CHAPTER 7

Developing and Using Effective Indicators

What's measured improves.

—Peter F. Drucker

Healthcare organizations (HCOs) have more data available to them than ever before. Raw data is rarely useful, however, for healthcare quality and performance improvement. To begin with, there is now often *too much* data generated through all the activities and systems within healthcare to use effectively. Indicators provide convenient performance snapshots of processes, financial measures, and outcomes critical to the quality and performance goals of the HCO. This chapter will discuss the importance of indicators in quality and performance improvement, and how to create or choose indicators that are most effective for the requirements of your HCO.

Measures, Metrics, and Indicators

There is a saying that "you can't improve what you can't measure." While this may not be strictly true—I have seen HCO undergo tremendous improvement via the foresight and vision of remarkable leaders—bringing about change in healthcare requires measurement of processes and workflows and effective representation of those measurements.

As a result of the increasing volumes of available data and the abundance of analysis tools, many different reports, dashboards, and other information requests are being generated for decision making. Even though HCOs are experiencing a proliferation of dashboards and other information tools, many are still struggling to improve their quality, performance,

HOW TO MAKE MEASURES MORE USEFUL

There is some thinking that the development of metrics and indicators is the sole domain of the business or QI teams. It is vital that analytics teams are aware of how to develop effective indicators, however, because it is they who bring indicators to life. They need to know not only how to analyze data but also how to put that data into context. When asked for metrics and measures, analytics teams should know that the analysis is only part of the solution; every indicator should be presented with appropriate ranges and targets. If this information is not available for inclusion with the indictor on a dashboard, report, or other analytical application, analytics teams should approach the requestor of the information for that context. Without that context, the information gets buried in just another report that does not assist the HCO in making decisions or achieving its quality goals.

and competitiveness. It is clear, then, that having data, producing more reports, and developing more dashboards is not the only answer.

Rather than simply collecting more data, healthcare leaders need information grouped and summarized in logical ways that let them know how their organization is performing. The usual starting point is to define measures, metrics, and indicators that are representative parameters for examining the performance of the organization. These three terms are commonly (but incorrectly) used interchangeably. Although there is by no means universal agreement as to the *exact* definition of the terms, the definitions below are sufficient to convey how the terms differ in meaning, and how those differences relate to the measurement of healthcare.

Tip

Rather than simply collecting more data, healthcare leaders need information grouped and summarized in logical ways that let them know how their organization is performing.

Measure. The term "measure" (when used as a noun) in healthcare typically refers to a quantitative value representing some aspect of patient care, and may (or may not) be linked to specific performance and QI initiatives. Typically, measures have not been processed (except for perhaps being

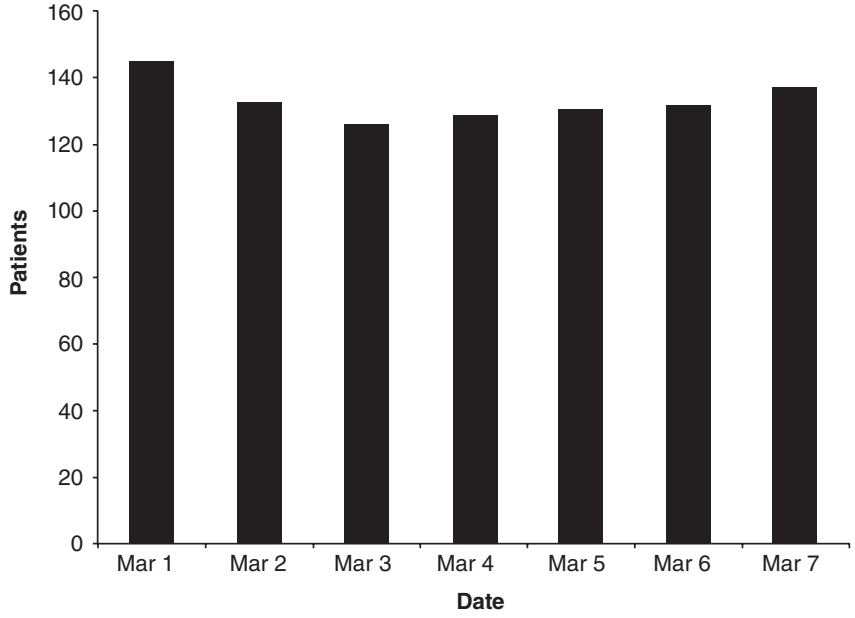

FIGURE 7.1 Sample Graph of a Measure (Number of Patients Triaged)

grouped in some logical manner) and may include variables such as time (such as hours waiting), counts (such as patients), and other similar data. Since almost any quantitative value can be considered a measure, I like to consider measures as the raw data that forms the basis for further analysis.

Figure 7.1 illustrates a measure—simply the number of patients who have been triaged in the emergency department over a seven-day period. This information is "nice to know," in that it provides some context as to the busyness of the emergency department over that time period; however, it doesn't provide any additional information about the performance of the department.

Metric. A metric is some aspect of healthcare quality or performance to which a quantitative value is attributed for purposes of monitoring and evaluation. I consider metrics to be measures with more focus and purpose. Metrics typically specify a given point of time or a time period. Metrics can be situational (for example, they may be relevant only for a special purpose or project), but can also measure performance longitudinally, as long as the metric is relevant to some aspect of quality or performance that the HCO needs to monitor. Examples of metrics used in healthcare improvement include time (such as length of stay), number of patients seen by a physician per shift, number of medication errors, and other important descriptors of quality and performance.

Figure 7.2 illustrates a metric, in this case the percentage of patients whose triage scores were overridden by the triage nurse from what was suggested by the computer's triage algorithm. I would consider this a metric, because it ties directly to a process within the department (the triage

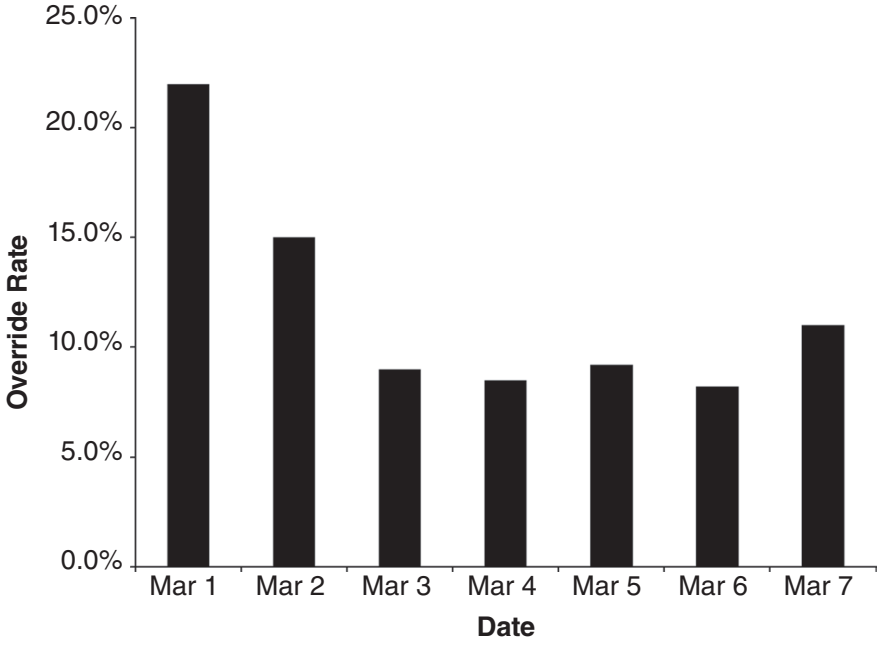

FIGURE 7.2 Sample Graph of a Metric (Triage Override Rate, March 1, 2013, to March 7, 2013)

of patients) and it relates to quality (too frequently overriding triage scores may present a clinical and legal risk, and may suggest that the computerized triage algorithms need adjusting). The purpose of monitoring this metric is to minimize clinical and legal risk and to ensure clinical quality.

In this case, we can see that March 1 and 2 had higher override rates than the other seven days, but the chart tells us little else. A few things are missing from this metric that would make it really useful: some indication of what a good (or acceptable) override rate is—the target—and how current performance measures up against previous (or baseline) performance. Without this additional context, it is difficult to know if any corrective action is necessary, and if so, what action to take.

Indicator. A metric without context may be insufficient for making decisions—it is merely "a number," and having too many metrics may actually contribute to information overload and impede decision making. Indictors, then, are metrics that are more useful for driving business decisions, because indicators have *context* assigned to them. See Figure 7.3 for the graph of a sample indicator. Some of the most important pieces of contextual information that separates an indicator from a metric is having an acceptable range and target assigned to the indicator, which is necessary to

- Identify whether current performance is "good" or "bad,"
- Determine how far away performance is from reaching its performance target, and

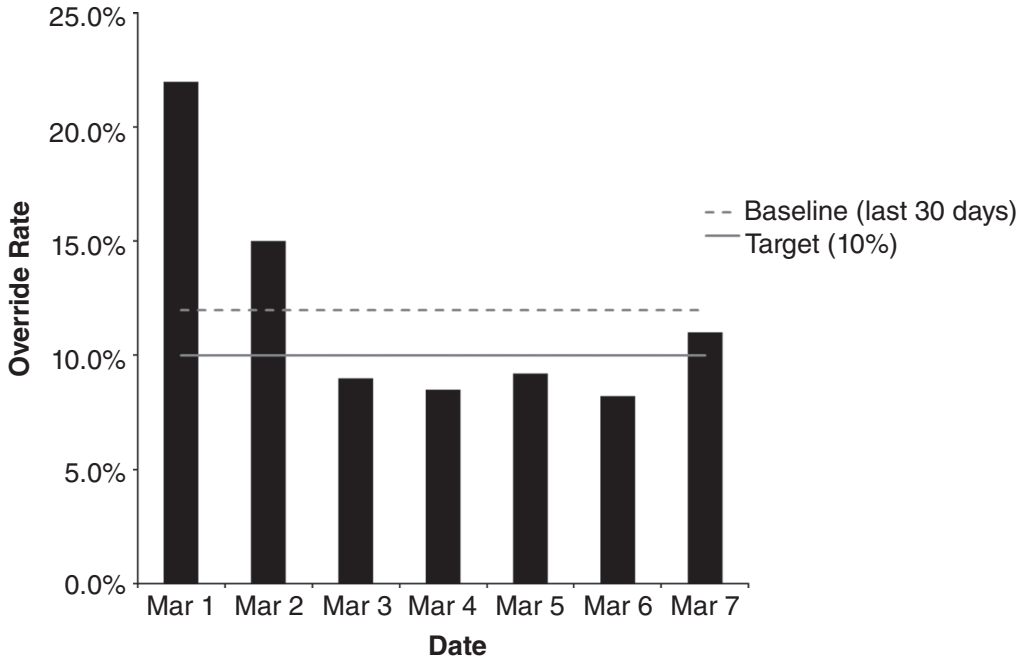

FIGURE 7.3 Sample Graph of an Indicator (Triage Override Rate, with Baseline and Target, March 1, 2013, to March 7, 2013)

- Tell whether performance is trending toward meeting the target (or staying within target range) or if it is trending away from the target (or trending toward becoming out of the target range).

The triage override rate metric becomes a true indicator and trigger for action once we add the baseline performance (so that we can compare current performance over past performance, in this case, over the last 30 days) and the target (which is what would be considered an acceptable rate of triage override). With the two new pieces of information, we can see in Figure 7.3 that, over all, performance over the last seven days was better than the baseline for five out of seven days, and that performance was within the target range for four out of seven days. It is possible that March 2 and 7 are outside the target range due to random variation, but March 1 appears to stand out. This could, for example, trigger the nurse manager to see who was triaging that day—perhaps one or more of the triage nurses is inexperienced and needs a refresher on the triage tool. Note how important the target information is: if the acceptable range for override rates was 20 percent (not 10 percent), then likely no corrective action would need to be taken at all.

To keep focus on the measures that matter, performance dashboards should be populated with indicators. Indicators are preferable on dashboards and performance reports because they relate to a particular process or other component of the healthcare business. When using indicators with

an appropriate visualization approach (such as a line or bar graph), not only can trends be spotted, but also the associated targets highlight whether performance is good or bad, and improving or getting worse.

Developing Effective Key Performance Indicators to Focus Improvement Efforts

Key performance indicators (KPIs) are defined as "a set of measures focusing on those aspects of organizational performance that are the most critical for the current and future success of the organization."[1]

Although many executives and other decision makers may have different opinions about what constitutes "critical for the success of the organization," KPI expert David Parmenter has identified the five main characteristics of KPIs that work for successful organizations:[2]

1. Expressed in nonfinancial measures.
2. Measured and reported frequently (typically daily, 24/7).
3. Acted upon by senior management (including chief executive officer) and key decision makers (to ensure that the KPI can make a difference).
4. All staff understand both the measure and the particular corrective action required (so that all know their part in improving quality and performance).
5. Ties responsibility of performance and action to the individual or team (so that no KPI and accompanying corrective action goes unassigned).

Despite their obvious value to managing an organization, KPIs are claimed by some people to be "dead." These claims are made on the basis that with so much data now available to some HCOs on nearly every aspect of their clinical and operational performance, insight on any aspect of performance is now merely a click away and thus does not need to be boiled down to a handful of indicators. While this point may be true, HCOs can focus on only a few areas of improvement at a time. Indicators are absolutely necessary for organizations to stay focused on the issues and actions that matter the most at a given period of time. As priorities of the HCO change, new indicators will emerge and older, less relevant ones will be deemphasized. In this way, the key priorities of the organization can always stay in focus with the proper indicators selected.

Tip

Indicators help organizations stay focused on the issues and actions that matter the most at a specific period of time.

It is important to have indicators, but if they are not measuring the right things, then it's likely improvement efforts will falter. In healthcare, there are literally hundreds, if not thousands, of parameters that could be monitored. How can an HCO choose which parameters to follow and turn them into relevant, effective indicators?

A common acronym that is used to help guide the development of indicators is SMART. That is, well-formed indicators that can be used to identify bottlenecks and other quality issues and to drive decision making should, whenever possible, be:

- Specific
- Measurable
- Actionable
- Relevant
- Time-bound

Specific. It must be clear exactly what it is the indicator is measuring, and what the defined acceptable ranges and targets are. The indicator must describe a unique, distinguishable component of the business (such as process or workflow). A poor example is "length of stay," which is generic and doesn't indicate what it is that we're measuring the length of stay of. A better example would be "length of stay for emergency department patients who are not eventually admitted to hospital." The acceptable ranges and targets associated with indicators must also be specific. For example, an emergency department length of stay of less than four hours for 95 percent of patients is a specific target. The more specific indicators are, the better they are at discerning changes in performance.

Measurable. Even though an indicator may be very specific, it may not be measurable. This may be because no data can be obtained to calculate the indicator value, or that the data is incomplete and inaccurate. There is no point in creating an indicator, even if it is vital to the business, if sufficient data is not available. For example, tracking the number of times an electronic chart is corrected might be an important indicator of data and/or clinical quality, but if that data is not available in audit data, then it's necessary to refocus efforts on developing indicators that can actually be measured.

Actionable. "Actionable" is a commonly used word, but what does it mean? As an example, the fuel indicator on a vehicle's dashboard is actionable because when the indicator gets too close to the empty mark, it is obvious when to take action (and what action to take)—the driver must fill up with fuel or risk running out of gas. Ideally, healthcare indicators should also be similarly actionable in that the performance trends they monitor identify when action is needed. For example, if a real-time indicator suggests that a

patient is at high risk for falls, then the appropriate falls-prevention protocol can be activated to prevent that occurrence within the department.

Relevant. The problem with information is that sometimes there's just too much of it. It takes a lot of effort to turn around the performance of an HCO, and QI teams can only focus on a few problems at a time. Bombarding teams, management, and executives with too much extraneous information can actually complicate the decision-making process. Indicators should be chosen for their importance to the effective operations of the HCO and their relevance to the goals and objectives of QI projects.

Time-bound. When appropriate, indicators and their associated targets should be time-bound. That is, the indicator should specify what time period the indicator covers (daily, weekly, monthly), and the target should also indicate what time frame the indicator is aiming for (e.g., within one week, one month, etc.). For example, if the rate of central line infections is an indicator of interest, a relevant time frame and target date must also be defined when measuring and reporting the data.

Aligning Indicators with Data and Processes

The section in Chapter 6 titled "Aligning Processes with Data" discusses the importance of aligning data with business processes so that important contextual background (such as business rules) can be incorporated into analytics. Indicators must also be in alignment—with both data and processes. Indicators must align with one or more data points, since, after all, indicators are a summarization of performance based on data.

The reason that metrics and indicators must maintain alignment with both data and processes is because any changes in processes that are being monitored by indicators may in fact violate basic assumptions of the indicator's calculations. In other words, process changes may result in changes to data that in turn *incorrectly* impact the calculation of indicators.

An important case in point comes from my own experience. Prior to implementing electronic clinical documentation, we would use data from our emergency department information system to calculate the length of stay of a patient as the time the patient was originally registered in the system prior to triage to the time the patient was removed from the tracking

MORE ABOUT INDICATORS

Please visit this book's web site, http://HealthcareAnalyticsBook.com, for additional examples of indicators and for resources about the creation of effective healthcare performance indicators.

board. The rationale for using removal from tracking board as the endpoint of the visit was that the manually inputted discharge time was the time a disposition decision was made (i.e., when the physician decided the patient could leave), *not* the actual time the patient left the department. The time the patient was removed from the board, on the other hand, was the time the patient actually vacated the bed, so we felt this was a better indication of length of stay.

It turned out that after the implementation of electronic clinical documentation, a process was devised to keep patients on the tracking board longer by placing them in a special temporary location, as a visual cue to remind care providers to complete their documentation. Within two weeks of the change in system and process, the average length of stay for the department increased by 0.6 hours, with some patients having two or more hours tacked onto the end of their visit even though they were no longer in the department.

In this case, it was the change in process that prompted my team to review the data, which uncovered the issue of extended length-of-stay values. One of the solutions was to modify the length-of-stay calculations performed during the Extraction/Transformation/Load process to account for the extra time patient names were kept on the tracking board in the special temporary location. It is easy to see how, without a clear understanding of how process impacts data, a calculation as basic as length of stay can be corrupted. And because length of stay is fundamental to many key indicators of emergency department patient flow, the basic decision-making value of these indicators would have been severely compromised had this relatively simple process change, which really has nothing to do with actual patient care, not been detected early on.

Given the number of processes and associated data elements that make up the delivery of healthcare, staying on top of changes to data, process, and indicators is not a trivial task. This is another argument for analytics teams to be in close proximity to the business and to the people who are intimately familiar with processes and how they evolve over time. This connection is crucial—without a close connection between process experts and analytics experts, it is exceedingly difficult to maintain the close connection necessary between data, process, and indicators in decision making and performance improvement.

Using Indicators to Guide Healthcare Improvement Activities

With an endless potential array of quality metrics and indicators, how do healthcare executives, unit managers, QI professionals, and analytics

developers know what information is important and necessary for making the right decisions? With so many facets of healthcare, and with so many possible indicators to develop, it can be challenging to choose which indicators to focus on.

Two of the most important qualities of indicators are that they are *relevant* and *actionable*. In other words, indicators must be useful for understanding the most pressing quality and performance issues facing an HCO, should identify what needs to be done to mitigate those quality and process issues, and ultimately should trigger appropriate action when certain conditions arise.

Relevant indicators are aligned with the goals and objectives of the HCO, and can be defined for two major levels—*strategic* and *tactical*. Figure 7.4 illustrates that the metrics, indicators, and associated targets that drive analytics can be defined from a top-down perspective for indicators that are in alignment with the strategic goals and objectives of the organization, and from a bottom-up perspective to meet tactical-level requirements. Figure 7.4 also highlights that the "voice of the customer" (especially the patient) is crucial for defining metrics and indicators at the tactical level and used for specific quality and performance improvement initiatives.

Strategic goals are the quality goals and objectives for the entire organization, and specify the overall performance levels that the HCO aspires to achieve. These strategic goals typically are based on published best practices and what the HCO feels it needs to achieve. Alignment of indicators is necessary so that the goals and objectives are communicated (and being adhered to) throughout the organization. Dashboards, reports, and other analytics that provide focus to the key indicators are an excellent method of communicating these important goals and targets throughout the organization.

Focusing *only* on strategic goals and targets, however, may not provide enough information for use at the unit, department, or similar level. In my experience, the most productive and innovative QI activities occur at the *tactical* level, that is, at or near the front line where the activities associated with providing healthcare are actually performed. For frontline decision making and QI efforts, a complementary set of metrics and indicators (or submetrics and subindicators) can be developed for use at the tactical level. Frontline improvement activities use tactical-level indicators to monitor and evaluate performance during and after improvements have been made.

Strategic Level	Strategic Objectives		
Analytics	Metrics	Indicators	Targets
Tactical Level	Tactical Objectives	Voice of the Customer	

FIGURE 7.4 Aligning Indicators with Strategic and Tactical Objectives

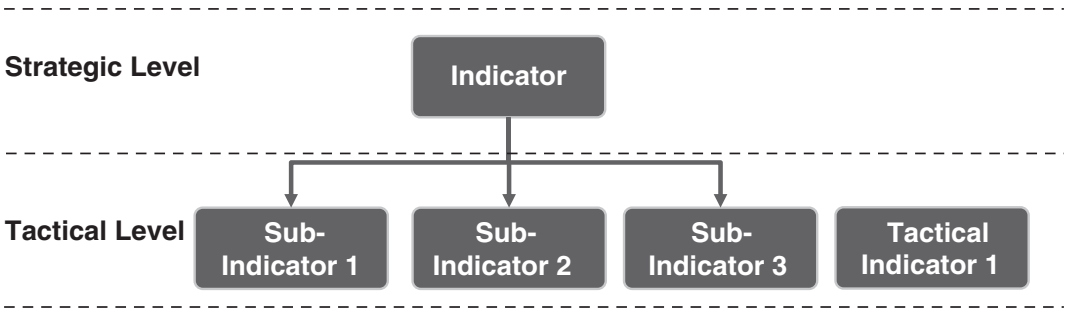

FIGURE 7.5 Hierarchy of Strategic-Level Indicators and Tactical-Level Indicators and Subindicators

Tactical-level indicators are based on the needs of specific QI activities (and perhaps remain relevant only during the span of a project and its evaluation period) and exist at the tactical level where most of the actual improvement activities are performed. Subindicators at the tactical level break down a strategic-level indicator into more detail that is relevant to a performance improvement project. Improvement projects may also have their own specific relevant indicators; these are not necessarily related to strategic-level indicators but are important for understanding performance and ongoing evaluation related to a specific improvement project. This hierarchy is illustrated in Figure 7.5.

Selecting Appropriate Indicators

With literally hundreds of data elements being generated on some modern EMR systems, it is important to differentiate which of this data is important to analyze and report on for the purposes of improving healthcare, and which should be set aside until needed at another time. It is likely that only some of the data available is relevant to the current quality and improvement performance goals of an HCO, and even less is directly actionable.

Yet with so much data available for analysis, the temptation is to create numerous indicators and to build a collection of dashboards to display them all. Creating too many different dashboards and reports risk causing an increase in information overload and loss of focus on improvement goals, which is counterproductive to the goal of improving the healthcare system.

When healthcare is under pressure, it is important to provide management and QI teams with the key pieces of information they need to focus on the most important problems and to make appropriate, timely decisions. The use of indicators to guide healthcare improvement activities often falls into one of two extremes: using a *single or too few* indicators to reflect the performance of a department, program, or facility, or the other extreme, which is using *too many* indicators.

Due to the complexity of healthcare, and the myriad factors that impact quality and performance, it is nearly impossible for a single metric or indicator to reflect accurately changes to the system. For example, efficiently functioning HCOs must measure many aspects of their performance, ranging from quality clinical care to administrative efficiency, to evaluate their performance, detect any problem areas, and take any necessary corrective action.

Using too many indicators (and who hasn't seen a dashboard crammed with every indicator possible?) serves only to confuse decision making. In the same manner that a pilot will focus on about six key instruments throughout most of a flight (with supplemental information being provided by other instruments), the critical indicators derived from approaches such as Lean and Six Sigma can guide decision making on the part of the HCO and result in real healthcare improvement.

HCOs need to be able to monitor many aspects of their performance to ensure that performance is attained and/or sustained at the desired levels. One way to make effective use of indicators is to bundle them into three groups: *outcome*, *process*, and *balancing*,[3] as outlined in Table 7.1. Outcome and process indicators are aligned with the healthcare elements of process and outcome described in Chapter 4.

Process and outcome indicators are typically what are monitored from an organizational standpoint and during QI activities. Including a variety of measure types in performance reports and dashboards is necessary to

TABLE 7.1 Outcome, Process, and Balancing Indicators

Indicator Type	Description
Outcome	Measures overall system performance, and includes the voice of the patient (or customer) and the results of improvement initiatives.
	Examples: percentage of unplanned emergency revisits, percentage of patients experiencing adverse outcomes.
Process	Measures how well key components (processes, workflows, steps) are performing.
	Examples: percentage of patients receiving rt-PA within the appropriate window, percentage of patients with chest pain having EKGs taken and read within 10 minutes of arrival.
Balancing	Provides a look at the system as a whole as processes and outcomes are improved, and may help identify unintended consequences.
	Examples: changes to staff workload as improvements are implemented, staff satisfaction.

obtain a comprehensive understanding of an organization's performance and the impact of improvement activities. Focusing on too many of one type of measure (such as outcomes), or even one particular outcome (such as length of stay) may lead to tunnel vision and an inability to spot any quality and performance issues in areas that are not being closely monitored. Likewise, having too many of any type of indicator will result in lack of focus. For any given improvement project, having between three to eight of the balancing measures is recommended.[4] This is a manageable number of indicators for decision makers and QI teams, and using all three types of indicators will enable a broader approach to monitoring the success of an improvement initiative.

Notes

1. David Parmenter, *Key Performance Indicators: Developing, Implementing, and Using Winning KPIs* (Hoboken, NJ: John Wiley & Sons, 2007), 3.
2. Ibid., 5.
3. Lloyd P. Provost and Sandra K. Murray, *The Health Care Data Guide: Learning from Data for Improvement* (San Francisco: Jossey-Bass, 2011), Kindle ed., locations 1326–29.
4. Ibid.