TRANSFORM HEALTHCARE by measuring what matters.

embold HEALTH™

MAKING HEALTHCARE BETTER — FOR EVERYONE

TOO OFTEN, AMERICANS RECEIVE MEDICAL CARE THAT IS POOR QUALITY OR DOESN'T FOLLOW THE LATEST SCIENTIFIC EVIDENCE. Too often, they receive care that costs too much. And, worst of all, they often receive care that is unnecessary in the first place, needlessly increasing the risk of complications while failing to improve their health.

This is a systemic problem in our country. In fact, as much as 30% of health care spending in the U.S. (more than $640 billion annually) is wasted on medical care that does little to improve patient health. The largest area of wasteful spending is unnecessary or inappropriate care—services patients do not need because they do not offer benefit or are downright harmful.

Seeing the trend lines, some large, self-insured employers have begun developing their own solutions. By sending employees to health care centers of excellence for certain kinds of advanced care—like spine surgery and joint replacement—as many as half of referred patients can avoid those major surgeries completely. And for patients who do have surgery, treatment from top-tier providers helps ensure a faster recovery with fewer complications.

But what about people who can't travel across the country when they need advanced care? What about the countless Americans who just need to find a good doctor in their own community when they're expecting a baby, managing a chronic health condition such as diabetes or heart disease, or simply needing to establish a primary care relationship?

This white paper provides an overview of the challenges Americans face in identifying high-quality health care providers and explores how Embold Health leverages powerful health care data to shine a light on those physicians consistently delivering high quality, appropriate care at a reasonable cost.

[1] McGinnis, J. Michael, et al., eds. *Best care at lower cost: the path to continuously learning health care in America*. National Academies Press, 2013.

[2] Berwick, Donald M., and Andrew D. Hackbarth. "Eliminating waste in US health care." *Jama* 307.14 (2012): 1513-1516.

[3] Slotkin, J. R., et al. "Why GE, Boeing, Lowe's, and Walmart are directly buying health care for employees." *Harvard Business Review* (2017): 1-7.

[4] Woods, Lisa, J. R. Slotkin, and M. R. Coleman. "How Employers are Fixing Healthcare." *Harvard Business Review* (2019): 1-3.

DEFINING QUALITY

The definition of quality in health care is evolving. Increasingly, today's health care providers are evaluated based on how well they follow evidence-based guidelines—the practices shown to produce better patient outcomes—and whether they achieve those outcomes at a reasonable cost.

But quality isn't just about measuring the effectiveness of the care delivered, it's also about measuring the care that isn't delivered. Patients are all too frequently subjected to tests, treatments or even surgeries that simply aren't shown to offer any benefit and often come with dangerous risks or side effects.

To find the best providers, three critical elements of care delivery should be considered:

APPROPRIATENESS	EFFECTIVENESS	COST
Are patients receiving the care they need without unnecessary risk?	Are providers delivering care in accordance with the latest clinical guidelines, and did patients achieve positive outcomes?	Is care being delivered at a reasonable cost?

Take C-section rates, for example. We know pregnant women should ideally receive regular prenatal care, avoid an induction or C-section if possible, and go home with no complications or infections. However, actual practice patterns for uncomplicated pregnancies vary widely.

In one Texas market, some physicians perform C-sections on half of all low-risk pregnancies, compared other providers whose patients undergo c-section only 14% of the time. Complication rates for low-risk pregnancies among these physicians ranged from 1.2% to as high as 7.8%, and the total cost of care varied from about $10,400 to more than $19,000.

If consumers, employers, health plans and physicians had visibility into this kind of information, we would be empowered to improve quality by steering patients to top-performing providers and providing lower-performing physicians with a path for improvement.

A SHOT IN THE DARK

Unfortunately, the health care industry hasn't had a mechanism for identifying quality health care providers in local communities. Consumers instead rely on a patchwork system of narrow or incomplete resources to find the right doctor or hospital.

Many ask family members, colleagues or even friends on social media for recommendations. This feedback is, of course, based on individual experiences and may be heavily skewed by subjective criteria such as the provider's personality, the convenience of the office location or wait times.

Those looking for more objective data are lucky if they find scraps of useful information online. While consumers can access various quality ranking systems, most provide only a snapshot of provider performance during a given window of time and fail to consider whether the care delivered was necessary in the first place.

[5] Defined as a pregnancy in a mother 35 years or younger at the time of delivery with no history of comorbid illness known to be associated with adverse pregnancy outcomes.

[6] Embold Health data.

For example, one rating system might provide information on costs while others focus on complication rates, hospital readmissions or consumer satisfaction scores. None provide a comprehensive picture of provider performance or reliably assess a physician's success treating a particular condition or whether the provider follows evidence-based guidelines to avoid risky or unnecessary care.

As a result, there is little visibility into the tremendous variation among health care providers treating patients with the same health condition. Employers and health plans also face information gaps when building their health plan provider networks. How can they determine which doctors and hospitals to feature in their networks without a way to reliably assess a provider's track record of delivering effective, appropriate care at a reasonable cost?

CREATING A PATH TO IMPROVEMENT

Despite increasing pressure to report quality measures, physicians are similarly challenged when it comes to accessing information about their own performance and how it compares with their peers.

In training, doctors learn through observation and evaluation. Yet after years of near-constant instruction in medical school and residency training, most physicians practice medicine with little feedback on their performance and few opportunities for continued peer-to-peer evaluation.

Furthermore, as the science of medicine continues to evolve and technology helps link certain practice patterns to better outcomes, there is often a delay in getting new knowledge into physicians' hands and, ultimately, into clinical practice. Indeed, it has been shown to take up to 17 years for new evidence-based findings to reach patients. As a result, many providers continue to rely on outdated practices that may lead to unnecessary care and, often, poorer outcomes.

Though physicians share a universal desire to help patients by delivering the highest quality care, most lack the information and tools they need to reliably assess their performance compared to the latest science and to their peers. This basic information is necessary to help them continually improve their performance.

MEASURING WHAT MATTERS

While the need for reliable physician-level quality data is clear, assessing provider performance remains a challenge for most organizations.

Providing a complete picture of physician quality requires massive amounts of data and a focus on specialty-specific physician quality measures shown to impact patient outcomes. In addition, most existing provider rating systems are based solely on Medicare and other publicly available data sources and are informed by discrete episodes of care. Measuring a few metrics in isolation or evaluating a certain population demographic or a single episode of care simply doesn't provide a complete view of physician performance over time.
To really understand physician performance you have a take a much more holistic view.

[7] Balas, E. Andrew, and Suzanne A. Boren. "Managing clinical knowledge for health care improvement." *Yearbook of medical informatics* 9.01 (2000): 65-70.

Embold Health was founded by a physician to measure provider performance around what really matters—those practice patterns shown to produce better care time and again. With the input of physicians and data scientists from leading academic institutions, we identify the quality measures that have the highest clinical impact and apply them across one of the largest and most diverse datasets in the country—providing unparalleled insight into what's working with health care. And when existing measures fail to capture the most important elements of quality, we build new measures to measure what matters – including appropriateness of care.

Through collaborative agreements with multiple data sources, Embold Health uses the largest, most robust dataset of complete closed claims available in the United States. This new national data source is both commercial and government funded (Medicare/Medicaid), and therefore carrier-neutral. The data allows us to look beyond a single episode of care and follow a patient's complete health care journey to reliably evaluate the appropriateness and effectiveness of the care they received.

By applying the quality measures across our dataset, Embold is able to identify the doctors and hospitals delivering high-quality, appropriate care in local communities. We provide this information to employers and health plans so they can curate their provider networks to feature high-quality providers and guide employees and members to the doctors and hospitals delivering the right amount of care, the right way, at the right cost.

BOLDLY TRANSFORMING CARE

We are enabling a new healthcare model that features physicians delivering high-value care. To do this, Embold Health has partnered with stakeholders across the industry to improve health care.

EMPLOYERS

Feature the highest-value physicians in your employee health plans.

Improve quality and reduce cost by decreasing inappropriate care.

HEALTH PLANS

Leverage massive patient datasets.

Implement on top of existing provider networks.

PHYSICIANS AND HEALTH SYSTEMS

Highlight the highest-value physicians.

Empower physicians with the data and tools they need to improve.

EMBOLD HEALTH

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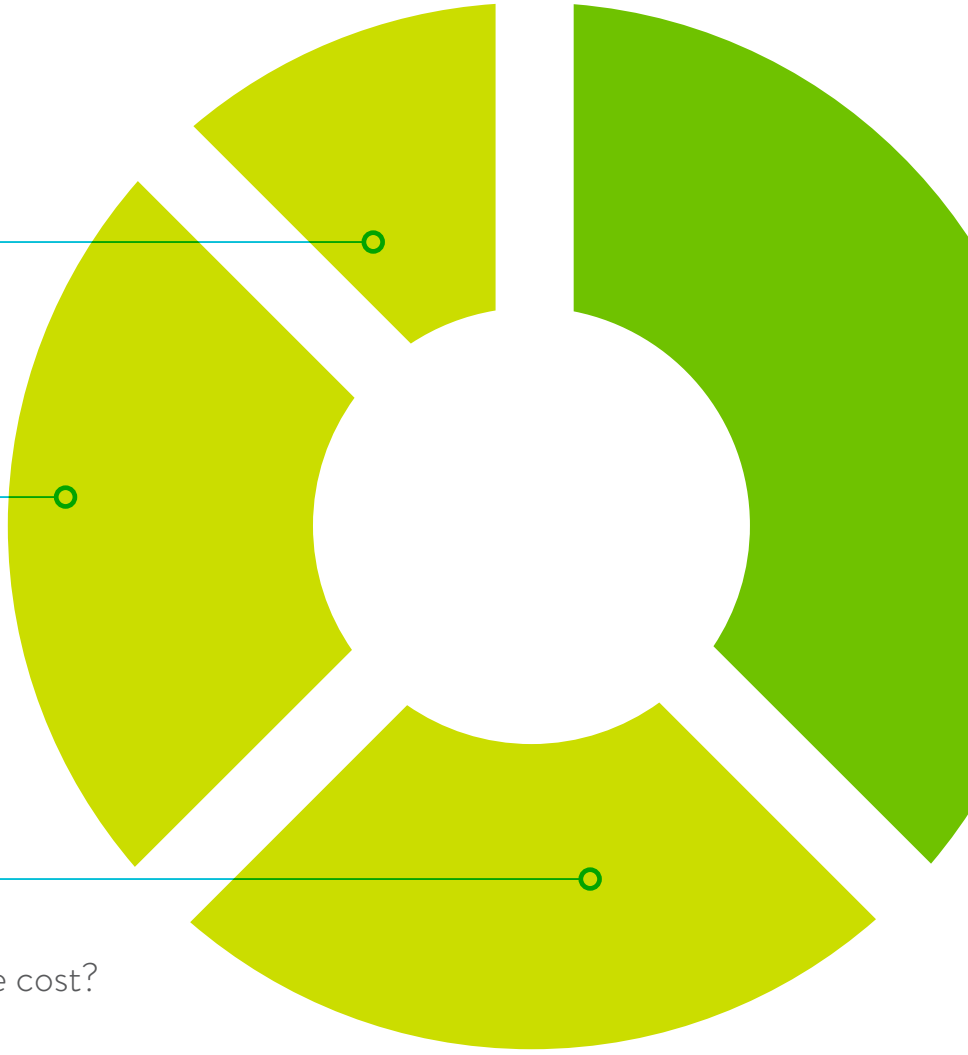
THE EMBOLD HEALTH METHODOLOGY

EMBOLD HEALTH'S ANALYSIS IS DESIGNED TO ASSESS PROVIDER PERFORMANCE IN THREE KEY AREAS:



APPROPRIATENESS

Are patients receiving the care they need without unnecessary risk?

EFFECTIVENESS

Are providers delivering care in accordance with the latest clinical guidelines, and did patients achieve positive outcomes?

COST

Is care being delivered at a reasonable cost?

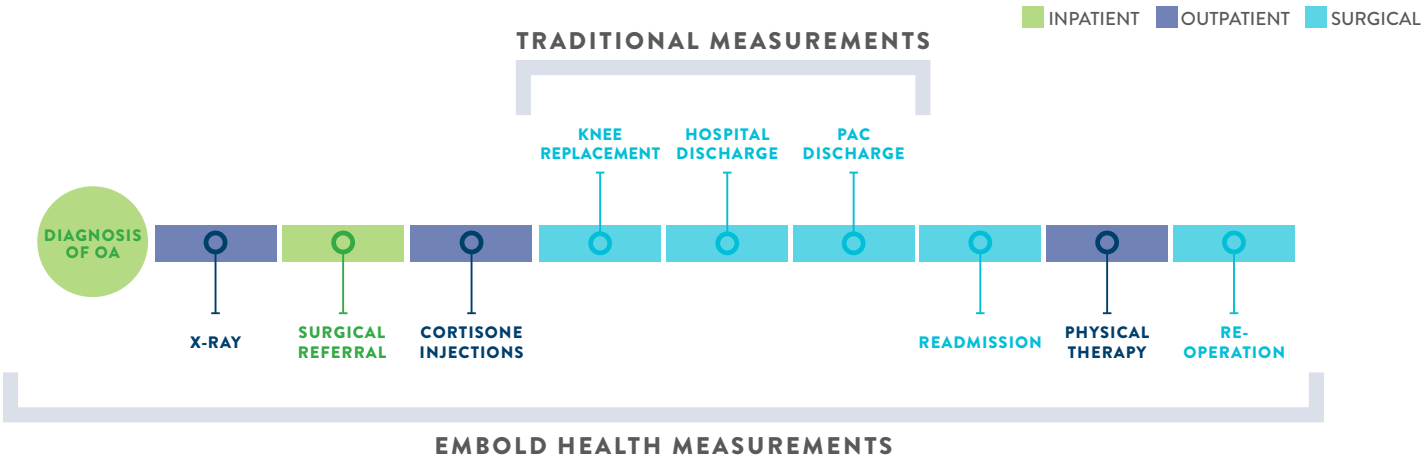


Figure 1
Scope of Embold Health's Data Measurements

APPROPRIATENESS

With the input of our Scientific Advisory Board, Embold Health has built a library of clinical appropriateness measures to identify providers delivering the right amount of care to patients, in keeping with the latest clinical evidence and clinical practice guidelines. We analyze provider performance against these measures over the course of a patient's entire care journey — from diagnosis through treatment — to characterize provider- level variation in the intensity of care across patients with the same condition. (*Figure 1*).

With the breadth of our data, sophisticated clinical analytics and scientifically rigorous approach to measurement, Embold Health identifies and evaluates key clinical decisions far in advance of high-cost, high-risk procedures. Doing so enables Embold Health to isolate physician variation in inappropriate care, benchmarked against peers in the local market and nationally. Despite high-quality evidence from multiple sham-randomized controlled trials each failing to identify any benefit associated with arthroscopy among patients with knee osteoarthritis, there remains multi-fold variation in the use of this high-cost procedure without any known benefit (*Figure 2*).

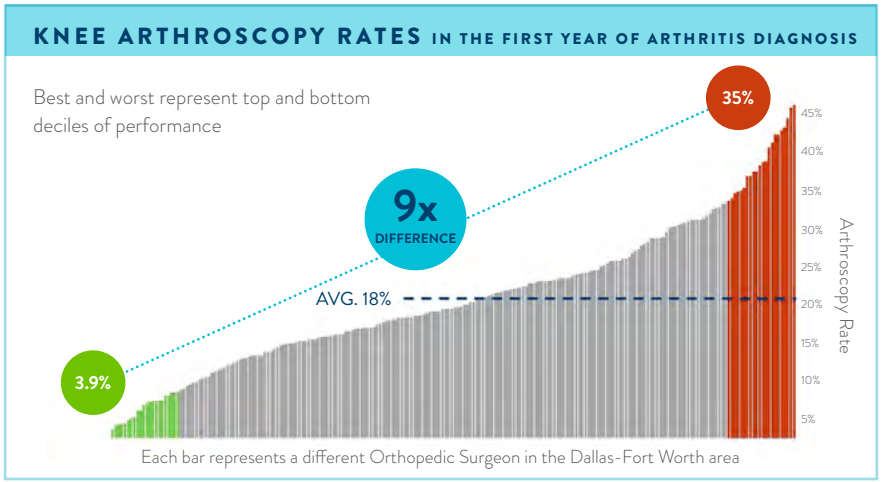


Figure 2
Knee Arthroscopy Rates in the first year of arthritis diagnosis

EFFECTIVENESS

Working with the Embold Health Scientific Advisory Board and clinical subject matter experts, we identify physician quality measures that have the highest clinical impact on patient outcomes for a given specialty or procedure. While scientific evidence and clinical practice guidelines inform health care providers of clinical interventions that should or should not be pursued, there remains significant variation in adherence to these best practices, as evidenced by provider-level variation in the use of statin therapy among patients with known coronary artery disease (*Figure 3*).

In addition to measuring differences in adherence to clinically important guidelines, we measure patient-important outcomes, among them need for hardware removal after lumbar spine surgery (*Figure 4*).

Where possible, we leverage existing quality measures from AHRQ, CMS, NQF and other consensus groups. Where there are gaps, we then augment our measure library with specialty-specific, risk-adjusted quality measures from medical society clinical practice guidelines and the latest medical evidence.

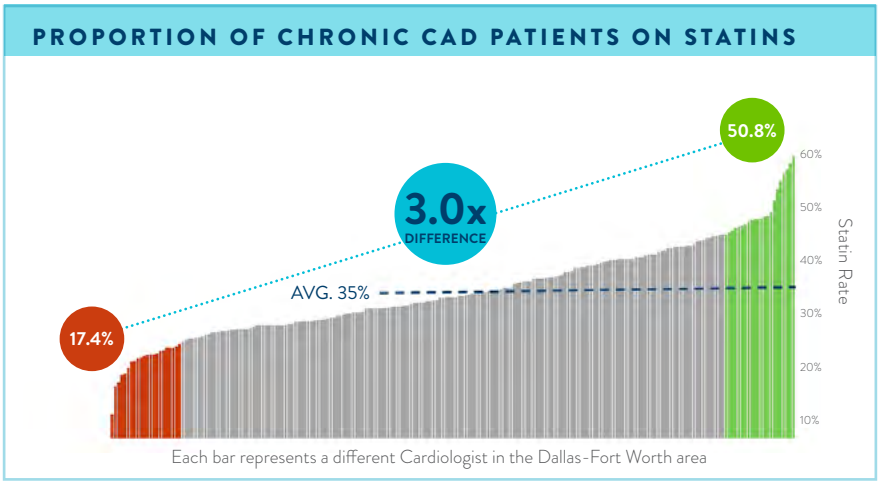


Figure 3
Proportion of Chronic CAD Patients on Statins

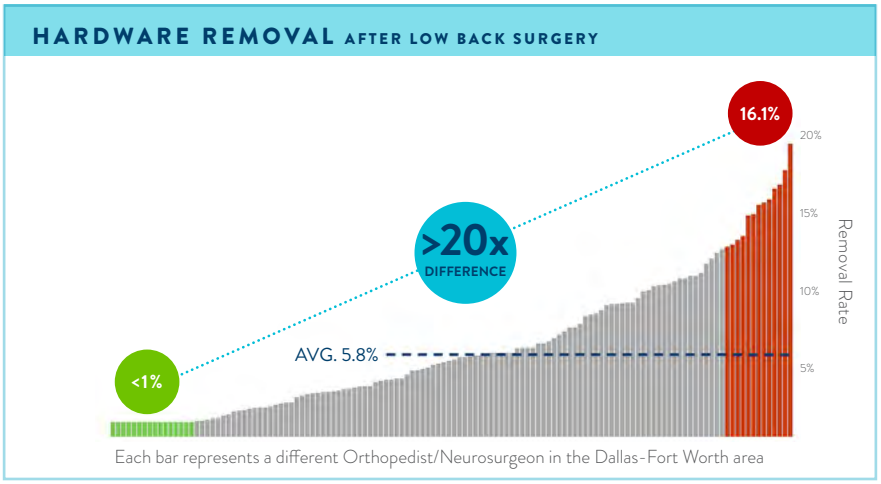


Figure 4
Hardware removal after low back surgery Hardware removal within one year of elective spine surgery

COSTS

We measure total costs of care across collections of longitudinal care journeys and analyze the results by physician, physician group, hospital, or health system.

Our holistic measurement incorporates both variations in unit price and the larger variations in the use of discretionary, high-cost interventions. This analysis adjusts the time period and inclusion/exclusion criteria to match the specific medical condition or treatment.

CLINICAL VALIDATION

Embold Health has partnered with a nationally recognized, integrated health system to access linked clinical and claims data. In collaboration with our academic partners, all appropriateness and quality measures undergo thorough clinical validation through manual chart abstraction. This process ensures Embold Health's measures accurately reflect the clinical scenario under investigation. and it facilitates rapid testing and iteration of new quality and appropriateness measures as well as analysis of new specialties and conditions.

RISK ADJUSTMENT

We know that patient-level factors are associated with both the type of treatment patients receive and their outcomes. In order to minimize the potential for confounding, we incorporate adjustment for patient-level risk-factors into our statistical analyses. Specifically, we adjust for patient-level comorbidity using the commercial Hierarchical Condition Categories (HCC) score and for socioeconomic status using a zip-level socioeconomic index.

STATISTICAL ANALYSIS

After the provider-level quality results are obtained, Embold Health uses rigorous analytic methods to bring the universe of Embold Health measures into meaningful provider performance summaries. Within each measure, we use Bayesian modal hierarchical random effects modeling to predict how they will perform on new patients relative to their market peers, adjusting for multiple factors including patient-level comorbidity and socioeconomic status. We then collapse these data onto three composite scores: one rating of a provider's appropriateness, one rating of a provider's effectiveness, and one rating of a provider's

overall cost performance, weighting each measure by its ability to confidently rank providers. These advanced statistical models allow us to estimate individual provider-level effects, while taking into account patient-level differences among providers. Advanced simulations then ensure the validity of provider rankings.

Our rigorous analytics provide enhanced reliability and ensure that variations in provider quality represent statistically meaningful differences across appropriateness, effectiveness and total cost of care.

COMMITMENT TO TRANSPARENCY

Embold was founded on the premise that physicians share a universal desire to help patients by delivering the highest quality care. However, many lack the information and tools they need to reliably assess and continually improve their performance.

In addition to sharing data directly with its employer and health plan partners, Embold makes its analysis available to doctors at the individual level.

At Embold, there are no hidden agendas or secret measures. Our “glass box” methodology allows providers to understand how they perform and why, creating a path for continual improvement.

CONCLUSION

As the demand for transparency in health care grows, there are new opportunities to leverage health data to gain insights about provider-level performance to benefit consumers, health plans, employers and physicians alike.

By shining a light on the providers who are delivering high quality, appropriate care at a reasonable cost, Embold Health helps patients make better health care decisions, allows employers and health plans to guide employees and members to high quality providers, and provides physicians with the information they need to assess and compare their performance, creating a path to continued improvement.

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BE BOLD WITH US.
LET'S MAKE HEALTH CARE BETTER TOGETHER.