Follow the evidence

CCO is a data driven, leading practice methodology to minimize clinical variation and improve quality in healthcare

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Dolores, a 70-year-old woman with pulmonary hypertension, is admitted to the emergency department (ED) with fever, nausea and the inability to speak. Due to a medical history of blood clots and the current aphasia, the suspicion is that she has suffered a stroke. She is given tissue plasminogen activator (tPA) immediately and brought to radiology for an MRI of her brain. Shortly after she returns to the ED, her fever rises to 103 and she loses consciousness. Blood work is obtained, and it is discovered that she has a very high white blood cell count, abnormally low platelets and elevated lactic acid. As her urine culture also shows signs of a urinary tract infection, sepsis is suspected, and the patient is started on an aggressive dose of a broad-spectrum antibiotic. The sepsis continues to advance toward septic shock, and given her underlying health conditions, the patient declines rapidly and expires three days later.

Unfortunately, Dolores is not alone. There are more than 1 million cases of sepsis per year in the U.S., and more than half of those are fatal, according to the Centers for Disease Control.[1] Out of those, 30 percent can be attributed to avoidable medical error,[2] such as delayed diagnosis, an inappropriate specialist assigned to the case, or hospital-acquired infection. Unlike other all patient refined disease-related groups (APR-DRGs) targeted for quality improvements and decreases in clinical variation, sepsis is particularly challenging. Presentation and progression can vary widely from person to person. For example, one person might have mild breathing difficulties and a low-grade temperature, while another might have rapid organ failure.

In order to decrease variability in sepsis outcomes, there have been a number of high-profile initiatives to introduce sepsis resuscitation bundles for initial management of severe sepsis and septic shock. One widely used bundle comprises carefully timed protocols ranging from measurement of serum lactate levels, to administration of multiple antibiotics, to efforts to raise central venous pressure (CVP). Adhering to evidence-based protocols is paying off. For example, the bundle introduced by the

Surviving Sepsis Campaign in 2002 has seen a 25 percent risk reduction in sepsis-related mortality among the 29,470 patients whose histories are stored in the organization's database.[3]

Common manifestations of clinical variation[6]

– Lack of adherence to evidence-based practices

– Placement in the incorrect status or setting within the hospital

– Delayed surgery or treatments

– Inadequate discussion of care progression goals, missed diagnosis or treatments

– Delayed transfer to post-acute care settings

– Inappropriate specialists consulted or assigned

– Hospital-acquired infection

– Failure to admit from the ED

– Procedure complications

This example leaves us with a number of questions that this paper seeks to answer: What drives clinical, operational and financial variation in care at a particular hospital? Is variation due to what care is ordered, how the care is delivered, or preventable complications?[4] How can hospitals reduce clinical variation?[5] The answers come from the discipline we call Care Continuum Optimization (CCO).
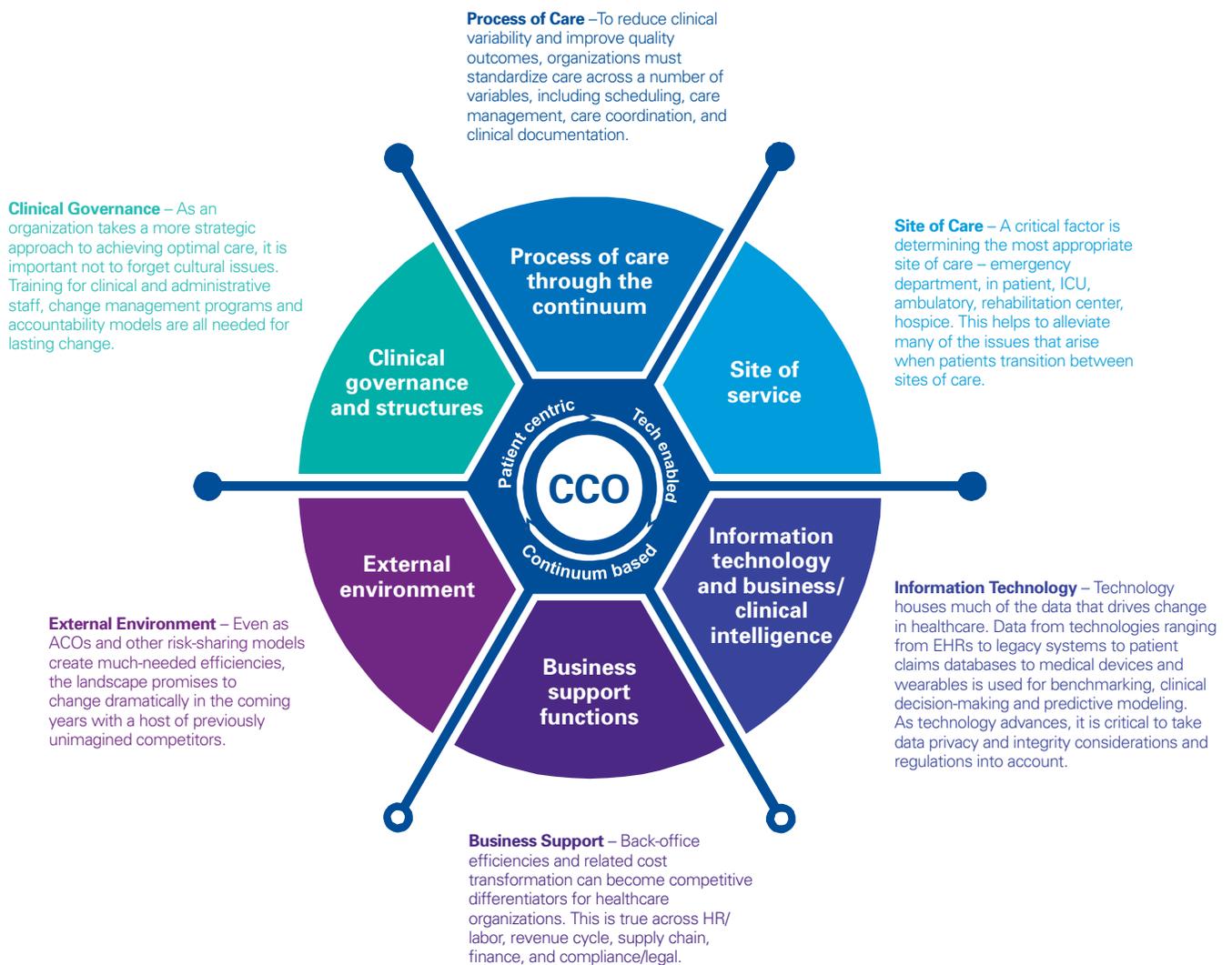
What is Care Continuum Optimization?

Care Continuum Optimization (CCO) is defined as performance improvement across the care continuum so that clinical variation is minimized and evidence-based practice is maximized. The discipline comprises clinical care redesign across APR-DRGs, supported by data analysis, care management, appropriate care progression, and governance models to manage accountability among providers.

Improvements are achieved through management and analysis of operational, financial and clinical data, a daunting task to be sure. Data sources can range from patients' electronic health records to claims databases, outcome studies, and other public and private data repositories. Advanced data & analytics is the key to identifying the most viable areas for process improvement, and to sustaining results over time. As stated by the Harvard School of Public Health, organizations cannot even begin to make improvements in the practice of healthcare until they identify what opportunities exist for improvement and establish desired baseline outcomes.[7]

So why now, you may ask. The fact of the matter is, no matter what happens with the Affordable Care Act (ACA), there will be a continuing need to drive quality, minimize variation, manage costs per case, optimize resources, and improve margins.

Process of Care –To reduce clinical variability and improve quality outcomes, organizations must standardize care across a number of variables, including scheduling, care management, care coordination, and clinical documentation.

Clinical Governance – As an organization takes a more strategic approach to achieving optimal care, it is important not to forget cultural issues. Training for clinical and administrative staff, change management programs and accountability models are all needed for lasting change.

Site of Care – A critical factor is determining the most appropriate site of care – emergency department, in patient, ICU, ambulatory, rehabilitation center, hospice. This helps to alleviate many of the issues that arise when patients transition between sites of care.

External Environment – Even as ACOs and other risk-sharing models create much-needed efficiencies, the landscape promises to change dramatically in the coming years with a host of previously unimagined competitors.

Information Technology – Technology houses much of the data that drives change in healthcare. Data from technologies ranging from EHRs to legacy systems to patient claims databases to medical devices and wearables is used for benchmarking, clinical decision-making and predictive modeling. As technology advances, it is critical to take data privacy and integrity considerations and regulations into account.

Business Support – Back-office efficiencies and related cost transformation can become competitive differentiators for healthcare organizations. This is true across HR/labor, revenue cycle, supply chain, finance, and compliance/legal.

Process of care through the continuum

Clinical governance and structures

Site of service

External environment

Information technology and business/clinical intelligence

Business support functions

Patient centric · Tech enabled · Continuum based

CCO

What are the most important aspects of CCO?

1 Data analysis

The process of determining which DRGs to focus on involves dynamic filtering of a wide variety of data. In our experience, it is best to use complete patient files that are not just retrospective but current, pull a year at a time, and then filter down multiple layers to investigate variability within the data. Data scientists are able to analyze these variations, providing comparisons to both internal and external best practice benchmarks to determine what is statistically significant. The DRGs that are chosen are then risk-adjusted for severity to provide consistent comparisons among groups.[8]

In our view, data reveals patterns and nuances that tell a story. Ideally, the story will comprise not only areas where a hospital can improve, but strengths upon which it can build. Analytics tools and consulting guidance can help organizations focus on the opportunities that are appropriate for quality and margin improvements. Ultimately, consultants can assist an organization in determining what actions to take and where to focus their efforts, e.g., on comprehensive care redesign, and/or on supporting operational and clinical transformation efforts, such as care management, clinical documentation, care progression/multi-disciplinary rounds, and governance/accountability processes.

Statistics & modeling

Bayesian Data Analysis

Discrete Choice Models

Exploratory Data Analysis

Linear Regression

Monte Carlo Methods

Panel Data/ Longitudinal Data

Statistical Estimation Adaptive Filtering

Survival Analysis

Time Series Analysis

Advanced Regression

Unsupervised learning & clustering

Unsupervised Learning & Clustering

K-Means

LDA

Information extraction & retrieval

Document Clustering

Fuzzy Matching and Term Weighting

Link Analysis

Web Crawling

Web Scraping

Supervised techniques

Decision Trees

Ensemble Methods, Random Forests

Logistic Regression

Neural Networks

SVM

Natural Language Processing (NLP)

Machine Translation

Named Entity Recognition (NER)

Part-of-Speech Tagging

Sentence Parsing and Chunking

Sentiment Analysis & Text Classification

Topic Modeling & Keyphrase Extraction

Word Sense Disambiguation

Big data architecture

Cloud Computing

MapReduce

Stream Processing

Decision science/ ops research

Decision Theory

Linear Programming/ Mixed Integer

Programming

Stochastic Processes & Queuing Theory

Data mining & machine learning

Dimension Reduction

Feature Selection

Large-Scale Machine Learning & Algorithms

Social Network Analysis and Mining

Ensemble Methods and Random Forests

Supervised Techniques: SVM

Supervised Techniques: Neural Networks

Supervised Techniques: Decision Trees

Supervised Techniques: Logistic Regression

2 Clinical care redesign

Clinical care redesign aims to achieve consistency and reduce clinical variation in care delivery. The resulting structure supports clinician adoption of evidence-based standards of care for targeted DRGs and elimination of unnecessary tests and treatments. The lynchpins of care redesign are care pathways that prescribe daily medical milestones, treatment patterns, expected lengths of stay (LOS), and recommended tests and treatments that, if addressed, are most likely to lead to desired clinical outcomes. The pathways and milestones serve to guide both the delivery and progression of care.

Eliminating non-evidence-based care/medical errors. There are a variety of cognitive explanations for why medical practitioners hold to long-standing care practices, even if they are not necessarily the most effective. One is *communal reinforcement*: This is when an idea is repeated in a community, regardless of whether there is sufficient evidence to support it. In fact, quite a few studies have been completed on this phenomenon. A study from Health Services Research showed that physicians are likely to determine LOS based on the norms at the hospital where they practice. And, when physicians practice at more than one hospital, the LOS for similar patients varies based on where the physician is treating them.[9]

Another explanation is *availability error* – or when the first option that comes to mind is assumed to be the best solution. This is particularly common when there is no clear choice among drugs, tests and therapies, so doctors provide therapies based on their own experiences to attempt to deliver the best outcomes. This last is particularly dangerous and is arguably a major contributor to the 100,000 deaths caused every year through medical error, according to the Institute for Healthcare Improvement (IHI).[10]

Minimizing wasted spending. There are many causes of inflated spending, including excess utilization, missed risk-based payments, avoidable penalties, opportunity costs due to narrow network exclusion, and inflated malpractice payouts. Significantly, a study by the Healthcare Advisory Board suggests that 42 percent of wasted spending is due to insufficient quality.[11]

Ineffective care can lead to wasted spending that amounts to billions of dollars (as shown in the chart below). The numbers may be daunting, but there is hope. In the Healthcare Advisory Board research, hospital leaders cited clinical care redesign as the primary means of cost containment, crediting the methodology for up to 40 percent of potential cost savings.

Following are some areas of ineffective care and their relative contribution to healthcare waste:

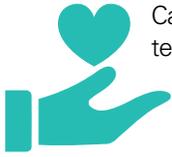|	
Failure of care coordination	$35B
Failure of care delivery	$128B
Overtreatment	$192B

3 Care Management

Care management is focused on longer term coordination of a patient's needs across the care continuum, including review of patient utilization (and over-utilization) of medical services, placement in the appropriate care setting, discharge planning, and clinical documentation improvement (CDI).

It is important to note that care management should reflect the movement toward integration of physical and behavioral health. Balancing these aspects of a patient's makeup is critical to ensuring that psychosocial concerns are addressed insofar as they impact medication adherence, understanding of self-care protocols, and availability of transportation to physician appointments and treatments. As care management practices take hold, coordination for high-risk patients will increasingly span the continuum, i.e., across physicians, nurses, social workers, social services agencies, and other ancillary providers.

4 Care progression (including multi-disciplinary rounds)

Care progression is designed to guide a patient through the medical system from the point of entry to acute care through the transition to home, or to post-acute care. Not to be confused with clinical or teaching rounds, multi-disciplinary rounds (MDRs) are the most critical component of care progression. They involve structured communication between members of a patient's team across medical specialties and focus on barriers to discharge and progression through medical milestones.

MDRs comprise daily meetings about each patient; technology tools to enable a consistent, real-time picture of a patient's status; processes that remove barriers to care progression; identification of evidence-based clinical pathways; interventions to prevent complications; and appropriate planning for discharge and post-acute care.

5 Governance

A robust clinical governance and accountability structure is needed to support care transformation efforts and monitor the pace of change among physicians, nurses and ancillary staff. The effort should include timely monitoring, escalation and resolution of concerns.

One of the most important considerations here is devising metrics to monitor the performance of improvements that have been implemented. Performance can be measured on two fronts:

Operational: Represented by performance at the campus or local level, an example would be tracking the quality review scores for multi-disciplinary rounds.

Financial: Quantifying the individual campuses' and the system's ability to use operational change to meet financial goals, examples would be cost savings realized through reduced LOS or lower cost of care for specific patient populations.

What outcomes can I measure?

Length of stay

Many organizations believe they have LOS handled. However, it can be tricky to integrate all the factors that have an impact, i.e., transforming the clinical enterprise, balancing cost and quality, and decreasing unnecessary test and procedure utilization.

There are numerous reasons that LOS is unnecessarily extended, all of which speak to inefficiencies. For example, delays in test results, procedure scheduling or access to appropriate specialists are reflective of care that is sub-par in quality. In a recent study from the Agency for Healthcare Research and Quality, 10 percent of hospital days are due to delayed discharge, and 11 percent are most likely unnecessary.[12]

Impacting LOS takes time, but organizations that dedicate themselves to the effort can see real change. For example, longitudinal research on leading hospitals published in the Annals of Internal Medicine found that an intense focus on efficiency led to an average decrease of 27 percent in LOS and 16 percent in 30-day readmissions.[13] However, since lengths of stay that are both longer and shorter than average are associated with increased risk of readmission, it is all about finding that sweet spot.

Of course, appropriate length of stay is impacted by disease severity and diagnosis as well. For example, an uncontrolled diabetic with decreased kidney function would arguably need to be monitored longer than a diabetic with no current complications.

Clinical variation

We know that the frequency – and cost – of certain procedures and surgeries vary widely across different areas of the United States. For example, caesarean delivery rates vary up to 10 fold in the United States, depending on the institution.[14] Another example lies in how cerebral aneurysms are treated: According to a study from the Dartmouth Atlas of Healthcare, in certain areas of Florida, Indiana and Washington State, the less invasive treatment of coiling is used in more than 97 percent of patients; by contrast, in areas of Georgia and Wisconsin, only 36 percent of patients receive coiling and instead are treated with the much more invasive clipping technique.[15]

The reasons for disparities such as these can range from institutional norms to physician preference to availability of medical equipment. It is rare that variations have much to do with best practices. In fact, with the exception of relatively rare procedures where frequency correlates with surgeon skill, there is no consistent relationship between utilization and quality measures, according to the Institute of Medicine.[16]

Quality

Quality has been difficult to measure, as the industry has struggled to come up with a consistent way to define it. Some define quality in terms of positive patient outcomes. Others are focused on favorable patient experience ratings. In many cases, however, there is not enough emphasis on cost transparency. We would argue that the most appropriate way to evaluate quality is in terms of the differential between patient outcomes and costs. For example, organizations can't say they are improving quality at the same time as inflating costs or performing numerous unnecessary procedures. And they can't start eliminating potentially life-saving interventions and allow outcomes to decline.

There is also some disparity in the timeline organizations use to measure quality: Some track a patient's progress during a hospital stay and base quality measures on avoidance of complications, appropriate LOS and no readmissions. More and more, there is pressure to look at longer term endpoints for measuring whether or not patient care was successful and that costs over time were justified by outcomes.

Memorial Hermann takes a leap forward

Problem: Memorial Hermann Hospital in Houston had inefficient clinical, operational, and financial processes across multiple departments. Chief among the barriers to improved care were multiple sources of siloed data, insufficient quality of care metrics and lack of training on best practices.

Solution: KPMG instituted a comprehensive five-year process improvement plan that started with a focus on care redesign. Over the next five years, the team expects to realize $195M in savings via reengineered care management, clinical documentation improvement (CDI), focused improvements in the UR department, the addition of multi-disciplinary care rounds, targeting of 12 DRGs for clinical care redesign, and a new clinical governance model designed to improve accountability among providers. The basis for all this work was a sophisticated data analytics program that allowed the organization to pinpoint viable opportunities for eliminating variability, and monitor the success of these new programs via comprehensive dashboards.

Conclusion:
Moving CCO forward

It is critical that CCO initiatives reflect physician buy-in. After all, physicians determine the course of care, potentially plan for discharge at admission, and ultimately initiate the discharge process. And, of course, it is their payments that are impacted if quality isn't optimized. In other words, physicians must find the tipping point between discharging patients before they are at risk for a hospital-acquired infection, and keeping them under observation long enough to minimize the risk of readmission.

Ultimately, it is data that will drive commitment to CCO by physicians. If physician leaders understand the analysis of the data, they can espouse change and bring others along.

This is not to say that the C-suite can take a back seat. Senior administration must ensure that improvements span not only clinical factors that affect outcomes, but care management efficiencies, resource allocation, staffing structures, governance policies, and performance measurement methods.

Ultimately, it is a combination of data, process improvement methodologies, and new or enhanced tools and technologies that will drive commitment to improvements in care by physicians, whether they are providing care in an acute care, post-acute care, or ambulatory setting.

CCO has the potential to allow hospitals to become lean and profitable while dramatically raising the level of patient care. However, clinical, operational and behavioral transformation requires credibility around the message that clinical performance improvements are not only possible but imperative.

How can KPMG help?

As our healthcare clients increasingly require substantial data to justify and calibrate transformation projects, KPMG has put a particular emphasis on continuing to expand and enhance our data & analytics capabilities. We have accomplished this via organic building of an in-house think tank (Lighthouse), strategic acquisitions of analytics consultancies and tools, and an infusion of D&A into our industry-focused teams. This allows us to help clients define problems, gain funding and institutional support for transformation efforts, benchmark against internal and external players, and monitor and sustain change.

It is important to note that our healthcare teams comprise clinicians, strategy professionals, management consultants, and data scientists, and, therefore, can help an organization start the care redesign process at any point, e.g., care management, addition of multi-disciplinary rounds, CDI, etc.

Our engagements with healthcare organizations comprise some or all of the following:

— Development of long-term investment and process improvement plans to maximize efficiencies and reduce costs

— Creation of data & analytics tools and programs that ease flow of information, benchmarks and dashboards

— New processes across multiple sites of clinical care

— Workshops to identify needed clinical care redesign, including current state analysis and identification of opportunities for improvement

— Care Management, and Care Progression improvements, including assembling a team with the industry background to understand current issues, determine appropriate and feasible changes, and execute those changes

Executive summary page of the CCO dashboard

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