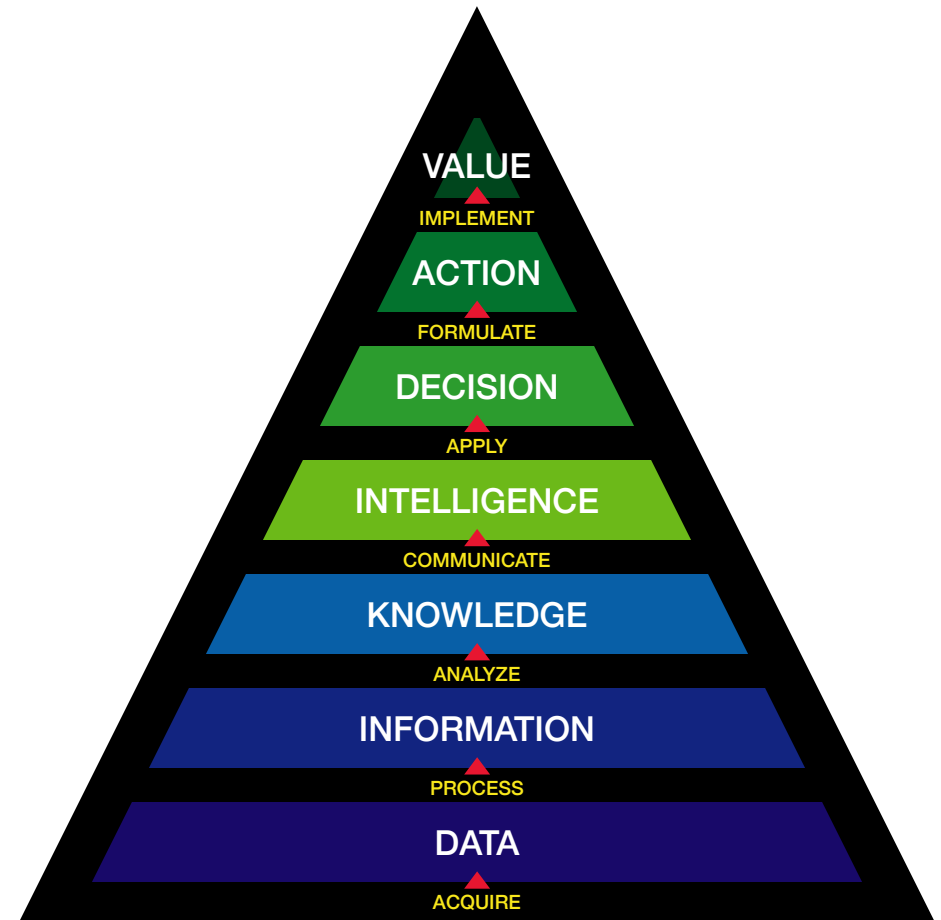
About d2i

d2i was founded in 2010 by Scott Richards and Jonathan Rothman, who each have more than 20 years of experience in EM data management and analytics. The company provides a performance analytic application that aggregates, harmonizes, and enriches data from various sources, and provides EM-actionable insights that lead to ED performance optimization.

d2i provides vital services to many of the largest EDs in the U.S. with a cloud-based application that spans the clinical, quality, financial and operational domains.

d2i's Performance Analytic Application embeds best practices determined by details from more than 17 million ED visits. It requires little up-front cost, no new infrastructure, and can be implemented in a matter of weeks.

In addition to its application, d2i offers analytic services, sharing its extensive industry expertise and organic knowledge to ensure that client partners continue to stay ahead of the curve by rapidly identifying and implementing opportunities for improvement.

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