

Innovation Series 2007

Whole System Measures

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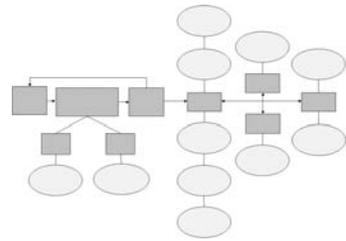
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Whole System Measures

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Executive Summary

The aim of this white paper is to describe and promote the use of a system of metrics, called the Whole System Measures, to measure the overall quality of a health system and to align improvement work across a hospital, group practice, or large health care system. The Institute for Healthcare Improvement and colleagues developed the Whole System Measures, a balanced set of system-level measures, to supply health care leaders and other stakeholders with data that enable them to evaluate their health systems' overall performance on core dimensions of quality and value, and that also serve as inputs to strategic quality improvement planning. Properly constructed, the Whole System Measures should complement existing measures that organizations use to evaluate the performance of their health care systems. The Whole System Measures, because they are intended to focus on important system-level measures, are limited to a small set of 13 measures that are not disease- or condition-specific. One objective for developing the Whole System Measures was to also provide a view of performance that reflects care provided in different sites—both inpatient and outpatient—and across the continuum of care.

Context and Background

There was a time when it was mainly the providers of care who were concerned about health care quality data; this is no longer the case. Today, not only are the providers of care keenly focused on the processes and outcomes of health care delivery, but the consumers of health care—as well as managers, boards, purchasers, and policy makers—are also becoming increasingly interested in being shown that health care services are safe, effective, patient-centered, timely, efficient, and equitable. Many of the questions that drive this growing interest in health care quality measurement can only be answered with data.

The Institute for Healthcare Improvement (IHI) is committed to helping health care organizations develop, implement, and use measurement systems that enable them to evaluate the efficiency and effectiveness of the services they provide. IHI and colleagues therefore developed the Whole System Measures, a balanced set of system-level measures. Specifically, the Whole System Measures (WSMs) provide the following:

- A useful conceptual framework for organizing measures of health care quality; and
- A specific set of quality metrics that can contribute to a health care organization's family of measures, balanced scorecard, or dashboard of strategic performance measures.

A central premise of IHI's work on the WSMs is that any family of measures should reflect a balance among structures, processes, and outcomes.¹⁻³ A balanced set of system-level measures is needed to provide leaders and other stakeholders with data that:

- Show performance of their health care system over time;
- Allow the organization to see how it is performing relative to its strategic plans for improvement;
- Allow comparisons to other similar organizations; and
- Serve as inputs to strategic quality improvement planning.

The aim of IHI's WSMs initiative was to develop, test, and use a small set of measures that focuses on quality of care and is aligned with the Institute of Medicine's (IOM's) six dimensions of quality (i.e., care that is safe, effective, patient-centered, timely, efficient, and equitable).⁴ Properly constructed, the WSMs should complement existing measures (e.g., utilization, program growth, finance, workforce satisfaction, etc.) that organizations use to evaluate the performance of their health care systems. It is important to note that not all of the measures are applicable to every health care organization. Systems should modify the WSMs to reflect their own structures and strategies. IHI hopes to continue learning about the application of the WSMs by working with health care organizations to share best practices and results.

The Whole System Measures are based on the following ideas:

- In the WSMs, “system” can refer to an integrated health system, a multiple hospital system, a free-standing hospital, or an ambulatory care organization. The WSMs operate at the provider-organization level, whether or not the organization is part of a larger entity.
- Health system leaders (and the public) need a small set of measures that reflects a health system's overall performance on core dimensions of quality and value.
- To maintain a systems perspective, a small set of high-level, system-wide measures complements the traditional large set of highly specific measures that reflect the performance of discrete aspects (microlevel performance) of a health system.
- The IOM *Crossing the Quality Chasm* report's six quality dimensions (i.e., care that is safe, effective, patient-centered, timely, efficient, and equitable) provide a practical framework for organizing the WSMs.
- Graphic displays of data over time are the preferred tools to show patterns and trends in each health system's quality measures. Shewhart control charts can be used with these displays to help interpret the patterns of variation.
- Large administrative databases are a useful way to provide health systems with comparative data. However, it may be necessary to enhance data from these databases if the data cannot be collected frequently and in a timely way.
- Some organizations will either not wish to or not be able to track all the WSMs, but may still find it helpful to use a subset of measures and then add or modify others as needed.

This white paper has six sections that describe the Whole System Measures in detail:

- Section One: Overview of the Whole System Measures
- Section Two: Implementing the Whole System Measures
- Section Three: Setting the “Toyota Specification” for Each Whole System Measure
- Section Four: Lessons Learned and Conclusions
- Section Five: Case Study of an Organization Using the Whole System Measures
- Section Six: Appendices
 - o Appendix A: Detailed Information on the Whole System Measures
 - o Appendix B: Example of One Organization Using the Toyota Specifications
 - o Appendix C: Measurement Experts for Each of the Whole System Measures

Section One: Overview of the Whole System Measures

In 2003 a group of approximately 10 people from the United Kingdom, Sweden, and the United States met to discuss the idea of developing a method for measuring the quality of care at the level of a health system. They believed that although many helpful quality measures existed and more were being rapidly created, high-level measures reflecting the overall quality of a health system were largely missing. They also believed that the important work to measure hospital quality—based on an overall mortality measure called the hospital standardized mortality ratio (HSMR)—done by Sir Brian Jarman, MD, Emeritus Professor and head of the Dr Foster Unit at Imperial College in London, could serve as a model for a high-level quality measure.^{5,6} Together the members of this group, including leaders from IHI, believed they could develop a small set of measures to go beyond Jarman’s HSMR metric.

After several months of dialogue and planning, the following health systems began to test the initial set of prototype measures the group developed:

- Sweden: Jönköping County
- United Kingdom: East Lancashire—Blackburn Trust, Bentley Trust
- United States: Pursuing Perfection site⁷—McLeod Regional Medical Center
- United States: IHI IMPACT network⁸ organizations—Geisinger Medical Center, St. John’s Mercy, ThedaCare

Based on their experience with the prototype measures and the associated work of collecting and analyzing data, reporting the results, and using this information for evaluation and improvement, the group produced Version 1.0 of the Whole System Measures. Version 1.0 contained nine measures that cut across the six IOM quality dimensions and represented both inpatient and outpatient care.

From the fall of 2004 through the summer of 2005, approximately 30 health systems collaborated with IHI to collect data and measure their progress using the WSMs. Lessons learned from their work and progress in the field of health care quality improvement led IHI to create a revised version of the WSMs—adding new measures where there were gaps in the system-level metrics and removing measures that were not helpful. IHI presented the WSMs to senior leaders of organizations in IHI’s IMPACT network as the proposed measurement set for their systems. Moreover, IHI’s Framework for the Leadership of Improvement calls for senior leaders and board members to focus their strategic improvement work on important measures (i.e., the “big dots”) such as mortality, harm, and patient satisfaction that reflect the quality of care delivered.^{5,9}

Keeping in mind that the WSMs are meant to be the “big dots” at the system level, the WSMs are limited to a small set of 13 measures that are not disease- or condition-specific. One objective for developing the WSMs was to provide a view of performance that reflects care provided in different sites and across the continuum of care. Table 1 lists the Whole System Measures, the relevant IOM quality dimension for each measure, and the setting(s) in which the measure applies.

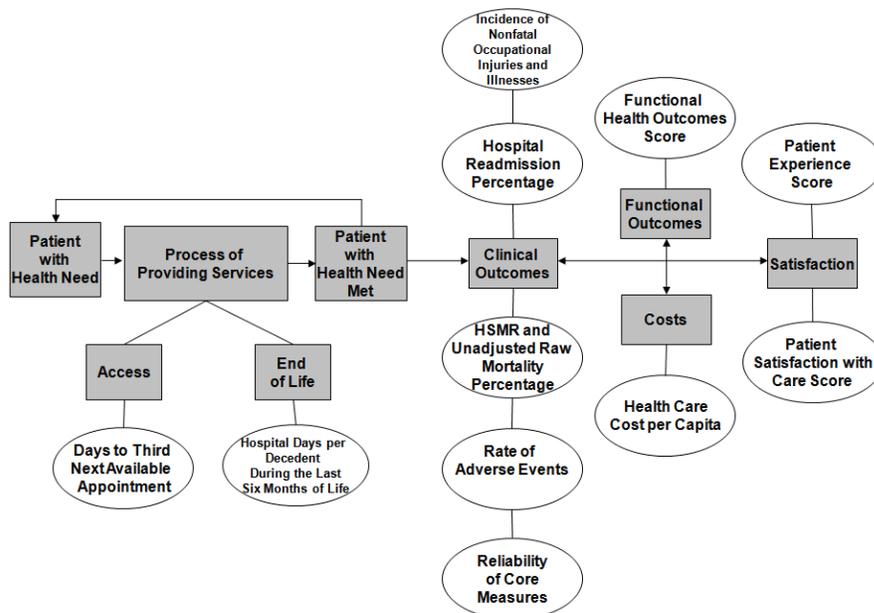
Table 1. Whole System Measures, IOM Dimensions of Quality, and Care Locations

Whole System Measure	IOM Dimension of Quality	Outpatient Care	Inpatient Care
1. Rate of Adverse Events	Safe	X	X
2. Incidence of Nonfatal Occupational Injuries and Illnesses	Safe	X	X
3. Hospital Standardized Mortality Ratio (HSMR)	Effective		X
4. Unadjusted Raw Mortality Percentage	Effective		X
5. Functional Health Outcomes Score	Effective	X	X
6. Hospital Readmission Percentage	Effective	X	X
7. Reliability of Core Measures	Effective	X	X
8. Patient Satisfaction with Care Score	Patient-Centered	X	X
9. Patient Experience Score	Patient-Centered	X	
10. Days to Third Next Available Appointment	Timely	X	
11. Hospital Days per Decedent During the Last Six Months of Life	Efficient	X	
12. Health Care Cost per Capita	Efficient	X	X
13. Equity (Stratification of Whole System Measures)	Equitable	X	X

While most of these measures are well known and have been used in many organizations for years, a few represent measures that are relatively new to health care quality improvement professionals or that are being used in a different context. These measures are labeled as *Measure Currently in WSM Testing Phase* in Appendix A, which provides a detailed description of each measure. A subset of health systems is working with IHI to further test and refine their application.

Figure 1 depicts the conceptual design for the WSMs. This diagram portrays a health system using a balanced set of quality performance measures (the Whole System Measures, depicted in the ovals) that reflect a patient's journey (depicted in the boxes), from first presenting with a health need to that need being met and an assessment of the care received from the system. By following the data as it flows through the system, senior leaders can gain a sense of how the quality components of the system work together to achieve results.¹⁰

Figure 1. View of a Health System Using the Whole System Measures



Note that equity is not pictured in the figure. This important quality dimension is measured by stratifying the Whole System Measures, when possible, into subpopulations that differentiate by gender, age, income, or racial groupings, for example.

Data Sources

Whenever possible, IHI selected measures that are easy to capture and in many cases are already being used by health care systems. Ten of the Whole System Measures are usually collected by the health care system. Three of the measures (Hospital Standardized Mortality Ratio, Hospital Days per Decedent During the Last Six Months of Life, and Health Care Cost per Capita), however, rely on national databases that use administrative information and data sets (e.g., Medicare data). The measures Health Care Cost per Capita and Hospital Days per Decedent During the Last Six Months of Life are derived from the *Dartmouth Atlas* and can be found on their website (<http://www.dartmouthatlas.org>).⁴⁴ The measure Hospital Standardized Mortality Ratio (HSMR) was developed by Sir Brian Jarman, MD, using Medicare data in the United States, National Health Service data in the United Kingdom, and national hospital registry data in Sweden. Organizations interested in obtaining their HSMR should contact IHI at info@ihi.org.

Section Two: Implementing the Whole System Measures

To maximize the intended benefits of using the WSMs—that is, to align improvement work across a health system, and to enable senior leaders to use these metrics effectively to evaluate and improve the quality of care offered by their health system—many people need to collaborate and cooperate. Most organizations have some form of balanced scorecard or measurement dashboard; the best approach is to integrate the WSMs into the existing dashboard. IHI suggests that organizations

incorporate the roles listed below into their current data support system for collecting and assembling the monthly or quarterly family of measures. It is important to note that these roles are not meant to indicate full-time equivalents needed specifically for the Whole System Measures; rather they reflect functions that are helpful in collecting and using the Whole System Measures.

- **Senior Leader Quality Metrics Champion**

This individual is a senior leader (e.g., CEO, President, COO, CMO) responsible for:

- o Using the quality metrics at the top level of the organization to set goals;
- o Monitoring progress; and
- o Deploying system-wide improvement initiatives.

- **Quality Metrics Leader**

This individual is responsible for:

- o Serving as a liaison with the quality improvement experts on ways to make the best use of the metrics for strategic improvement;
- o Learning with and from other senior leaders; and
- o Promoting the learning from the “best measured” health systems as to what processes and best practices are responsible for producing their superior results.

- **Technical Quality Metrics Key Contact**

This individual has technical expertise and a mandate from senior leaders to be responsible for:

- o Overseeing the health system’s work to collect needed data;
- o Monitoring and ensuring the data quality and accuracy; and
- o Analyzing, displaying, and interpreting results for senior leaders and for the larger workforce and other stakeholders.

- **Data Coordinator**

This individual is responsible for:

- o Submitting the health-system-reported metrics monthly or quarterly, as appropriate;
- o Overseeing the training of staff to collect the data needed to report the measures; and
- o Extracting data to show patterns and trends over time.

Using the Whole System Measures

The WSMs were designed to serve as a health system’s highest level of measures. In this way, they can be thought of as the top of a cascade (i.e., the “big dots”), from which other smaller measures (i.e., the “small dots”) flow. It is IHI’s recommendation that, rather than flooding an organization’s senior leaders and board members with countless pages of data tables, the WSMs are properly integrated into the organization’s existing family of measures in a balanced dashboard report.^{3,12}

If the system is performing well at the highest level of aggregation, then it is likely to be performing well at lower levels whose measures roll up into the high-level measures. If the best possible results are not being achieved, then it is necessary to dig deeper into the causal system to identify how and where the processes of care need to be improved.

Drilling down requires that health care organizations develop methods for measuring quality at different levels of the organization. While the Whole System Measures are meant to be used at the macrosystem level by the organization's senior leaders, it is necessary to establish different measures at the level of individual patients and clinicians—that is, the front-line microsystems and clinical units that directly provide care—and at the level of the mesosystem that takes responsibility for cross-cutting clinical service lines, namely populations of patients that share a health condition such as cancer, trauma, childbirth, or cardiovascular care. By looking at macrosystem and microsystem measures frequently—daily, weekly, or monthly—the organization can better monitor its performance, find improvement opportunities, and prevent quality levels from eroding without anyone noticing.¹³ These additional measures help to provide context for changes in the WSMs.

Section Three: Setting the “Toyota Specification” for Each Whole System Measure

Once health care organizations implement the data and monitoring systems to create their Whole System Measures dashboard, they are ready to take the next step in performance: setting goals for each measure. The aim of the Pursuing Perfection program was to “build the Toyota of health care”—that is, using Toyota's example in the auto industry, build an efficient system that produces reliable, inexpensive, high-quality health care.¹⁴ Recognizing that the health care industry did not have a mechanism for identifying a “Toyota,” IHI enhanced the Whole System Measures and, for each measure, set an ambitious goal that would represent breakthrough performance—performance that exceeds previous believed “limits”—referred to as the “Toyota Specification.” Table 2 shows the performance (“Toyota”) specifications for system-level measures, while Table 3 shows the performance specifications for specific components of the care system.

The Toyota Specifications were created from best-known performance seen by IHI, top-decile performance in national measure sets, or best practices in other industries. If there was no known performance that yet reached breakthrough results, IHI set a goal that was in line with the expectations of the other Toyota Specifications. For example, some of the best results IHI has seen to date for the WSM Rate of Adverse Events (expressed as Adverse Events per 1,000 Patient Days) are from organizations sustaining levels of 40 Adverse Events per 1,000 Patient Days. However, IHI believes that this current level can be surpassed in the near future; therefore, IHI set the Toyota Specification for this WSM at 5 Adverse Events per 1,000 Patient Days.

Table 2. Toyota Specifications: System Level

IOM Dimension of Quality	Whole System Measure	Toyota Specification
Patient-Centered	Patient Experience Score <i>[Response to the question in the How's Your Health database, "They give me exactly the help I want (and need) exactly when I want (and need) it."]</i>	72% of Patients Report, "They give me exactly the help I want (and need) exactly when I want (and need) it." ¹⁵
Effective and Equitable	Functional Health Outcomes Score	5% of Adults Self-Rate Their Health Status as Fair or Poor ¹⁶ <i>[Self-rating will not differ by income]†</i>
Efficient	Health Care Cost per Capita <i>[Surrogate measure: Medicare Reimbursement per Enrollee per Year]‡</i>	\$3,150 per Capita per Year ¹⁷ \$5,026 per Enrollee per Year ¹¹

†Due to the lack of nationally available data using the Functional Health Survey-6+ (described in Appendix A), IHI used self-reported health status data from the Centers for Disease Control and Prevention Health-Related Quality of Life Surveillance report.

‡Due to difficulty with calculating Health Care Cost per Capita, a surrogate measure of Medicare Reimbursement per Enrollee may be used for ease of collection.

Table 3. Toyota Specifications: Component Level

IOM Dimension of Quality	Whole System Measure	Toyota Specification
Safe	Rate of Adverse Events	5 Adverse Events per 1,000 Patient Days
Safe	Incidence of Nonfatal Occupational Injuries and Illnesses	0.2 Cases with Lost Work Days per 100 FTEs per Year ¹⁸
Effective	Hospital Standardized Mortality Ratio (HSMR)	HSMR = 25 Points Below the National Average
Effective	Hospital Readmission Percentage	30-Day Hospital Readmission = 4.49% ¹⁹
Effective	Reliability of Core Measures	10 ² Reliability Levels ²⁰
Patient-Centered	Patient Satisfaction with Care Score	60% of Patients Selected the Best Possible Score
Timely	Days to Third Next Available Appointment	Primary Care: Same-Day Access Specialty Care: Access Within 7 Days
Efficient	Hospital Days per Decedent During the Last Six Months of Life	7.24 Hospital Days per Decedent During the Last Six Months of Life ¹¹

The Toyota Specifications are meant to be used as an input to strategic planning, representing the level of ambition and scope of a system-level goal that demonstrate breakthrough levels of performance. Senior leaders may choose one or two Whole System Measures per year and then create a portfolio of improvement projects that enable the organization to work towards achieving or surpassing the Toyota Specification for those measures. Executing system-level improvement initiatives is not a trivial task and requires thoughtful planning and appropriate leadership. In the IHI white paper, *Execution of Strategic Improvement Initiatives to Produce System-Level Results*, IHI Senior Fellow Thomas Nolan suggests an approach to execution.²⁴

Senior leaders will need to continuously demonstrate that their Whole System Measures are not part of an isolated project; they need to work with leaders of mesosystems and microsystems to set goals at their respective levels of the organization that will influence the Whole System Measures. For example, an organization whose HSMR is more than the desired Toyota Specification for this WSM may set an aim to reduce their HSMR by 10 percent and work toward achieving the Toyota Specification level of performance. Once the organization sets the aim, senior leaders must communicate the goal across the organization and work with the leaders of different departments to achieve that goal. For example, the cross-departmental improvement initiative to reduce the HSMR by 10 percent might include the following leaders and improvement objectives:

- Chief of Surgery: Tasked with eliminating surgical site infections
- Medical Director of ICU: Tasked with reducing ventilator-associated pneumonias and central line infections
- Nursing Manager: Tasked with working across the organization to improve medication reconciliation to prevent adverse drug events
- Head of the Emergency Department: Tasked with reducing death in patients who arrive in the emergency department with acute myocardial infarction

Each of these leaders will then create interdisciplinary teams to improve care within their areas. They will create local measures to inform them of their progress; data from the local measures are used to inform the Whole System Measure for HSMR. For example, the surgical team may establish their local measures (such as percent of clean surgery patients having a postoperative wound infection), which will then roll up to affect the Whole System Measure for HSMR.

Section Four: Lessons Learned and Conclusion

Since the initial testing of the Whole System Measures in 2003, IHI has learned much about the need for clarity, continuity, parsimony, and utility when using the Whole System Measures. Since many of the measures are collected within health care organizations, we learned that the difficulty of gathering the data elements is not a planning challenge, but rather an operations issue that requires *clarity* of roles and responsibilities. Thus, while the role of Data Coordinator for the Whole System Measures is not an independent full-time job, formally assigning this role to a staff member who is part of the data team helps to establish clarity about the measures being collected and the timeline on which they are reviewed.

Using the WSMs to establish *continuity* across multiple sites of care has been very helpful in providing senior leaders with a representative view of their system. It is important, therefore, to have measures that not only reflect different sites of care (e.g., inpatient and outpatient), but also cross boundaries (e.g., readmissions). Monitoring these measures as a whole system highlights the interactions among the microsystems, mesosystems, and macrosystems that comprise the overall health care system.

Parsimony is crucial when creating Whole System Measures. Using too many measures results in too little focus. It is helpful to have different levels of the measures—“big dots” and “little dots”—rather than a multiplicity of unrelated measures. The WSMs are the biggest macrolevel “dots” and, therefore, should be the fewest in number and should be reviewed at the highest level of the organization.

Finally, by working with different types of health care organizations, IHI has learned the value of *utility*: some measures are very helpful and others need to be evaluated and replaced. Throughout the testing of the WSMs, IHI removed and added measures to increase the usefulness of the measure set. Similarly, it is also necessary for organizations using the WSMs to periodically review their strategic plan and add or replace measures from the WSMs as their strategy evolves over time.

While the WSMs were developed for use at the local level within health care organizations, they also could be used at the national level. IHI has begun to test moving the “big dots” with its national 5 Million Lives Campaign,²² using the adverse events and mortality Whole System Measures as success metrics. While this effort is still at an early stage, much is being learned from the experiences of the more than 3,600 hospitals enrolled in the Campaign. Further testing and refinement of the WSMs is necessary to put them into a national context and to create traction for their widespread use. One key challenge for national use of the WSMs is to align them with existing required measures such as the Hospital Quality Measures used by the Centers for Medicare and Medicaid Services and The Joint Commission, and the National Quality Forum Safe Practices. This alignment is needed both to reduce the measurement burden on hospitals and to gain broad-based support from key stakeholders.

Section Five: Case Study of an Organization Using the Whole System Measures

Cooley Dickinson Hospital: A Community Hospital in Northampton, Massachusetts

Providers from Cooley Dickinson Hospital report their experience with using IHI's Whole System Measures to set goals and provide focus for areas of continued improvement.

Overview

Cooley Dickinson Hospital (CDH) is a 135-bed community hospital in Northampton, Massachusetts, whose vision is the bold aspiration to become a model community hospital. Their vision was built on the knowledge that almost 90 percent of care in the US is provided in community hospitals, yet most clinical knowledge and improvement knowledge is developed at the

tertiary care level. CDH aims to take a lead in the following: 1) achieving the best possible care at the community hospital level; 2) testing external and creating internal improvement knowledge at the community hospital level; and 3) sharing their learning with others. CDH chose to use the Whole System Measures as the underpinning of their measurement system to help determine whether they are achieving the best possible care and to measure progress over time.

Why the Whole System Measures?

Massachusetts was one of the first states to test pay-for-performance. Each health plan had its own set of measures, which made it difficult for Cooley Dickinson Hospital to focus its improvement work. CDH learned of the Whole System Measures when the hospital turned to the Center for the Evaluative Clinical Sciences at Dartmouth and Eugene Nelson, one of the Center's faculty, to help sort out their data demands. The WSMs helped focus CDH's approach on real care changes and put the range of performance measures in a context in which the hospital could work. CDH is also a member of IHI's IMPACT network, which provided additional impetus and support for implementing the WSMs. IMPACT members were encouraged to use the initial set of WSMs, share their data, and learn from each other to advance the care in all member institutions. CDH was one of the first IMPACT member hospitals to share its WSMs data.

Creating a System to Collect WSMs

In order to collect and use the WSMs, CDH modified the roles discussed in Section Two of this white paper to align the roles with the hospital's available resources. The CEO serves as the Senior Leader Quality Metrics Champion; the director of quality improvement fulfills two roles as the Quality Metrics Leader and the Technical Quality Metrics Key Contact; and a data analyst is the Data Coordinator. More specifically, a data analyst gathers the data for CDH's system measures from various sources for the CDH dashboards (which are tabs in one Excel file). She has systems set up for the appropriate individuals to submit the data from each department on a set schedule, or she pulls reports from the appropriate organizational databases. The data analyst then puts the data into a spreadsheet and, based on the setup, the data populates in all the appropriate dashboards. The director of quality improvement distributes the Board of Directors Report to the board-level Quality Committee, which includes key senior leaders within the organization, and then to the entire board on a monthly basis. The director of quality improvement also distributes the reports through the committee/management structure of the organization. It is important to note that the data analyst has other responsibilities in addition to the WSM data collection and reporting.

Using WSM with Senior Leaders

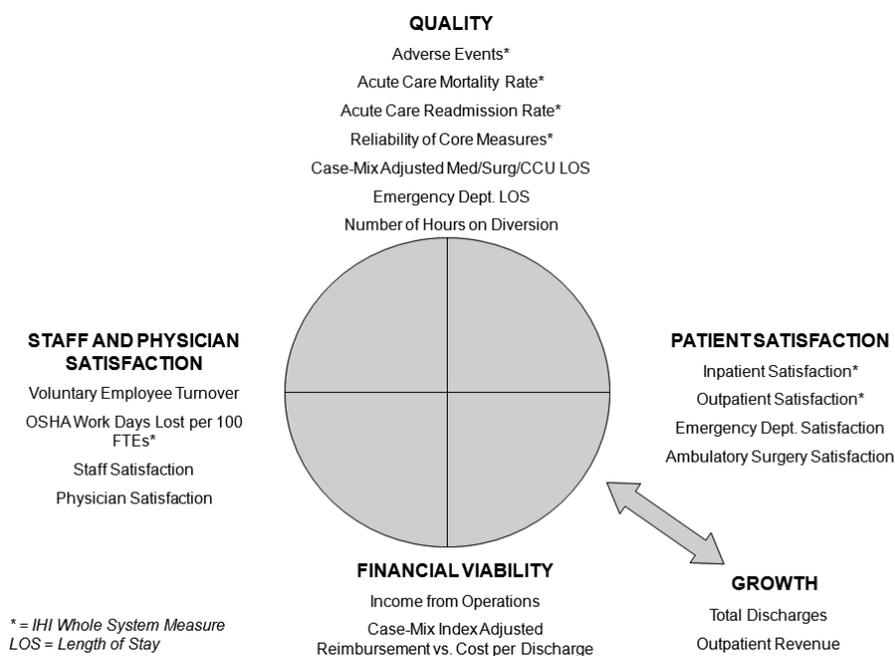
CDH has a board-level dashboard built around a quality compass. The specific board-level measures are derived from the WSMs. Not all of the WSMs were selected for initial use. The selected measures were aligned with the organization's current strategic planning, with the idea of modifying or adding measures as it became appropriate. Next, program and department-level measures were developed in the context of the hospital achieving its system-wide measures. Table 4 provides a crosswalk of the WSMs with the measures CDH has incorporated into their dashboard and those not yet implemented. CDH is using clinical microsystems—small, interdependent groups of people who work together regularly to

provide care for specific groups of patients—as the conceptual framework for improvement, with three guidelines supporting their approach: to provide 100 percent of evidence-based care 100 percent of the time for 100 percent of patients; to have zero avoidable defects in care; and to continuously improve.³³ The hospital uses the WSMs as a critical component in focusing the organization and the clinical microsystem teams that are central to their care transformation. Figure 2 depicts CDH’s quality compass (one possible way to display organizational strategy) and highlights the WSMs that have been incorporated. Figure 3 illustrates CDH’s Board Dashboard. Figure 4 shows the breakdown of one of the WSMs, Reliability of Core Measures, into four separate measures to allow for a more in-depth view of the data that comprises the overall WSM.

Table 4. Crosswalk of IHI’s Whole System Measures and Cooley Dickinson Hospital System Measures

Whole System Measure	CDH System Measure	Additional Comments / Future Collection Plans
1. Rate of Adverse Events	Yes	Baseline data collection of 6 months recently completed
2. Incidence of Nonfatal Occupational Injuries and Illnesses	Yes	
3. Hospital Standardized Mortality Ratio (HSMR)	Modified Measure	HSMR has not been available with rapid turnaround time; APR-DRG adjusted rate utilized as a proxy for now
4. Unadjusted Raw Mortality Percentage	Yes	
5. Functional Health Outcomes Score	No	Not yet
6. Hospital Readmission Percentage	Yes	
7. Reliability of Core Measures	Yes	
8. Patient Satisfaction with Care Score	Yes	
9. Patient Experience Score	No	Not yet
10. Days to Third Next Available Appointment	No	CDH has not yet included measurement in the outpatient setting
11. Hospital Days per Decedent During the Last Six Months of Life	No	Data shows opportunity in days in critical care unit—have not focused on this yet
12. Health Care Cost per Capita	No	Data not available on a frequent enough basis
13. Equity (Stratification of Whole System Measures)	No	Not yet

Figure 2. Cooley Dickinson Health Care Corporation: Health System Measures Quality Compass



As indicated in Figure 3, some measures at CDH are trending in the desired direction, such as case-mix adjusted length of stay; some are stable but not moving in the desired direction, such as acute care mortality and readmission rates; and others clearly need action, such as patient satisfaction and emergency department (ED) length of stay (LOS). By looking at these measures over time, CDH senior leaders and the board are able to make decisions regarding where to focus resources and whether to shift priorities, and they can ensure appropriate action plans are executed and their effectiveness measured. For example, based on the data CDH chartered a clinical microsystem team with the goal of decreasing the ED length of stay to two hours or less. The team initiated workgroups to focus on improving potential bottlenecks in the flow of patients through the ED: triage, fast track, the ED Hold Unit, and the process of admission to a nursing unit from the ED. Improvements will be tested and implemented while measuring the impact on length of stay.

Figure 3. Cooley Dickinson Hospital Board Dashboard

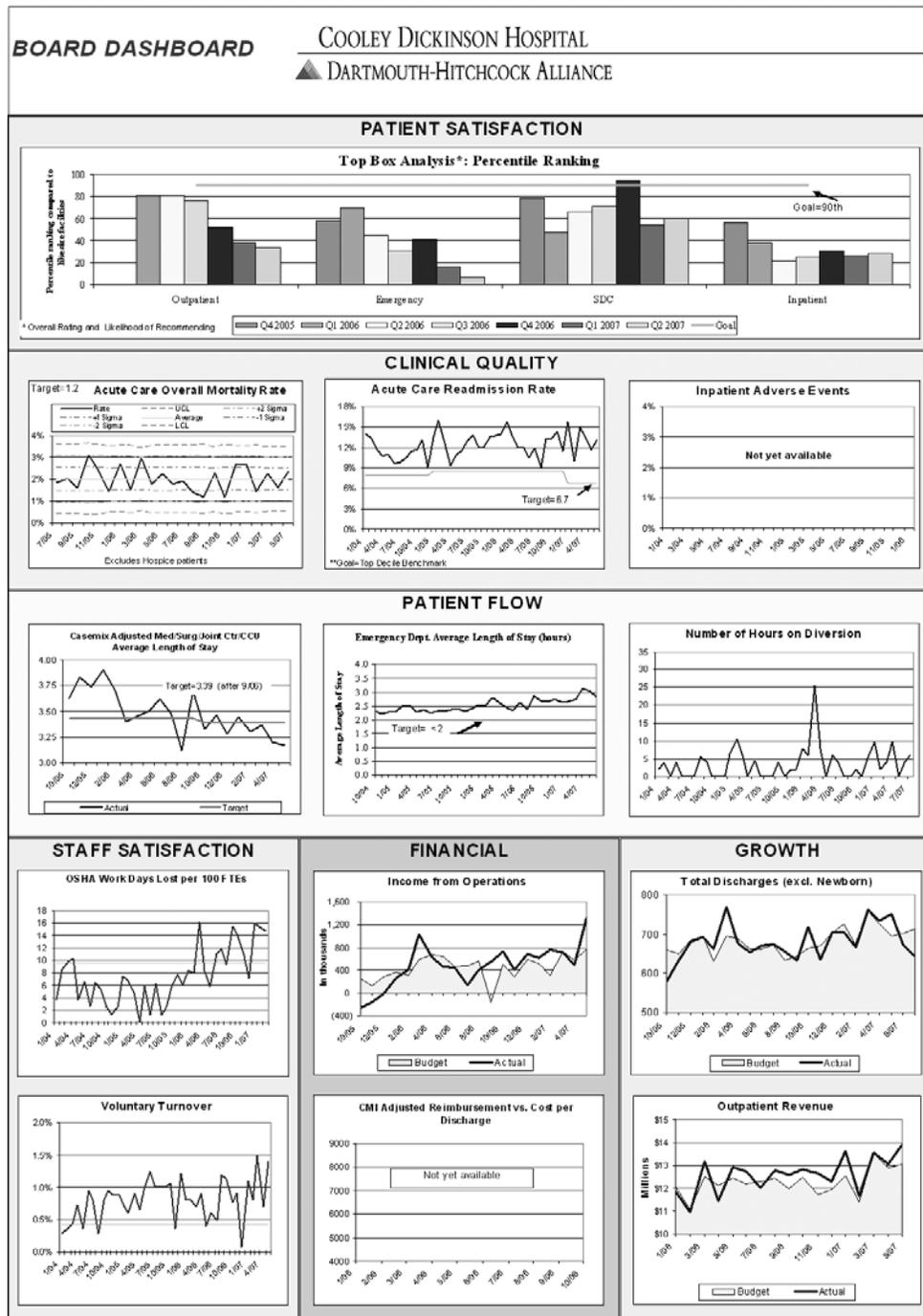
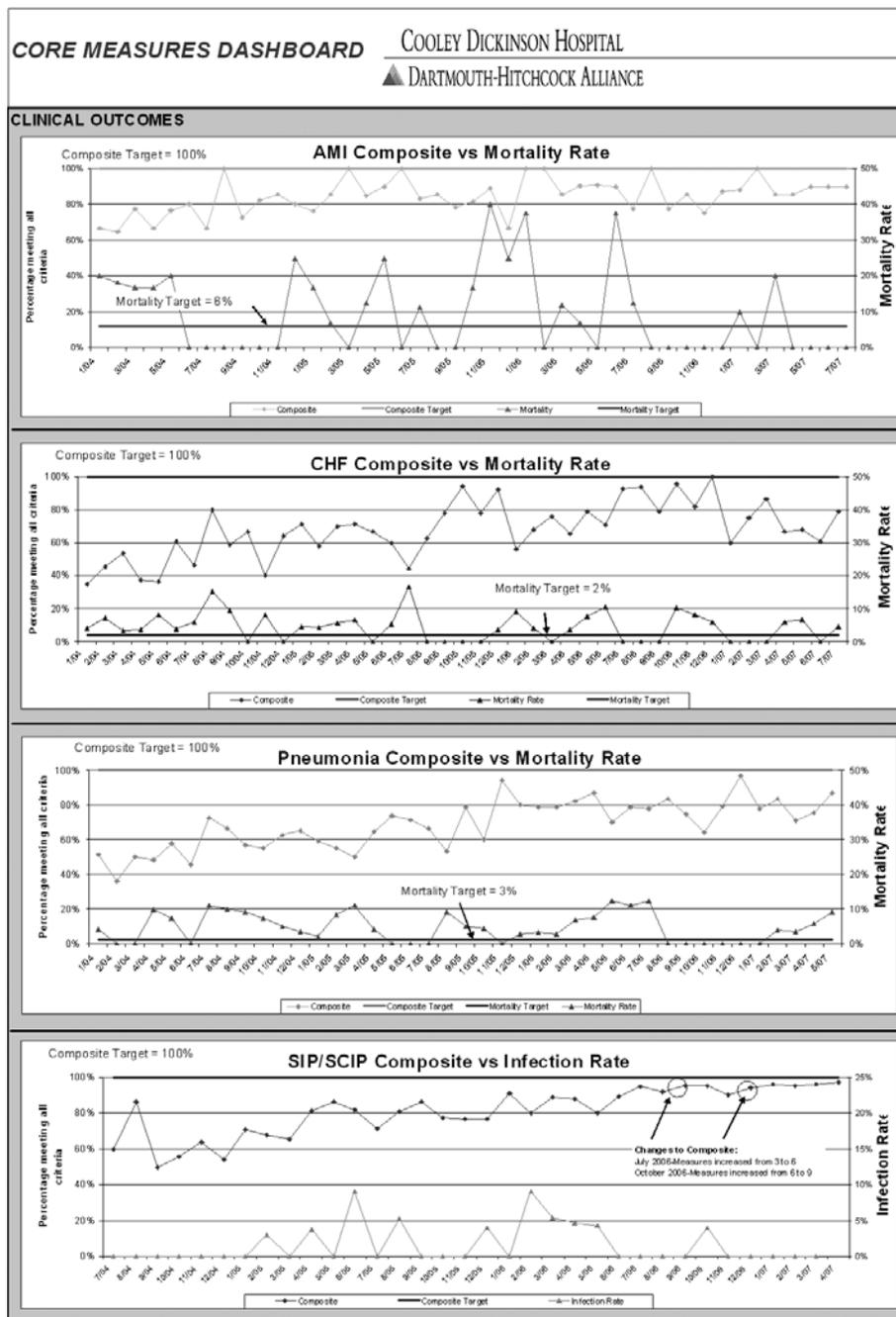


Figure 4. Cooley Dickinson Hospital Core Measures Dashboard: Detail of Measures Comprising the WSM, Reliability of Core Measures



Next Steps at CDH

CDH is one of five organizations supported by a Blue Cross Blue Shield of Massachusetts “LEAD” grant to transform care over a two-year period, with the identification and pursuit of “audacious goals” as the required focal point for being a grantee hospital. Four of the five goals that CDH chose are derived from the WSMs, and the hospital is implementing improvement processes in each area with the grant support (see Table 5).

Table 5. Cooley Dickinson Hospital Outcome Measures Selected for LEAD Program (May 2007)

IOM Dimension of Quality	CDH Proposed Goal	Baseline Data
Safe	Decrease Inpatient Adverse Events to Zero per 1,000 Patient Days	Not known but will be determined via chart review
Effective	Reduce APR-DRG Adjusted Acute Care Mortality Rate by 30% to a Ratio of 0.80† (ratio of actual to expected)	4th Quarter 2006 = Ratio of 1.1
Effective	Reduce Acute Care Readmissions Within 30 Days by 46% to 6.9%	4th Quarter 2006 = 12.8%
Patient-Centered	Achieve 90th National Percentile “Top Box” Performance for Both Overall Rating of Care and Likely to Recommend Questions	4th Quarter 2006 = 31st national percentile
Timely	Reduce ED Length of Stay by 27% to Less Than 2 Hours (includes all patients)	2.8 hours

†CDH will utilize the raw acute care mortality rate internally to monitor progress on a month-to-month basis. Current performance (4th Quarter 2006) is at 2.74% compared to established benchmark value of 10th percentile performance of 1.44% (CY 2006) as reported by ACS MIDAS+ DataVision™ Comparative Performance Measurement System, Tucson, Arizona.

Section Six Appendix A: Detailed Information on the Whole System Measures

This appendix contains detailed information on each of the Whole System Measures as follows:

- Definition
- Frequency of measurement
- Method for measuring and data collection
- Additional background on the measure (if necessary)
- Example line graph
- Toyota Specification

Example Line Graph

Each detailed measure page includes an example of how data should be tracked for the measure using a line graph to identify patterns and trends. Whenever possible, data from organizations with which IHI has worked was used to create these examples. For a few measures, primarily those denoted as *Measures Currently in WSM Testing Phase*, sample data was used in place of actual organizational data. In general, IHI recommends that organizations annotate their line graphs to indicate when major changes or events occurred, so as to better understand the data and improvements. Annotations are not included in the example line graphs in Appendix A because the goal of the paper is to explain the use of the Whole System Measures as a whole, not to outline how to improve results for each measure. See IHI's website for more general information on measurement for improvement (<http://www.ihl.org/IHI/Topics/Improvement/ImprovementMethods/Measures/>).

Toyota Specification

A Toyota Specification graphic for all appropriate Whole System Measures is also included. Whereas the line graph is the basic tool organizations should use to display data over time, the Toyota Specification graphic is a useful way to display comparison data points and goals for each measure. An organization could use the Toyota Specification to draw a goal line on their line graph to indicate the desired level of performance for each measure. The triangle in each graphic indicates the Toyota Specification for that measure.

WSMs Requiring Additional Testing

Some of the Whole System Measures require additional testing by health care organizations because there is limited experience using them at the organizational level. These measures, labeled *Measure Currently in WSM Testing Phase*, are as follows:

- Rate of Adverse Events (Outpatient)
- Functional Health Outcomes Score
- Patient Experience Score

Table 6. Overview of the IHI Whole System Measures

Whole System Measure	Definition	Measurement Frequency	Measure Currently in Testing
1. Rate of Adverse Events (AEs)	Inpatient: AEs per 1,000 Patient Days = (Total number of AEs / Total length of stay for all patient records reviewed) * 1,000	Monthly	No
	Outpatient: <i>Measure in testing phase</i>	Monthly	Yes
2. Incidence of Nonfatal Occupational Injuries and Illnesses	(Number of injuries and illnesses / Total hours worked by all FTEs in a calendar year) * 200,000	Monthly	No
3. Hospital Standardized Mortality Ratio (HSMR)	(Observed deaths / Expected deaths) * 100	Annually	No
4. Unadjusted Raw Mortality Percentage	(Number of in-hospital deaths in acute care inpatient population / Number of acute care inpatient discharges) * 100	Monthly	No
5. Functional Health Outcomes Score: Inpatient and Outpatient	Physical Health Status and Mental Health Status, as measured by % Maximum Achievable Score for each	Monthly	Yes
6. Hospital Readmission Percentage	(Number of discharged patients readmitted to the hospital within 30 days of their discharge / Number of patients discharged) * 100	Monthly	No
7. Reliability of Core Measures	(Number of actions that achieved the intended result / Total number of actions taken) * 100	Monthly	No
8. Patient Satisfaction with Care Score	(Number of patients rating the hospital "top box" on two standard overall evaluation items / Total number of patients surveyed) * 100	Monthly	No

9. Patient Experience Score	(Number of patients who respond “strongly agree” to the statement, “They give me exactly the help I want [and need] exactly when I want [and need] it.” / Number of patients surveyed) * 100	Monthly	Yes
10. Days to Third Next Available Appointment	Number of calendar days until third next available appointment	Monthly	No
11. Hospital Days per Decedent During the Last Six Months of Life	Total per patient days for all hospitalizations during the last six months of life	Annually	No
12. Health Care Cost per Capita	Sum of all health care expenditures for a group of people who live in a defined geographic area / Number of people in the defined geographic area	Annually	No
13. Equity (Stratification of Whole System Measures)	The difference in outcome for a Whole System Measure stratified by different subpopulations	Monthly	No

1. Rate of Adverse Events

Inpatient Adverse Events

Definition: This measure is defined as the rate of adverse events (AEs) that cause harm to the patient, based on a review of a representative sample of hospitalized patients’ medical records. The IHI Global Trigger Tool for Measuring AEs allows organizations to conduct a retrospective review of patient records using “triggers” (or clues) to identify possible AEs. The use of triggers to identify AEs is an effective method for measuring the rate of harm from medical care in a health care organization over time. The IHI Global Trigger Tool defines an adverse event as an injury or harm to the patient related to (or from) the delivery of care. This measure is reported as the number of Adverse Events (AEs) per 1,000 Patient Days.

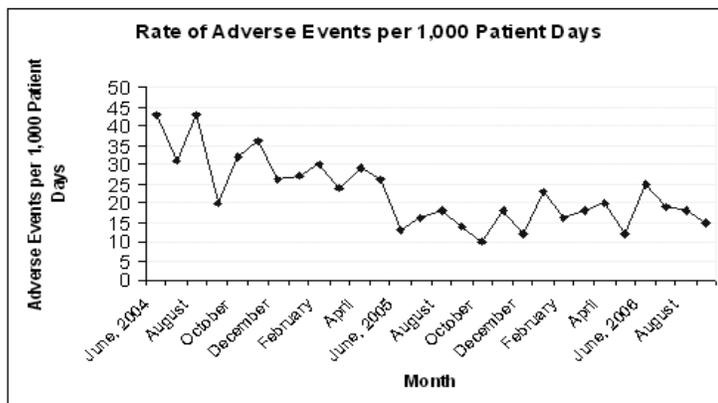
$$\text{AEs per 1,000 Patient Days} = (\text{Total number of AEs} / \text{Total length of stay for all patient records reviewed}) * 1,000$$

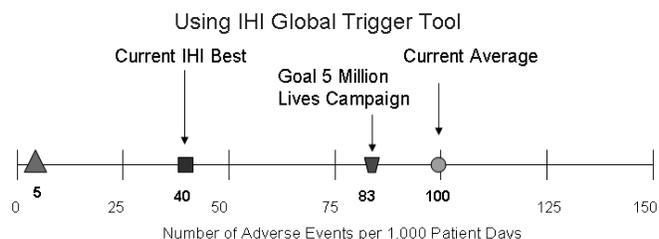
Frequency: Monthly

Method for Measuring²³

1. Review a minimum of 20 charts per month for each hospital.
2. Select patient charts randomly. Each patient should have a length of stay of at least 24 hours.
 - Randomization can be accomplished in a number of ways. The IHI Global Trigger Tool includes some suggested methods, or use a random number generator tool like the one listed on IHI’s website at <http://www.ihl.org/IHI/Topics/PatientSafety/SafetyGeneral/Resources/ResearchRandomizer.htm>.
3. Use the detailed instructions in the IHI Global Trigger Tool to review all 20 charts. The complete IHI Global Trigger Tool, including rules and methods for reviewing, is available on IHI’s website at <http://www.ihl.org/IHI/Topics/PatientSafety/SafetyGeneral/Tools/GlobalTriggerToolforMeasuringAEs.htm>.
4. Plot the final data as Adverse Events per 1,000 Patient Days monthly on a line graph and annotate as appropriate.

Example Line Graph: Adverse Events per 1,000 Patient Days in a US Multi-Hospital System



Toyota Specification**Outpatient Adverse Events**

[Measure Currently in WSM Testing Phase]

The IHI Outpatient Adverse Event Trigger Tool is currently in testing, and a prototype version of the tool is available on IHI's website (<http://www.ihl.org/IHI/Topics/PatientSafety/SafetyGeneral/Tools/OutpatientAdverseEventTriggerTool.htm>). This tool for measuring AEs in outpatient settings allows organizations to conduct a retrospective review of patient records using triggers to identify possible AEs. The IHI Outpatient Adverse Event Trigger Tool has identified 11 triggers that provide “clues” to studying patient charts for adverse events. Additional “floating triggers” may be added for your health care system. All triggers that are positive should be investigated for possible harm to the patient. An “event” is defined as something that causes harm to the patient. The harm can occur without an obvious error. Taking error out of the formulation allows for the removal of some judgment and reduces inter-rater variation. In order to test the IHI Outpatient Adverse Event Trigger Tool, you will need to have an integrated record (i.e., a system that has access to all medical records for all episodes of care, enabling access to all the triggers noted in the trigger list). If you do not have an integrated data system, this tool will not work. IHI will provide further information on its website once this tool has been further tested and refined.

2. Incidence of Nonfatal Occupational Injuries and Illnesses

Definition: This measure of safety is defined as the number of work days lost by an employee as a result of injuries and illnesses, reported monthly on standard Occupational Safety and Health Administration (OSHA) reporting forms.

$$\text{Incidence of Nonfatal Occupation Injuries and Illnesses} = \left(\frac{\text{Number of injuries and illnesses}}{\text{Total hours worked by all FTEs in a calendar year}} \right) * 200,000$$

[Note: 200,000 is the base for 100 full-time equivalent (FTE) workers (working 40 hours per week, 50 weeks per year).]

Numerator: Number of occupational injuries or illnesses that resulted in a lost work day

- This number can be pulled directly from Column K of OSHA's Form 300: Log of Work-Related Injuries and Illnesses.

Denominator: Total hours worked by all full-time equivalents (FTEs) in a calendar year

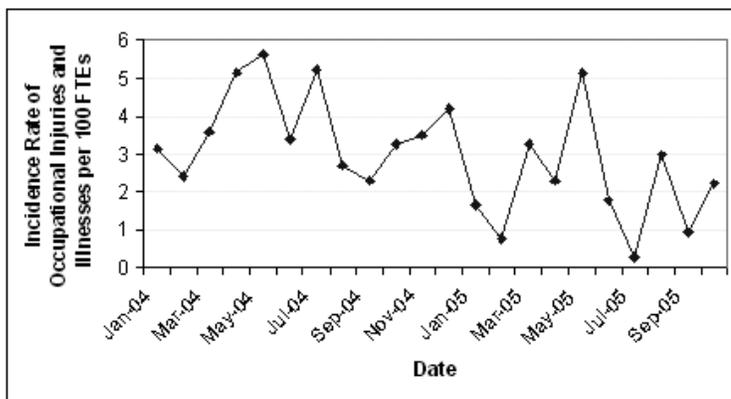
- FTEs include all full-time employees and all part-time employees.
- Equivalents should be derived from days worked, not days paid.
- Equivalents should be based on actual workers, not budgeted positions.

Frequency: Monthly

Method for Measuring: Data collection should follow OSHA reporting requirements.²⁴

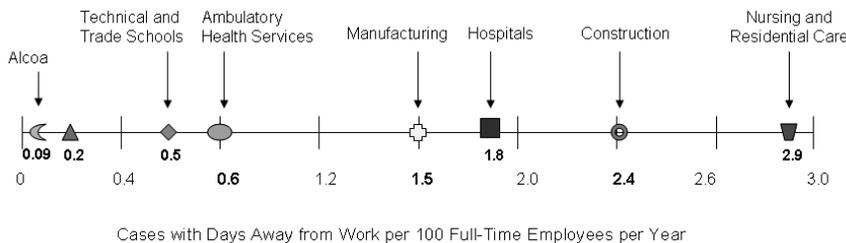
Background on the Measure: An injury or illness is considered work-related if an event or exposure in the work environment caused or contributed to the condition or significantly aggravated a pre-existing condition. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies. By reducing the number of work-related injuries and illnesses, a safer health care environment evolves that is inherently able to provide better care to patients. Work days lost due to illness and injury is a good proxy measure for a culture of safety, which is known to be extremely important but difficult to measure without special surveys and observations.

Example Line Graph: Incidence of Nonfatal Occupational Injuries and Illnesses in a US Hospital



Toyota Specification

Incidence of Nonfatal Occupational Injuries and Illnesses in Multiple Industries^{18,25}



3. Hospital Standardized Mortality Ratio (HSMR)

Definition: This measure of effectiveness is a ratio of observed deaths to expected deaths in a hospital. By definition, 100 (in the year 2000 in the United States) is the point where the expected number of deaths is equal to the number of deaths actually observed.

$$\text{Hospital Standardized Mortality Ratio} = (\text{Observed deaths} / \text{Expected deaths}) * 100$$

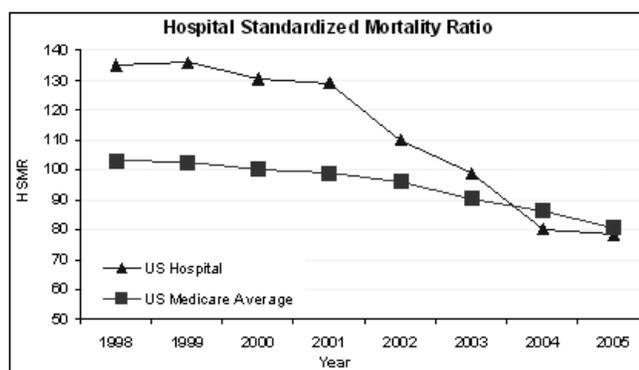
Frequency: Annually

[Note: Due to the use of national data, there is frequently a 1.5-year lag time in available data.]

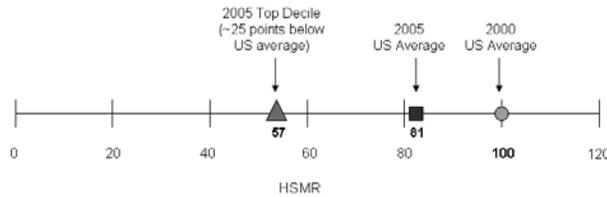
Method for Measuring: The method for measuring the HSMR was developed by Sir Brian Jarman, MD, Emeritus Professor and head of the Dr Foster Unit at Imperial College in London, and has been used in the UK, the US, and other European countries.*The HSMR is observed deaths divided by expected deaths among patients with diagnoses accounting for 80 percent of inpatient mortality after being adjusted for selected patient-mix and community variables. The HSMR values for each hospital can be provided annually by Jarman and his colleagues, based on analysis of National Health Service data for the UK hospitals, Medicare (patients aged 65 and older) data for US hospitals, and national hospital discharge data for other countries. Organizations interested in obtaining their HSMR can contact IHI at info@ihi.org.

Background on the Measure: The HSMR represents the observed versus expected rate of deaths occurring among hospitalized patients, adjusted for patient-mix and community variables. Six factors are used to estimate the probability of death for individual hospitalized patients: age, sex, principal discharge diagnosis, admission source, admission status, and length of stay. The model uses a second phase of calculation to adjust for approximately 10 factors that pertain to the hospital and its location. The calculation uses the year 2000 as the baseline for the adjustment. In 2000 the US average HSMR was 100; with each subsequent year the US average has decreased. It is important to know that data used for making these adjustments in the US are obtained primarily from the Centers for Medicare and Medicaid Services, the US Census Bureau, the *Dartmouth Atlas*, and the American Hospital Association.

Example Line Graph: HSMR in a US 750-Bed Regional Hospital



Toyota Specification



[Note: The US average HSMR in the year 2000 was 100, and with each subsequent year the US average has decreased. The Toyota Specification for the HSMR should be 25 points or more below the US average for the year being measured.]

4. Unadjusted Raw Mortality Percentage

Definition: This is a measure of acute care inpatient mortality and provides an organization with an opportunity to measure effectiveness on a more frequent and timely basis than the HSMR.

$$\text{Unadjusted Raw Mortality Percentage} = (\text{Number of in-hospital deaths in acute care inpatient population} / \text{Number of acute care inpatient discharges}) * 100$$

Numerator: All acute care deaths, including newborns
Denominator: Number of acute care inpatient discharges

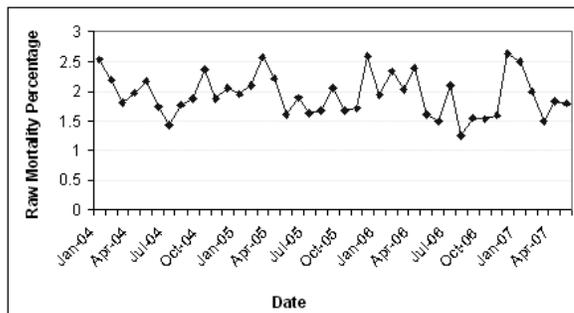
Denominator Exclusions: This measure is focused on acute care inpatient deaths and therefore, by definition, the following patients are excluded from the calculation:

- ED-only patients who are not admitted as inpatients
- Observation patients who are not admitted as inpatients
- Short-stay patients who are not admitted as inpatients
- Stillbirths

Frequency: Monthly

Method for Measuring: The method for measuring Unadjusted Raw Mortality is the same method that has been adopted for IHI’s 100,000 Lives Campaign and 5 Million Lives Campaign.²⁶ The population in this measure reflects acute care inpatients. The exclusion populations listed above are not considered by most US hospitals to be acute care inpatients.

Example Line Graph: Unadjusted Raw Mortality Percentage in a 500-Bed US Hospital



Toyota Specification

There is no specification for this measure since Unadjusted Raw Mortality is an organization-specific measure that does not adjust for patient and community variables.

5. Functional Health Outcomes Score: Inpatient and Outpatient

[Measure Currently in WSM Testing Phase]

Definition: This measure is defined as the physical health status score and mental health status score of a system's patient population. Functional health is measured using the Functional Health Survey, which can be found on IHI's website at <http://www.ihl.org/IHI/Topics/LeadingSystemImprovement/Leadership/EmergingContent/FHS6PatientQuestionnaires.htm>.

Functional Health Outcomes Score = Physical Health Status [as measured by % Maximum Achievable Score (MAS)] and Mental Health Status [as measured by % Maximum Achievable Score (MAS)]

Frequency: Monthly

Method for Measuring—Inpatient: The Functional Health Outcomes Score can be used to assess the functional outcome of a system's patient population at a given point in time, or patients can be followed to measure changes in their functional status over time. By selecting a unique sample of patients at multiple points throughout the year, a system can monitor the overall changes in functional status of the patient population it serves. This helps track outcomes of patient populations over time. To measure the functional outcomes at a particular point in time, add the questions in the Functional Health Survey to the system's post-discharge patient satisfaction survey.

[Note: The Functional Health Survey does not follow the same sample of patients over time; rather, it assesses the overall patient population of a system by using distinct monthly samples of post-discharge patients and thereby provides a "point-in-time" measure of functional status.]

Method for Measuring—Outpatient: The Functional Health Outcomes Score can be used to assess the functional status of a system's patient population at a given point in time, or patients can be followed to measure changes in their functional status over time. The Whole System Measure definition and data collection method described here address the first use (i.e., the point-in-time assessment of the functional health status of ambulatory care patients who are making a visit to see a clinician).

To measure the functional status of ambulatory care patients who are being served by a system, a sample of patients making a visit to an ambulatory care practice can be surveyed at the time they make a visit to their health care provider.

A unique sample should be drawn monthly by following the procedures listed below.

Proposed Sampling and Data Analysis Plan

1. Identify a Data Coordinator for the Functional Health Survey to work with the ambulatory care practices to conduct a brief health status survey on a sample of patients monthly.
2. The Data Coordinator should identify the ambulatory care sites that serve patients in the health system.
 - Include primary care and specialty care clinical programs and practice settings. Exclude special sites such as diagnostic testing and same-day surgery.
3. Select a sample of patients making a visit to these selected ambulatory care sites by having the

person who registers the patients ask a consecutive series of patients (or a systematic sample of patients, such as asking every fourth patient) to take part in a short health status survey.

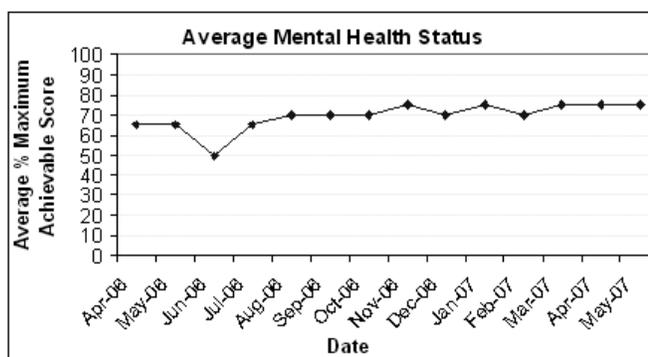
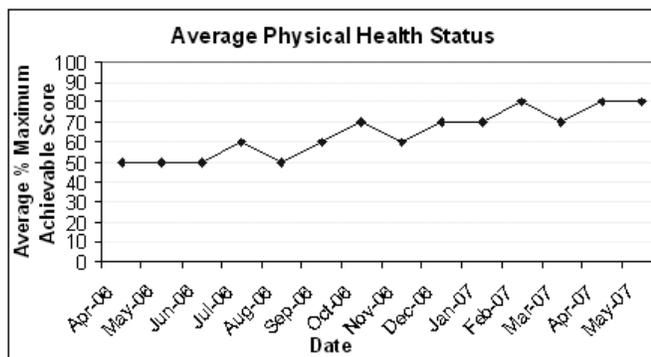
- Gather enough surveys in each site to provide a sample of 50 patients per month across all of the ambulatory care delivery sites.
4. Administer the Functional Health Survey to these patients when they visit the practice, as described below.
 - Pre-Visit: The patients should be encouraged to complete the survey, if possible, before they see their provider.
 - Post-Visit: If the time spent waiting to see the provider is not long enough to allow the patient to complete the survey before seeing the provider, the patient could spend a few minutes after the visit to complete the survey.
 - Survey Collection: The staff person who registers the patient should collect the completed surveys and give them to the Data Coordinator.
 5. The Data Coordinator analyzes the surveys and reports the data.
 - The Data Coordinator calculates the percent Maximum Achievable Score (% MAS) for both the physical health and mental health for each patient.
 - The Data Coordinator calculates a summary score (average physical health score and average mental health score) for the patients sampled to provide a point-in-time estimate for the Functional Health Outcomes Score for the ambulatory care population.

[Note: This method does not follow a cohort of patients over time to track their outcomes; rather, it assesses the overall health status of ambulatory care patients by using distinct samples of patients who are making an outpatient visit. An alternative approach is to follow one sample of patients and their progress over time.]

Background on the Measure: This measure of health status is a six-item Functional Health Survey (FHS-6+). It can be used to measure physical functioning and mental health and produces two indices: a physical functioning index and a mental health index. Both indices can be scored on a scale ranging from 0 percent to 100 percent of the Maximum Achievable Score (% MAS). IHI recommends adding a few additional patient descriptor, health, and demographic items to the survey. The additional items can be used as needed to provide patient-mix adjusted values, and to provide a standard set of items and a standard reference population for assessing patient function.

The FHS-6+ is based on the longer 36-Item Short Form Survey (known more simply as the SF-36). The SF-36 is the best validated and most widely used measure of general health status; it has been used for more than a decade in outcomes research throughout the world. The SF-36 was originally developed by researchers working at RAND and other locations. (For more information on the SF-36, visit http://www.rand.org/health/surveys_tools/mos/mos_core_36item.html.)

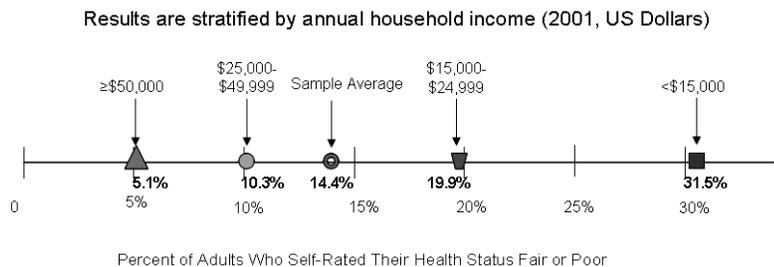
Example Line Graph: Functional Health Outcomes Score



Toyota Specification

Due to the lack of nationally available data using the FHS-6+, IHI used the self-reported health status data from the Centers for Disease Control and Prevention report, *Health-Related Quality of Life Surveillance—United States, 1993-2002*, to create the Toyota Specification for this measure.¹⁶

Would you say that in general your health is excellent, very good, fair or poor?



6. Hospital Readmission Percentage

Definition: Readmission to the hospital is a measure of both the care received in the hospital and the coordination of care back to the outpatient setting and within the outpatient setting. The Hospital Readmission Percentage is defined as the percentage of patients discharged from the hospital who are readmitted to the hospital within 30 days.

$$\text{Hospital Readmission Percentage} = (\text{Number of discharged patients readmitted to the hospital within 30 days of their discharge} / \text{Number of patients discharged}) * 100$$

Exclusions:

- Planned readmissions
- False labor patients

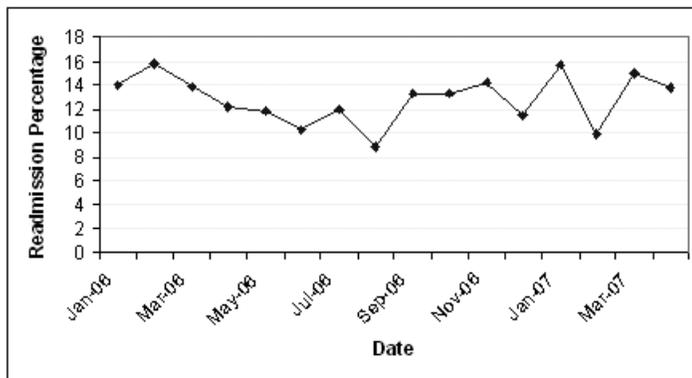
Frequency: Monthly

[Note: There is a one-month delay in obtaining the required data due to the need to wait for 30 days post-discharge.]

Method for Measuring: Each month, use your organization’s financial and/or admission information systems to identify patients who were discharged that month and also had a second admission within 30 days of the initial discharge date.

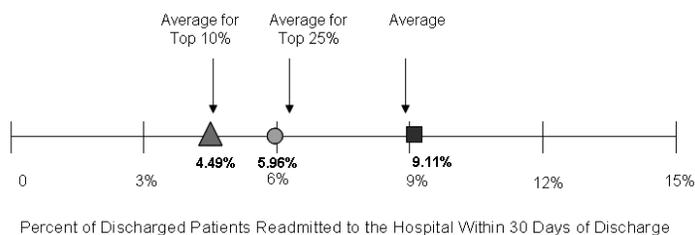
Background on the Measure: This is an important measure to indicate if changes to improve patient flow through the system are negatively affecting care. While some readmissions are part of the planned care and are desirable, others may be indications of a quality issue related to a shortened length of stay and premature discharge, inadequate care, or lack of patient adherence to the care regimen following discharge from the hospital.

Example Line Graph: Hospital Readmission Percentage (Within 30 Days of Initial Discharge) in a Multispecialty Health System



Toyota Specification¹⁹

Data for this Toyota Specification is derived from the 2006 Premier Perspective™ Database. Readmission is defined as patients readmitted within 30 days to the same hospital/health system (link by Medical Record Number). The following patients are excluded from the readmission rate calculation: skilled nursing facility patients; false labor patients (patients with principal or secondary ICD Codes 644.10, 644.13); and same-day readmissions (patients who are discharged and readmitted the same day).

**7. Reliability of Core Measures**

Definition: Reliability is defined as failure-free operation over time and is measured as the inverse of the system's failure rate. Reliability is expressed as a failure rate to demonstrate the order of magnitude. Reliability of 10^{-1} means one failure per 10 attempts, and 10^{-2} means five or less failures per 100 attempts.²⁰

$$\text{Reliability} = (\text{Number of actions that achieved the intended result} / \text{Total number of actions taken}) * 100$$

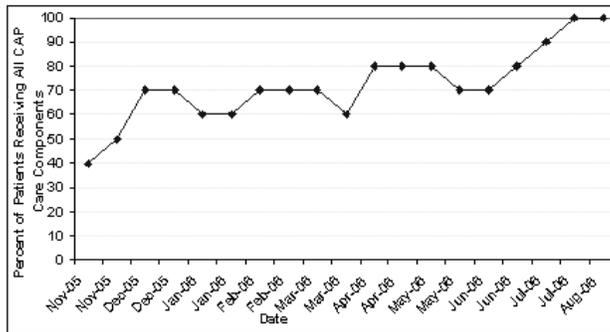
Frequency: Monthly

Method for Measuring: Define the processes in your organization for which you will measure reliability. There are many national measure sets that highlight clinical guidelines that should be followed. At a minimum, your organization should monitor and track reliability for the Hospital Quality Measures (also called Core Measures) used by the Centers for Medicare and Medicaid Services (CMS) and The Joint Commission (TJC).²⁷

Each month, use your organization's quality improvement data and additional data collection system to identify patients who were eligible for the indicated interventions or treatment. For each Core Measure, note the number of patients who received all indicated components of care and the number of patients who were eligible to receive care. See the IHI Innovation Series white paper, *Improving the Reliability of Health Care*, for additional information.²⁰

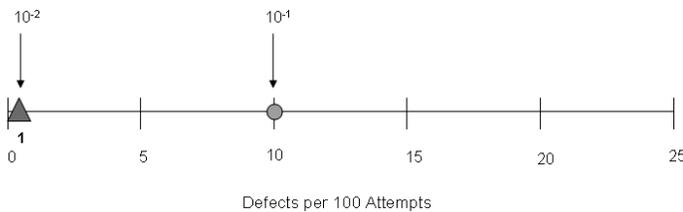
Background on the Measure: The principles of designing reliable systems are routinely used in many industries, such as manufacturing and air travel, to improve safety and compensate for the limits of human ability. Studies suggest that most US health care organizations perform below many other industries and consistently only achieve a 10^{-1} level of reliability. Systems can be put in place to increase the reliability of key processes and enhance both patient and staff safety.²⁰

Example Line Graph: Reliability of Care for Community-Acquired Pneumonia (CAP) in a US Faith-Based Hospital



Toyota Specification

The specification for this measure is to achieve a level of 10^{-2} reliability in each of the Core Measures used by CMS and TJC.



8. Patient Satisfaction with Care Score

Inpatient Care

Definition: Inpatient satisfaction is defined as the percentage of recently discharged medical patients who give the hospital the highest possible quality rating (i.e., the “top box” rating that indicates the highest level of assessment) on two standard overall evaluation items of hospital quality as perceived by the patient.

$$\text{Inpatient Satisfaction with Care Score} = (\text{Number of patients rating the hospital “top box” on two standard overall evaluation items} / \text{Total number of patients surveyed}) * 100$$

Two Standard Overall Evaluation Items:

- Using any number from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible, what number would you use to rate this hospital during your stay?
- Would you recommend this hospital to your friends and family?

Exclusion Criteria:

To provide a relatively homogeneous sample of patients in each hospital and across hospitals, exclude the following types of patients:

- Newborns
- Persons under 1 year of age or over 84 years of age
- Persons with psychiatric illness, terminal illness, and cognitive impairments such as dementia

Frequency: Monthly

Method for Measuring: To obtain a sample selection of medical patients, use a low-bias sampling method (i.e., a random sample, a systematic sample, or a consecutive series) to select 60 patients who fit the criteria and were discharged from the hospital during the month under study. This process can be aligned with your current patient satisfaction survey administration to prevent additional data collection.

Outpatient Care

Definition: Outpatient satisfaction is defined as the percentage of recent medical patients (non-surgical and non-maternity) with an office visit to a physician (or associate provider) who give the visit the highest possible quality rating (i.e., the “top box” rating that indicates the highest level of assessment) on two standard overall evaluation items that assess the quality of the visit as perceived by the patient.

Outpatient Satisfaction with Care Score = (Number of patients rating the clinic “top box” on two standard overall evaluation items / Total number of patients surveyed) * 100

Two Standard Overall Evaluation Items:

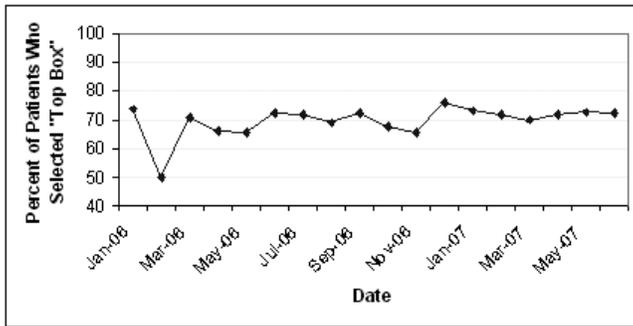
- Using any number from 0 to 10, where 0 is the worst doctor [or provider] possible and 10 is the best doctor [or provider] possible, what number would you use to rate this doctor [or provider] during your stay?
- Would you recommend this doctor [or provider] to your friends and family?

Frequency: Monthly

Method for Measuring: To obtain a sample selection of medical patients, use a low-bias sampling method (i.e., a random sample, a systematic sample, or a consecutive series) to select 60 patients who made an outpatient visit to the clinic or practice during the month under study.

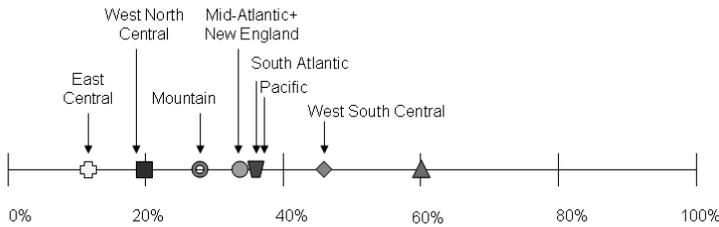
Background on the Measure: There are many patient satisfaction surveys in use in the United States. IHI extracted the two standard overall evaluation items (listed above) from the Consumer Assessment of Healthcare Providers Hospital Survey (H-CAHPS) and the Consumer Assessment of Healthcare Providers Ambulatory Survey (A-CAHPS) because they are similar to questions represented in other patient satisfaction surveys. (For more information on CAHPS, see <http://www.cahps.ahrq.gov/>.)

Example Line Graph: Inpatient Satisfaction with Care Score in a US Health Care System



Toyota Specification²⁸

“Using any number from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible, what number would you use to rate this hospital?”



9. Patient Experience Score

[Measure Currently in WSM Testing Phase]

Definition: This measure is defined as the percent of patients surveyed who respond “strongly agree” to the following statement in the How’s Your Health survey tool: “They give me exactly the help I want (and need) exactly when I want (and need) it.”²⁹

$$\text{Patient Experience Score} = \left(\frac{\text{Number of patients who respond “strongly agree” to the statement, “They give me exactly the help I want [and need] exactly when I want [and need] it.”}}{\text{Number of patients surveyed}} \right) * 100$$

Frequency: Monthly

Method for Measuring: This measure can either be collected separately from or in addition to the patient satisfaction survey that is used routinely. Use a low-bias sampling method (i.e., a random sample, a systematic sample, or a consecutive series) to select 60 patients who made an outpatient visit to the clinic or practice during the month under study.

10. Days to Third Next Available Appointment

Primary Care

Definition: This is a measure of patient access to an outpatient medical primary care visit and is defined as the number of days (including weekends) to the third next available appointment for a routine office visit with a primary care practitioner.

Days to Third Next Available Appointment = Number of calendar days until third next available appointment for a primary care office visit

Frequency: Monthly

Method for Measuring

1. Define the outpatient system of care as the ambulatory care clinical units that the health system is responsible for operating. Ambulatory clinical units include places that provide primary care services such as outpatient centers, ambulatory care practices, free-standing clinics, and outpatient departments.
2. Select all primary care practitioners that provide care in these clinical units. Primary care practitioners include physicians specializing in family practice, general practice, general pediatrics, and general internal medicine. Mid-level providers who see patients independently and have visits scheduled directly with them are included as primary care practitioners.
3. Select one day each week to serve as your reference day.
4. Using either manual or electronic methods, count the number of calendar days (including weekends) from that day to the day when the third next available appointment slot is available for a routine office visit.
5. Calculate the value for the month (based on the weekly averages of days) for each ambulatory clinical unit.

Specialty Care

Definition: This is a measure of patient access to an outpatient medical specialist visit and is defined as the number of days (including weekends) to the third next available appointment for a non-urgent office visit with a specialty care practitioner.

Days to Third Next Available Appointment = Number of calendar days until third next available appointment for a specialty care non-urgent visit

Exclusions:

- Anesthesiology and pathology

Frequency: Monthly

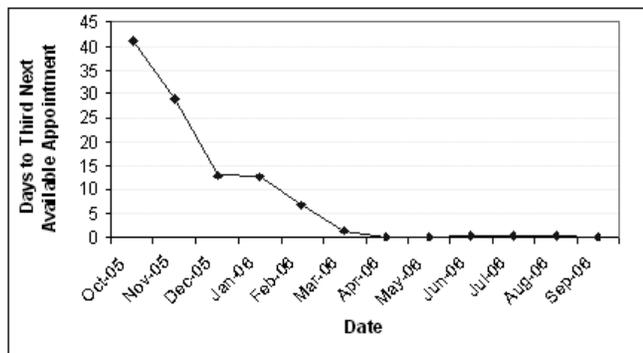
Method for Measuring

1. Define the outpatient system of care as the ambulatory care clinical units that the health system is responsible for operating. Ambulatory clinical units include places that provide outpatient services such as outpatient centers, ambulatory care practices, free-standing clinics, and outpatient departments.

2. Select all specialty care practitioners that provide care in these clinical units. (Specialty care practitioners exclude physicians specializing in anesthesiology and pathology.) Mid-level providers who see patients independently and have visits scheduled directly with them are included as specialty care practitioners.
3. Select one day each week to serve as your reference day.
4. Using either manual or electronic methods, count the number of calendar days (including weekends) from that day to the day when the third next available appointment slot is available for a non-urgent office visit. If there is an imbalance in the availability of providers (such as when a new provider joins the practice), a weighted average can be used by calculating the third next available appointment for each provider and then creating a weighted averaged according to provider availability.
5. Calculate the value for the month (based on the weekly averages of days) for each ambulatory clinical unit.

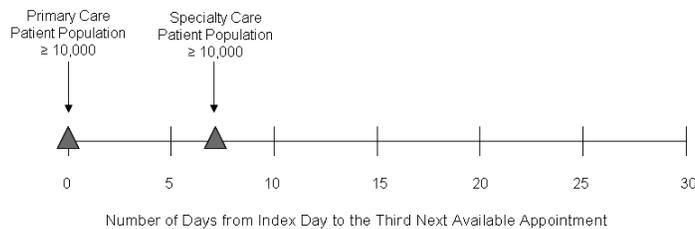
Background on the Measure: The “third next available” convention has been popularized in the US, based on IHI’s work with Mark Murray, MD, and Catherine Tantau.³⁰ It is preferable to use this measure because it has less variability than “next available.”

Example Line Graph: Days to Third Next Available Appointment in a Rural Primary Care Setting



Toyota Specification

The goal of the specification is to have same-day access for primary care and access within seven days for specialty care.



11. Hospital Days per Decedent During the Last Six Months of Life³¹

Definition: The number of days spent in a hospital during the last six months of a patient’s life. This measure is specific to the hospital and can also be evaluated for hospital referral regions, states, and the nation overall.

Hospital Days per Decedent During the Last Six Months of Life = Total per patient days for all hospitalizations during the last six months of life

[Note: Total days are the result of both the number of admissions and the average length of stay per admission.]

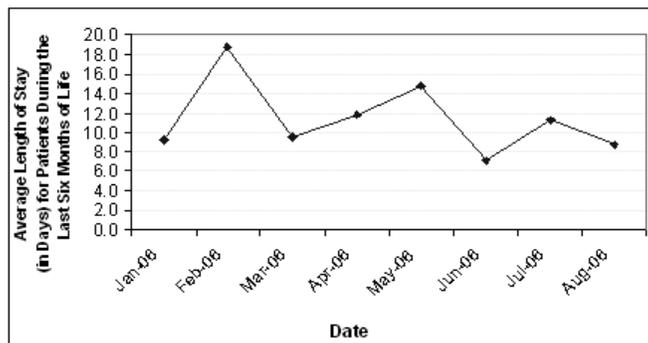
Frequency: Annually

[Note: Data is currently available on the Dartmouth Atlas website through the end of 2003.]

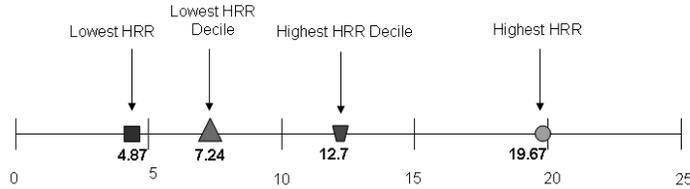
Method for Measuring: All of these methods are unique to the country of interest. In the US, calculation of this measure requires massive amounts of patient-level data and can only be done by a third party such as the *Dartmouth Atlas* (data through the end of 2003 can be found at <http://www.dartmouthatlas.org>). Some organizations (as depicted in the example line graph below) are collecting frequent local data to measure their improvement. While these data points are not identical to those collected through the *Dartmouth Atlas* methodology, they provide an organization with the basis for more frequent measurement to inform improvement efforts.

Background on the Measure: “Medicare claims monitor provider-specific performance for patients with chronic illness. Hospital-specific measures of utilization and resource inputs are possible because most Medicare patients with serious chronic illnesses tend to use the same hospital and associated medical staff throughout the course of their illnesses. To create the study population, we [the *Dartmouth Atlas* team] examined the pattern of use of hospitals in the two years prior to death and assigned patients to the hospitals they most often used. Medicare spending, resource inputs and utilization were calculated for fixed intervals prior to death for patients with chronic illnesses. Rates were adjusted for age, sex, race, and type of chronic illness.”³¹

Example Line Graph: Hospital Days per Decedent During the Last Six Months of Life in a Multi-Hospital US Health System



Toyota Specification¹¹



Number of Days Spent in the Hospital During the Last Six Months of Life per Decedent (2000–2003)

HRR = Hospital Referral Region in the United States. An HRR is a regional market for tertiary medical care. Each HRR contains at least one hospital that performs major cardiovascular procedures and neurosurgery. There are 306 HRRs in the US.

12. Health Care Cost per Capita

Definition: This measure represents the total of health care expenditures for a group of people who live in a defined geographic area.

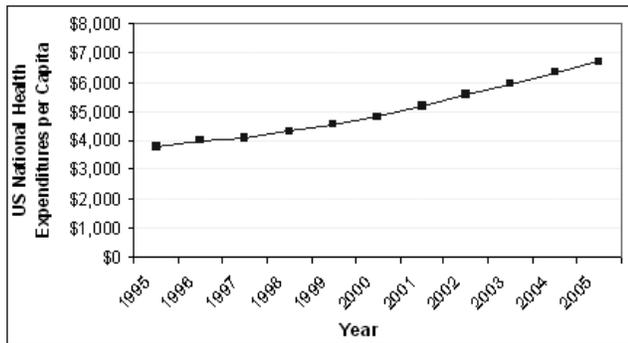
$$\text{Health Care Cost per Capita} = \frac{\text{Sum of all health care expenditures for a group of people who live in a defined geographic area}}{\text{Number of people in the defined geographic area}}$$

Frequency: Annually (or more frequently if possible)

Method for Measuring: All of these methods are unique to the country of interest. In the US, calculation of this measure requires massive amounts of patient-level data and can only be done by a third party such as the *Dartmouth Atlas* (<http://www.dartmouthatlas.org>). A proxy measure for individual hospitals in the US is Medicare Reimbursements per Enrollee.

Background on the Measure: The *Dartmouth Atlas* has developed a method for estimating cost per capita in the United States that is based on Medicare data. Dr. John Wennberg’s cost-per-capita measure reflects the sum of health care expenses for major categories of care such as inpatient services, outpatient visits, diagnostic tests, and skilled nursing care. These data are published annually in the *Dartmouth Atlas*.

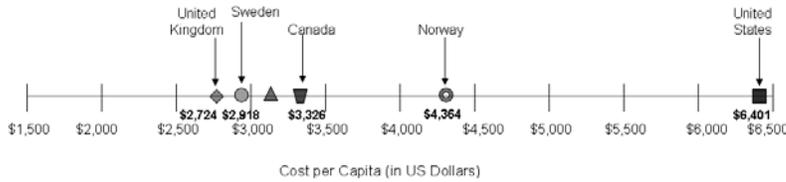
Example Line Graph: Health Care Cost per Capita in the US (in Total US Dollars), 1995–2005



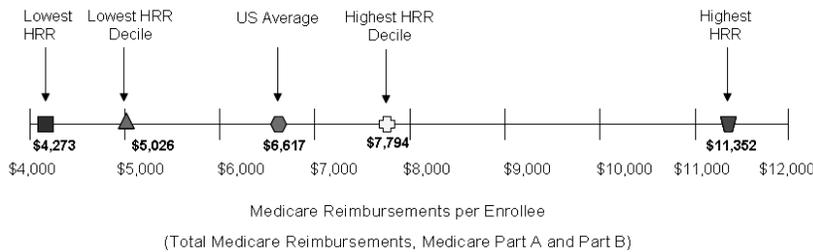
[Note: This data is not based on the Dartmouth Atlas results, but rather shows the increasing trend in US hospitals over time.³²]

Toyota Specification

Health Care Cost per Capita (in US Dollars) for Selected Countries (2005)¹⁷



Medicare Reimbursements per Enrollee by Hospital Referral Region (HRR)¹⁸



13. Equity (Stratification of Whole System Measures)

Definition: It is difficult to create a primary measure for equity. Equity is measured by stratifying the Whole System Measures, when possible, into subpopulations that differentiate by gender, age, income, or racial groupings, for example.

Equity = The difference in outcome for a Whole System Measure stratified by different subpopulations

Frequency: Monthly

[Note: If the sample is small and cannot be separated into subpopulations due to lack of adequate representation, monthly data should be aggregated and reviewed quarterly.]

Method for Measuring: When possible, each Whole System Measure should be stratified by subpopulation. The goal is to drive the difference in outcomes between subpopulations to zero.

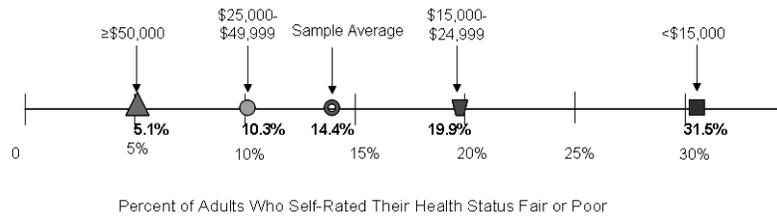
Toyota Specification

The two graphics below depict the Functional Health Outcomes Score Whole System Measure stratified by two different categories (annual household income and race/ethnicity). The goal is to have all subpopulations achieve the outcome of the Toyota Specification (which is 5.1 percent).

[Note: The self-reported health status data for this specification is derived from the Centers for Disease Control and Prevention report, Health-Related Quality of Life Surveillance—United States, 1993-2002.^{16]}

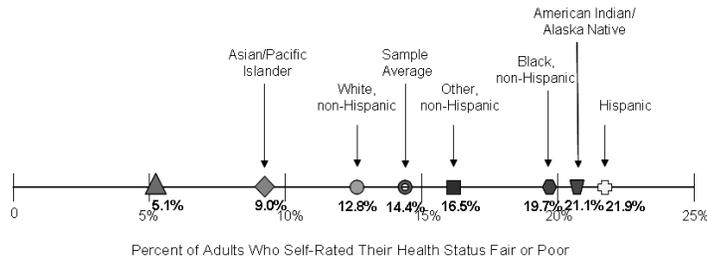
Would you say that in general your health is excellent, very good, fair or poor?

Results are stratified by annual household income (2001, US Dollars)



Would you say that in general your health is excellent, very good, fair or poor?

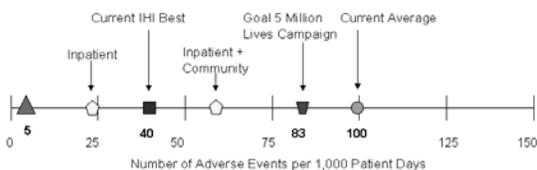
Results are stratified by Race/Ethnicity



Section Six Appendix B: Example of One Organization Using the Toyota Specifications

This example illustrates how a 350-bed regional medical center is using the Toyota Specifications for seven selected Whole System Measures as part of their overall strategic dashboard to gauge their current level of performance. On the graphics below, the triangle ▲ represents the Toyota Specification and the pentagon ◑ represents the medical center's current results. By looking at their results compared to the Toyota Specification for each of the selected Whole System Measures, the medical center is able to set goals for their improvement efforts.

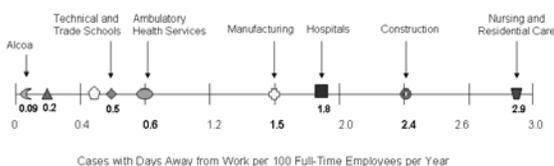
Rate of Adverse Events (Inpatient and Outpatient)



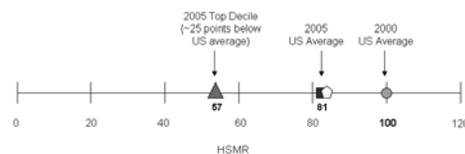
Hospital Days per Decedent During the Last Six Months of Life



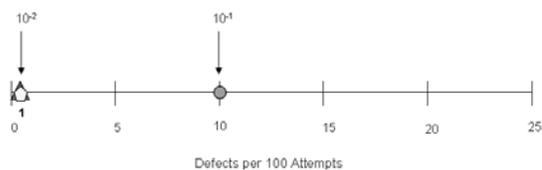
Incidence of Nonfatal Occupational Injuries and Illnesses



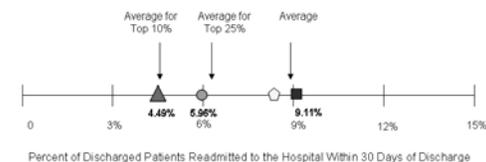
Hospital Standardized Mortality Ratio (HSMR)



Reliability of Core Measures

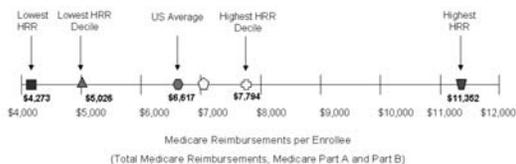


Hospital Readmission Percentage



Health Care Cost per Capita

(for the HRR, using the proxy measure Medicare Reimbursements per Enrollee)



Section Six Appendix C: Measurement Experts for Each of the Whole System Measures

The Whole System Measures are based on the work of many experts, without whom the WSMs would not be possible. Table 7 lists those individuals who served as lead experts for each measure.

Table 7. Measurement Experts for Each of the WSMs

Measure	Experts
Rate of Adverse Events (Inpatient and Outpatient)	David Classen, Frank Federico, Carol Haraden, Roger Resar
Incidence of Nonfatal Occupational Injuries and Illnesses	OSHA officials
Hospital Standardized Mortality Ratio (HSMR)	Andy Hackbarth, Sir Brian Jarman
Unadjusted Raw Mortality Percentage	Andy Hackbarth, Robert Lloyd
Functional Health Outcomes Score (Inpatient and Outpatient)	Ron Hays, Bill Rogers, John Ware
Hospital Readmission Percentage	Stephanie Alexander
Reliability of Core Measures	Frances Griffin, Carol Haraden, Thomas Nolan, Roger Resar
Patient Satisfaction with Care Score (Inpatient)	Paul Cleary, Susan Edgman-Levitan, Ron Hays
Patient Satisfaction with Care Score (Outpatient)	Paul Cleary, Susan Edgman-Levitan, Ron Hays, Dana Safran
Patient Experience Score	John Wasson
Days to Third Next Available Appointment (Primary Care)	Marjorie Godfrey, Ron Moen, Mark Murray, Catherine Tantau
Days to Third Next Available Appointment (Specialty Care)	Marjorie Godfrey, Ron Moen, Mark Murray, Catherine Tantau
Hospital Days per Decedent During the Last Six Months of Life	Elliott Fisher, David Goodman, John Wennberg
Health Care Cost per Capita	Jo Bibby, Elliott Fisher, David Goodman, Goran Henriks, John Wennberg
Equity (Stratification of Whole System Measures)	Eugene Nelson

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- ⁸ The IMPACT network is IHI's "association for change," an intensive program in which member organizations work together and with expert faculty to make dramatic and measurable improvements at the system level. Online information retrieved September 24, 2007. <http://www.ihl.org/IHI/Programs/IMPACTNetwork/>.
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