MANAGING DATA FOR PERFORMANCE IMPROVEMENT

U. S. Department of Health and Human Services

Health Resources and Services Administration

April 2011

Contents

MANAGING DATA FOR PERFORMANCE IMPROVEMENT

The goal of this module is to highlight the important role of effective data management in improving performance of an organization's health care systems. The module exemplifies how an organization's quality improvement (QI) team establishes a plan and methodology for gathering, analyzing, interpreting, and acting on data for a specific performance measurement.

Part 1: Introduction

In quality improvement (QI), managing data is an essential part of performance improvement. It involves collecting, tracking, analyzing, interpreting, and acting on an organization's data for specific measures, such as the clinical quality measures. Measuring a health system's inputs, processes, and outcomes is a proactive, systematic approach to practice-level decisions for patient care and the delivery systems that support it. Data management also includes ongoing measurement and monitoring. It enables an organization's QI team to identify and implement opportunities for improvements to its current care delivery systems and monitor progress as changes are applied. Managing data also helps a QI team to understand how outcomes are achieved, such as, improved patient satisfaction with care, staff satisfaction with working in the organization, or an organization's costs and revenues associated with patient care.

When an organization has adopted measures, calculated baselines, and identified appropriate aims for each measure, it is ready to proceed with this module. If an organization needs more knowledge on these topics, the **Performance Management and Measurement** module offers prerequisite information; for example, a *baseline* is an organization's current performance before systematic improvements are applied, and an *aim* is the organization's performance goal.

In the following sections, the **Managing Data for Performance Improvement** module reviews four primary steps of data management:

1. Collecting data
2. Tracking data
3. Analyzing and interpreting data
4. Acting on data

Part 2: Collecting Data

An organization must configure its systems so data elements are collected exactly the same way over time. This approach ensures accurate and credible data for QI improvement and avoids a team's wasted efforts on manual activities and reconfiguring its systems. A successful approach to reliable data collection includes proven tools, techniques, processes, and frameworks, and often involves automating parts of the data collection process, if feasible. At minimum, a QI team should develop a well-documented plan with detailed steps for collecting each data element. Successful QI teams recommend that a detailed data collection plan is in place prior to actually collecting the data, or to develop the plan while the baseline is calculated. An effective data collection plan includes the following details for each measure:

- Name of the measure
- Denominator detail with inclusions and exclusions
- Data source for the denominator and include any specific queries to be run or report parameters that must be entered
- Numerator detail with inclusions and exclusions
- Data source for the numerator and include specific queries to be run, manual steps, or specific sampling parameters
- If different individuals are assigned, identify who collects each data element and calculates the measure
- Include a calendar of measure-performance reporting, e.g., calculating Breast Cancer Screening measure on the second Tuesday of each month is appropriate if the Breast Cancer Screening QI Team reviews performance data on the second Friday of each month

Several tools and resources to assist an organization with developing its data collection plan are highlighted in **Table 2.1**:

Table 2.1: Data Collection Planning Tools

Name of Tool	Description and Use of Tool	Web Site Address for Tool
Simple Data Collection Planning (IHI Tool) *Institute for Healthcare Improvement (IHI)* *Boston, Massachusetts*	Simple data collection planning is a process tool that ensures the data collected for performance improvement is useful and reliable, without unnecessary cost and time.	http://www.ihi.org/knowledge/Knowledge%20Center%20Assets/Tools%20-%20SimpleDataCollectionPlanning_5dfce758-bdf7-424e-b4f1-6093df05868e/SimpleDataCollectionPlanning.pdf
Sampling (IHI Tool) *Institute for Healthcare Improvement (IHI)* *Boston, Massachusetts*	Adapted from the Institute for Healthcare Improvement's "Methods and Tools for Breakthrough Improvement" course, sampling has been used by hundreds of health care organizations.	http://www.ihi.org/knowledge/Knowledge%20Center%20Assets/Tools%20-%20Sampling_a1ab044e-b449-4b0e-8236-af3084282001/SamplingTool.pdf
NQC Quality Academy: Collecting Performance Data Developed by: New York State Department of Health AIDS Institute	Quality Academy Tutorial provides instructions on how to effectively and efficiently collect quality data and translate it into QI activities. It includes examples of sampling records for performance reviews by establishing review eligibility criteria, identifying minimal sample sizes, and selecting a random sample.	http://www.nationalqualitycenter.org/index.cfm/6127/15395
HIVQUAL Project Sampling Methodology	This step-by-step guide, developed by the National HIVQUAL Project, helps health care providers determine how many patient records to review for accurate performance measurement and how to effectively sample records.	http://www.hivqualus.org/index.cfm/5522
Data Collection Plan Worksheet & Template University of Iowa Hospital & Clinics	This tool serves as a reminder of why data collection is important and reinforces standard collection methods for sharing among team members.	http://www.uihealthcare.org/assets/0/108/113/191/380/2168/6164c0de-9925-4713-96a2-4c1029af027c.doc

Focus Indicators May 2009	Description	Goal	Numerator/Source	Denominator/Source	Data Notes & Exclusions	Calculation	Internal Review	QIC Review	Comments
CD4 q 4 months	Active, HIV-infected patients who had a CD4 within last 4 months	80%	Number of active, HIV-infected patients who had a CD4 count within 4 months of the audit date/EHR	Number of active, HIV-infected patients/POS patients from EHR	Exclude patients newly enrolled in the last 6 months	Num / den x 100		5/09; 8/09	
CD4 q 6 months	Active, HIV-infected patients who had a CD4 within last 6 months	90%	Number of active HIV-infected clients who had 2 or more CD4 T-cell counts performed at least 3 months apart during the last 365 days. /CW	Number of HIV-infected clients who had a medical visit with a provider at least once during the measurement year / POS patients from EHR	Exclude patients newly enrolled in the last 6 months	Num / den x 100		5/09; 8/09	

Figure 2.1: Example of an Excerpt from a Data Collection Plan for CD4 q Amounts in HIV-Infected Patients

In **Figure 2.1**, a team decides to measure CD4 q counts in patients with HIV at the end of four months, while aiming for a standard of care, and again at the end of six months to compare others using the measure recommended by the HIV/AIDS Bureau (HAB). The four-month CD4 q measure was simplest to calculate from the electronic health record (EHR), while the six-month CD4 q measure was easily assessed using the organization's CAREWare (CW) program. The measures were linked to the Quality Improvement Committee (QIC) calendar. The next sections discuss these important components in more detail.

What Data to Collect

During the next stage of the process, a QI team develops a collection strategy, methods, and tools before collecting the data. Most standardized measures, including the HRSA clinical quality measures, specify what data elements are needed to calculate the measure, as shown in **Table 2.2**. A QI team collects data elements for the denominator and numerator, then calculates the measure in the same way the baseline was calculated. A team also needs to incorporate any inclusions and exclusions for the numerator or denominator. The actions required to collect data for the Breast Cancer Screening (BCS) clinical quality measure are reviewed as an example in the following sections:

Table 2.2: Required Data Elements for the Breast Cancer Screening Example

Name	Description	Numerator	Denominator	Source	Reference
Breast Cancer Screening	Percentage of women 40 to 69 years of age who had a mammogram	Women in the denominator who received one or more mammograms during the measurement year or the year prior to the measurement year	All women patients aged **42 to 69** years of age during the measurement year or year prior to the measurement year	**NQF**	http://www.qualityforum.org/MeasureDetails.aspx?actid=0&SubmissionId=392#k=breast+Cancer+screening

Denominator with Exclusions and Inclusions

In the BCS example, a QI team first determines a methodology to find all women aged 42 to 69 years ***who will be impacted by the QI project***. If a team targets improvements on just one provider or practice team, it includes that provider's or practice team's specific patients. Targeting a smaller subset of patients within an entire practice is known as a *population of focus* (POF). Alternatively, a QI team may decide to focus on improving breast cancer screening for its entire population.

Note: If an organization is currently funded by HRSA, some performance measures, including the HRSA clinical quality measures, may be among those that will be reported to HRSA. An organization should consult its program's Web site plus links to bureau- and office-required guidelines and measures for more information:

BPHC MCHB HAB BHPr ORHP OHITQ

General information on HRSA grants, including searchable guidelines, is available and accessible at the **HRSA Grants Web site.**

Grantees are encouraged to contact their project officers with questions regarding program requirements.

An organization's QI team has several options for gathering information, but two common approaches are through a practice management system or an electronic health record (EHR). If a QI team focuses on *all* patients, the denominator is the number of female patients in the practice aged 42 to 69 years. If a team focuses on just one provider's patients, the denominator is the number of female patients aged 42 to 69 years who are part of the provider's patient panel. If a random sampling methodology is used, the denominator is the number of patients that reflect an adequate sample size.

Note: Random sampling is a method in which all members of a group (population or universe) have an equal and independent chance of being selected. Since improvement is the goal, not measurement, random sampling methodology allows an organization to reduce the QI team's burden while focusing on performance improvement of the selected measure.

Some measures specify inclusions, which are specific parameters that must be present for inclusion in the denominator. For example, there are measures for diabetes mellitus that specify the type of diabetes diagnosis (gestational, type 1 or type 2) for inclusion in the denominator. For the BCS measure, there are no denominator inclusions.

Before finalizing the denominator, it is important to check for exclusions, which are not present in all measures. Exclusions are parameters that guide a team to remove specific patients from the denominator for well-defined reasons. For the BCS measure, there is the following exclusion criterion for the denominator:

> ***Denominator Exclusion:*** *Women who had a bilateral mastectomy wherein the administrative data does not indicate a mammogram was performed; the bilateral mastectomy must have occurred by December 31 of the measurement year.*

For the BCS measure, a team needs to exclude women with bilateral mastectomies as defined in this denominator exclusion. These patients are found using CPT codes if using an EHR. Details on the specific codes are found in the **Breast Cancer Screening** module. A team using paper records often relies on clinicians to identify patients who had a bilateral mastectomy as a therapeutic or prophylactic intervention. Another technique used to evaluate the outliers for the measure is to review the medical records of patients who do not meet the numerator criteria to ensure they should be included.

Numerator with Exclusions and Inclusions

When considering the numerator, it is important to start with patients included in the denominator. In the clinical setting, for example, the denominator represents all patients eligible for or requiring certain care. The numerator represents those eligible patients who actually received care. It is important to ensure that the data collected matches the specifications of the measure. In the BCS measure, the numerator represents all women in the age range without bilateral mastectomy who had a mammogram within the last two years. While there are no exclusions for the numerator of the BCS measure, there is the following inclusion:

> ***Numerator Inclusions:*** *Documentation in the medical record must note the date the test was performed and the test results (or a copy of a mammogram result), or the record notates the date and results of a test ordered by another provider.*

This inclusion specifies that ordering the mammogram is insufficient: the results of the mammography must be evident to include the patient as having received the appropriate care.

If a team uses an EHR, the system can generate a report indicating if a mammogram report from a certain date is present in the record. An EHR's capability also allows reports that include the patient's name, date of the mammogram, and the results. It is important to ensure that only patients with ***documented mammogram results*** are included in the numerator; however, looking for computerized physician order entries (CPOE) for mammography is an inaccurate approach for determining this measure's numerator.

Even with an EHR, a team may discover that data capture for the numerator of the BCS measure is a more manual process. For example, the records of the patients within the age range are gathered via the EHR, but their mammography reports are reviewed manually to ensure test results are recorded—a process similar to a paper-based practice.

When confronted with a manual process, a team may choose to use a sampling methodology to decrease its burden. Sampling is a process where the performance measure is calculated on a subset of the total; it is a valid method for performance measurement when done appropriately. It is imperative that the sample is chosen randomly to accurately reflect the population. A team with a smaller patient volume, however, may choose to evaluate all patients in the denominator.

Randomized sampling is the most recommended method for performance improvement, because it ensures every patient has an equal chance of inclusion in the sample without bias. Some HRSA programs require specific parameters for using sampling, and an organization should check the Program Guidance before choosing it.

Methodology for Obtaining a Random Sample

Measurement is intended to speed improvement; however, if a QI team stalls in the in measurement process because it perceives more data is needed, changes are unnecessarily deferred. It is important to remember that improvement is the goal—not measurement. When a team gathers sufficient data to make a reasonable judgment, it should move to the next step. Instead of measuring the entire process (e.g., for an entire month, include all patients waiting in the clinic), it is more efficient to measure a sample (e.g., sample every sixth patient for one week, or sample the next eight patients) to help a team understand how a system is performing. There are a number of approaches for obtaining a random sample; however, an organization should review its program requirements before using a random sampling methodology.

Note: If an organization is currently funded by HRSA, some performance measures, including the HRSA clinical quality measures, may be among those that will be reported to HRSA. An organization should consult its program's Web site plus links to bureau- and office-required guidelines and measures for more information:

BPHC MCHB HAB HSB BHPr ORHP OHITQ ORO

General information on HRSA grants, including searchable guidelines, is available and accessible at the **HRSA Grants Web site.**

Grantees are encouraged to contact their project officers with questions regarding program requirements.

Below are a few tools an organization's QI team may use when randomly sampling a patient population:

- Research Randomizer is a free online service for organizations interested in conducting random assignment and random sampling.
- HIVQUAL Project Sampling Methodology is a step-by-step guide developed by the National HIVQUAL Project that helps health care providers determine the number of patient records to review for an accurate performance measurement and how to effectively sample records.
- Sampling (IHI tool) is adapted from the Institute for Healthcare Improvement's course, "Methods and Tools for Breakthrough Improvement," which is used by hundreds of health care organizations.

Calculate Each Measure

Calculation usually involves dividing the numerator by the denominator, then multiplying by 100 if the measure specifies a percentage. When sampling is used, the number of patients matching

the numerator criteria is divided by the total number in the sample. If some patients are excluded from the sample, replacements are needed to reach the suggested sample size for the population. The measure calculation reflects performance at the time measured; the data and its associated date of measurement should be recorded. For example, when a team reports data through the previous month, it is documented as:

Breast Cancer Screening Measure **Date of Report: April 12, 2010** **Reflecting Performance through March 31, 2010**

Special Considerations

Whether a team uses an electronic or paper-based system for performance measurement, the following sections offer a few tips from the field.

Electronic Health Record

When using an EHR for performance measurement, it can be challenging to ensure the EHR reports match the specifications of the measure. In the BCS measure, the EHR-generated report has to show there are documented mammogram results for each patient screened. EHR systems can report which patients have *orders* for mammograms, but only a few can report which of those have *results*. Some mammography results may be incorporated into the electronic record by scanning, but scanned reports are seldom incorporated into EHR population reports. If an EHR can generate reports of patients who have documented results, a team should review patient records showing no mammograms during the specified time period for scanned records excluded from the report.

Registry

A registry is an effective electronic system for improving care for a specified population of patients with a few contingencies. If the registry reports are used for performance measurement, the data collected must match the measure specifications and updated regularly to accurately reflect the performance of care given. When data is completed for the reported time period, a credible evidence of performance occurs. Many teams prefer to manage a registry than paper charts, and they factor registry maintenance into their resource planning and daily workflow requirements.

Below are a few resources for an organization interested in learning more about registries while developing a data collection plan:

- *Chronic Disease Registries: A Product Review* is a report provided by the California Health Foundation that helps physicians, medical groups, and other provider. organizations make informed decisions when considering the purchase or adoption of an electronic disease registry product.
- *Using Computerized Registries in Chronic Disease Care* is a report by the California Health Foundation that overviews the functions of computerized disease registries and

outlines issues for consideration when obtaining registry software and integrating registry products into an organization's work routine.

- *Do Disease Registries = $$ Rewards*
- *Using a Simple Patient Registry to Improve Your Chronic Disease Care*
- *Chronic Disease Electronic Management System (CDEMS)* is a Web site developed by the Washington State Department of Health that provides information about the CDEMS.
- *COMMAND Patient Registry* is a free chronic disease patient registry developed by the Mississippi Quality Improvement Organization: Information & Quality Healthcare.

Paper Records

If a team maintains paper records and has over 100 patients in a measure's denominator, it typically chooses random sampling to decrease the team's burden, while maintaining data integrity. Sampling with paper charts becomes inconvenient; however, when the charts are out of circulation during the time of the audit. When a QI team plans the data collection process, coordinates effectively with medical records staff for chart access, and completes the audit efficiently, it minimizes disruption to the organization.

Many organizations have developed and refined data collection tools over time, which can be easily adapted by a QI team to save time and resources. The chart below provides examples of proven tools used by other health care organizations that ensured the quality of their data collection:

Table 2.3: Data Collection Tools

Name of Tool	Description and Use of Tool	Web Site Address for Tool
Provider and Staff Satisfaction Survey	This survey, developed by IHI, provides a template for testing provider and staff satisfaction within an organization.	http://www.ihi.org/knowledge/Knowledge%20Center%20Assets/Tools%20-%20ProviderandStaffSatisfactionSurvey_fda0a349-1f41-45c0-a492-2cf8d33c3417/ProviderStaffSatisfactionSurveyTantau.pdf
The Consumer Assessment of Healthcare Providers and Systems (CAHPS)	The **Consumer Assessment of Healthcare Providers and Systems** (CAHPS) program is a public-private initiative to develop standardized surveys of patients' experiences with ambulatory and facility-level care. A **CAHPS Survey and Reporting Kit** explains how to prepare and field a CAHPS questionnaire, analyze the results, and produce consumer-friendly reports.	https://www.cahps.ahrq.gov/cahpskit/CAHPSKIT_main.asp
Short Survey (IHI Tool)	Short surveys provide simple and prompt feedback to assess whether attempts to improve performance are going in the right direction. They can also be used to pinpoint certain areas of interest (e.g., did patients find the new form easy to understand?).	http://www.ihi.org/IHI/Topics/Improvement/ImprovementMethods/Tools/Short+Survey.htm
Data Collection Check Sheet for observations American Society for Quality	A generic tool that can be adapted for a wide variety of purposes; the check sheet is a prepared structured form for collecting and analyzing data.	http://www.asq.org/learn-about-quality/data-collection-analysis-tools/overview/check-sheet.html

Sample Measurement Assistant Spreadsheet American Academy of Family Physicians	The Sample Measurement Assistant Spreadsheet is provided in an Excel worksheet.	Measurement Assistant Spreadsheet
Clinical Improvement Worksheet	This Excel worksheet is a sample for organizations to modify and use to collect clinical improvement data.	http://clinicalmicrosystem.org/assets/materials/worksheets/clinical_improvement.pdf
Observation worksheet	This Excel worksheet is a sample for organizations to modify and use when observing a process and focusing on improvement.	http://clinicalmicrosystem.org/assets/materials/worksheets/observation_worksheet.doc
Various Chart audit forms for collecting data	This site provides a variety of disease-specific chart audit forms for data collection. Do a Search.	http://www.migrantclinician.org
CDEMS sample data collection	This is a three-page Word document containing three CDEMS Sample Asthma Data Collection forms.	http://www.healthdisparities.net/hdc/hdcsearch/?IW_DATABASE=library&IW_FIELD_TEXT=8-3-2006.4401+IN+documentidtbl
Medication Therapy Management Data Collection Form	This form is used to record demographics; medication prescribing record; chronic conditions; vital signs, labs, and diagnostic test results; hospitalization and ER visits, and pharmacist intervention log.	http://www.healthdisparities.net/hdc/hdcsearch/?IW_DATABASE=library&IW_FIELD_TEXT=10-2-2009.4338+IN+documentidtbl
NQC Quality Academy: Collecting Performance Data	This NQC Quality Academy Tutorial provides instructions on how to effectively and efficiently collect quality data and translate it into quality improvement activities.	http://nationalqualitycenter.org/index.cfm/6101/15395

Standardize the Process

A well-documented data collection plan is essential to a successful start of a QI project, because it standardizes the various processes required to collect and measure data. It establishes a work plan with committed resources and target dates that promotes efficiency within the project. One important task is to have performance data available for a QI team's review according to the schedule defined in the data collection plan. A strategy employed by most teams is to designate a person who is accountable for gathering the data and having it available when the information is due. When the roles and responsibilities of that person are documented, it decreases the risk of disruption during staff transitions.

Another issue to overcome with a detailed data collection plan is when an organization's electronic systems are standalone or do not integrate easily. Since measuring performance may require data from various systems, a QI team needs to develop a process for capturing data from these different sources. Documenting the workaround procedures for compiling the data eliminates re-learning the process next month.

Designing and implementing procedures to examine the data ensures validity, reliability, completeness, timeliness, integrity and confidentiality. Standardized procedures may cover any relevant process to the project--communication, training, system checks, and routine data QI activities. When a QI team documents a data collection methodology for each measure calculated, it ensures reliable and reproducible data over time.

Performance measurement data is only as effective as the data collection process. A QI team should assess the reliability and effectiveness of the process before finalizing the plan. Often organizations conduct random chart audits of the collected data and reports to assess their accuracy. There are a number of chart audit forms available to QI teams that are measure specific, which are listed in **Table 2.4**:

Table 2.4: Chart Audit Tools and Resources

Name of Tool	Description and Use of Tool	Web Site Address for Tools and Forms
Chart audit tool	This tool is used to chart audits for diabetic patient, Paps, and mammograms.	http://www.healthdisparities.net/hdc/hdcsearch/?IW_DATABASE=library&IW_FIELD_TEXT=10-13-2009.7962+IN+documentidtbl
Various chart audit forms for collecting data	This site provides a variety of disease-specific chart audit forms for data collection.	http://www.migrantclinician.org
Dental peer review chart audit forms	This tool is a sample dental peer review chart audit form that could be used for quality assurance programs.	http://www.healthdisparities.net/hdc/hdcsearch/?IW_DATABASE=library&IW_FIELD_TEXT=7-28-2009.8587+IN+documentidtbl
Blank chart audit form—Homeless	This is a one-page Excel spreadsheet containing a blank chart audit form specifically geared for homeless patients. This form is used to assess adherence to the chart documentation requirements for this health center's providers.	http://www.healthdisparities.net/hdc/hdcsearch/?IW_DATABASE=library&IW_FIELD_TEXT=5-26-2006.4400+IN+documentidtbl
Blank chart audit form--Perinatal NH	This is a one-page Excel spreadsheet containing a blank chart audit form specifically geared for perinatal patients.	http://www.healthdisparities.net/hdc/hdcsearch/?IW_DATABASE=library&IW_FIELD_TEXT=5-26-2006.1461+IN+documentidtbl

Part 3: Tracking Data

Calculate Each Measure Over Time

When the performance is calculated, a QI team then decides how often to monitor it. As a general rule, a QI team that is actively making changes to systems of care monitors performance frequently. The following guidelines are suggestions that a team may use for determining performance measurement frequency:

Table 3.1: Guidelines for Performance Measurement Frequency

Frequency	Team's Position in the Process
Monthly	Actively changing the underlying systems
Quarterly	After aim or goal is achieved
Annually (or periodically)	After aim or goal is achieved and performance is stable

There are measure-specific performance improvement tracking tools available to QI teams, which are listed in **Table 3.2:**

Table 3.2: Performance Improvement Tracking Tools

Name of Tool	Description and Use of Tool	Web Site Address for Tools and Forms
Improvement Tracker	The Improvement Tracker allows an organization to track measures currently available in the Topics area of IHI.org; it automatically graphs data which creates customizable reports for specific audiences	http://app.ihi.org/Workspace/tracker/
Worksheet for Tracking Performance Results	This tool tracks an organization's performance results over several evaluation periods, and document ideas for interpreting and responding to the results.	http://ww3.harvardbusiness.org/corporate/demos/hmm10/performance_measurement/worksheet_for_tracking_performance_results.html
Measuring Clinical Performance: A Guide for HIV Health Care Providers	The New York State Department of Health AIDS Institute developed a guide that provides a step-by-step process for measuring clinical performance with the goal of improving quality of care.	http://www.ihi.org/knowledge/Pages/Tools/MeasuringClinicalPerformanceAGuideforHIVHealthCareProviders.aspx

Share Progress with the Practice Team

As a QI team makes changes in its systems of care, the performance measurement data reassures the team that changes are resulting in improvement. Because improvements are added periodically, measuring performance over time is important. Most QI teams schedule some time on the monthly team meeting agenda to review the data and share their findings.

Note: As a QI team reviews the data, it should keep its findings in perspective. Unsatisfactory performance data for one measure does not necessarily reflect the quality of care provided by an organization as a whole. Performance that appears deficient can be caused by exceptional factors, such as, access to equipment. It is important that a QI team recognizes unsatisfactory performance as an opportunity to improve current systems and, ultimately, performance on the measure.

Data displays are effective tools for sharing information throughout the data management process. Data that is displayed graphically or summarized in a concise format provides a quick view of the team's progress—from baseline to aim. The following sections provide examples of commonly-used data display techniques.

Run Charts

Run charts show trends in data over time, are easy to interpret, and provide a picture of how a process is performing. They can be annotated to indicate when a particular change is implemented, which may explain a marked improvement or decrease in performance. A sample run chart for tracking the immunization rate of two-year olds is shown in **Figure 3.1**:

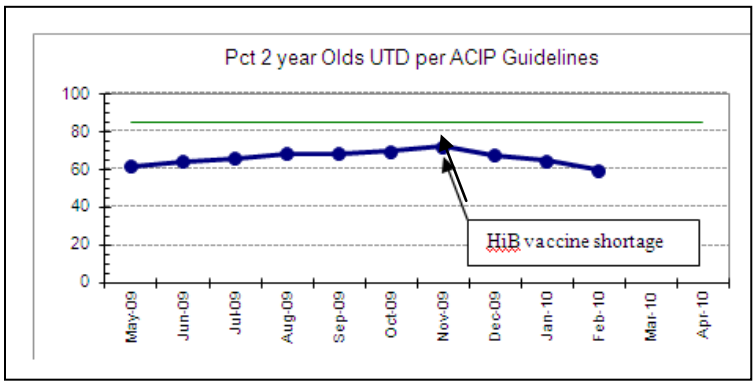


Chart Description:

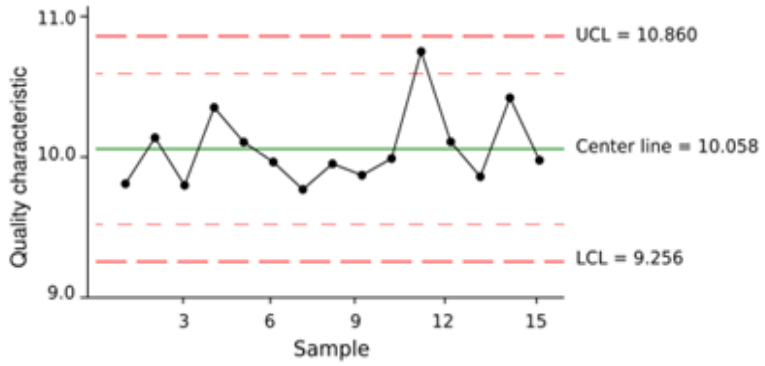
- X axis is the date when performance was measured
- Y axis is performance as a percentage
- First point indicates the baseline
- Green line indicates the aim
- Annotation (H1B vaccine shortage) explains significant impact on the system, which can be positive or negative

Figure 3.1: QI Project—Improve the Immunization Rate of Two Year Olds

The Improvement Tracker provided by the Institute for Healthcare Improvement allows a team to track predefined standard measures using run charts in several topic areas. Additionally, a QI team can create its own custom measures to track any data for its QI efforts.

Control Charts

Similar to run charts, control charts show data over time; however, they provide limits on which observed variation can be detected as either random or expected. Control charts are used less frequently in performance improvement but are helpful for understanding if the variation in data is beyond mathematical expectations. **Figure 3.2** shows an example of data displayed in a control chart.



- X axis may be defined as a specific sample or performance measurement date
- Y axis is a quality characteristic (performance)
- First point indicates baseline
- Green line is the mean
- Between the upper and lower confidence limits (UCL, LCL) is data within the normal variation. If data falls outside of the expected range, it may indicate something unusual occurred.

Figure 3.2: Example of Data Tracking with a Control Chart

Other Commonly Used Displays

Additional graphing types, such as bar graphs or pie charts, are useful for visually telling a performance story. A team's creativity for display design is unlimited if improvement efforts are visually displayed and easily interpreted.

Dashboard

Dashboard data displays, similar to the dashboard in an automobile, provide several performance indicators at a glance, and are more commonly used as organizations increase their number of measures. Dashboards are created to display various aspects of one quality improvement project or used to convey performance across the organization, as these next two examples demonstrate.

This dashboard in **Figure 3.3** depicts the performance of a small practice that is trying to improve several aspects of comprehensive diabetes care. The dashboard is a compilation of the run charts and represents the registry size and performance for each measure over time. The initial point is the baseline and the aim is represented by the green line. At a glance, the team can see the performance for all monitored measures, which can be used to focus improvement efforts for the next month.

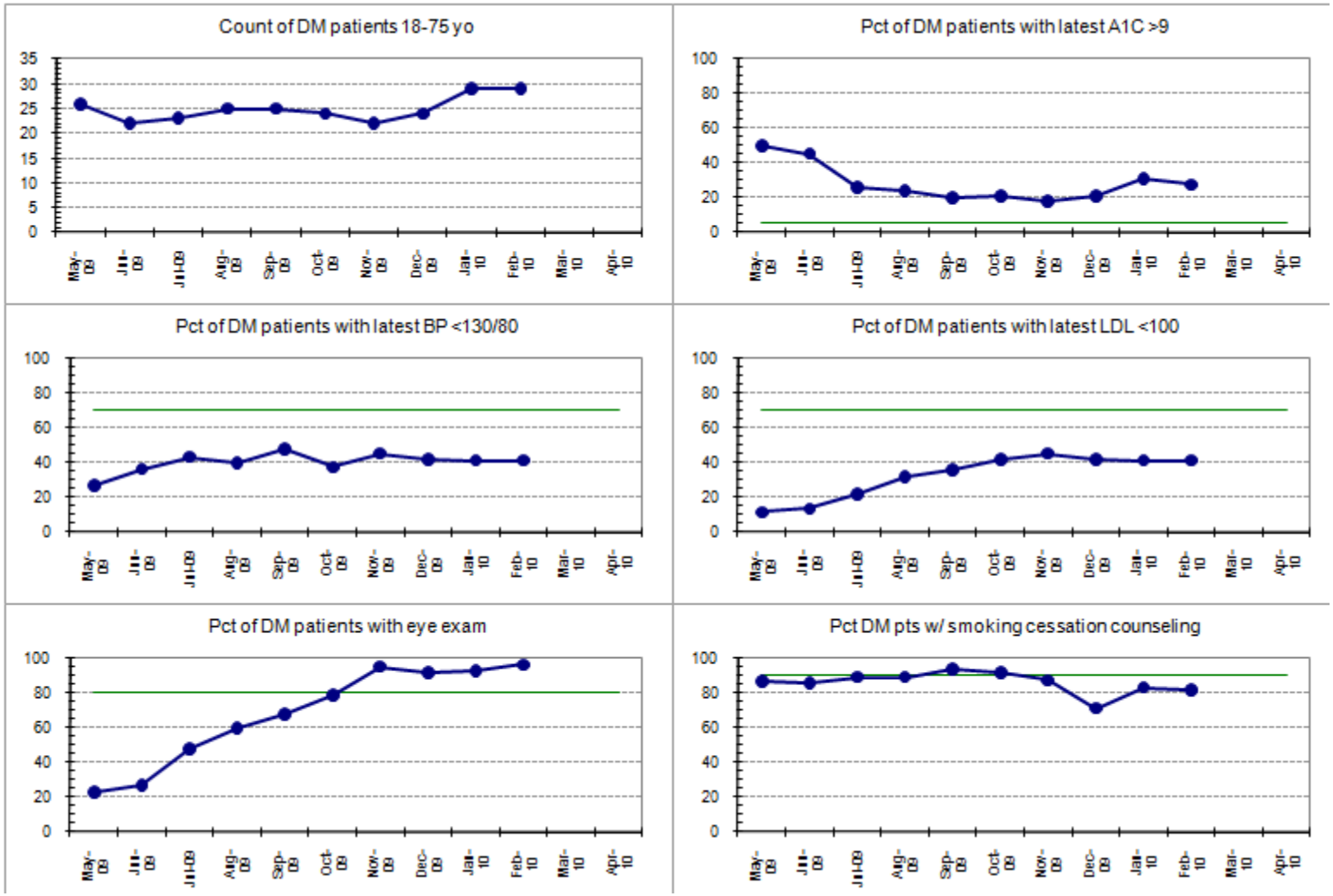


Figure 3.3: Dashboard for a Monitoring Improvements in Comprehensive Diabetes Care

The dashboard in **Figure 3.4** is more sophisticated and represents a team tracking performance in multiple areas of the organization, including patient access, patient satisfaction, and several clinical indicators. Also known as a spider diagram, this dashboard depicts the goal or aim as the green line and the current performance as the dark blue line. At a glance, the team is able to understand its performance across multiple domains and focus its efforts accordingly.

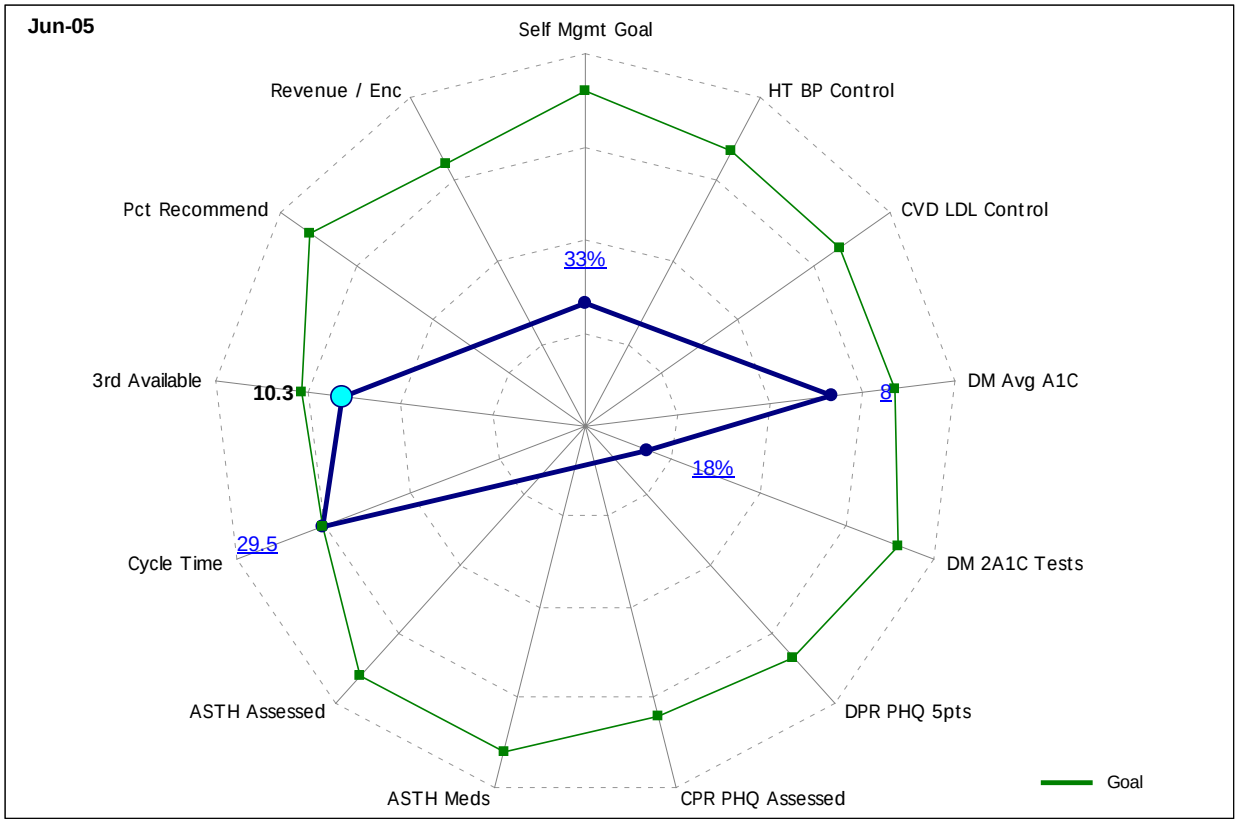


Figure 3.4: An Example of a Spider Diagram Dashboard Tracking Performance in Multiple Areas

Additional information about dashboards and other effective data displays may be found in the following resources:

- **NQC Quality Academy: Useful Quality Improvement Tools** - This NQC Quality Academy Tutorial discusses tools to help you understand and display work processes.
- **COCKPIT** – is a performance benchmarking network, offered nationally, where community health centers submit data (financial, practice management, etc.) and obtain dashboards of performance measures, reports, trend graphs, and analyses of their health centers performance benchmarked against other health centers.
- **(2010) Future Directions for the National Healthcare Quality and Disparities Reports**
- **Board on Health Care Services (HCS) -** *Chapter 6 - Improving Presentation of Information to National Healthcare Report Audiences (155-190).*
- A guide to using data for health care quality improvement - The guide outlines the fundamental concepts of data collection, analysis, interpretation, data display and reporting, as they relate to the quality improvement program.

An effective display of data creates a visual story in a concise and easy-to-understand format. The National Quality Center provides an online tutorial where an organization can learn the following:

- Basic concepts in statistics
- Why graphical display of data is successful
- How to display different types of data
- How to construct four different graphs to display data

Part 4: Analyzing and Interpreting Data

The next phase of data management involves two distinct albeit related processes:

1. *Analyzing* data is the *review* of performance data to determine if it meets the desired quality level; it is used to define a performance plan.
2. *Interpreting* data is the process of *assigning* meaning or determining the significance, implications, and conclusions of data collected; it is used to evaluate and improve activities, identify gaps, and plan for improvement.

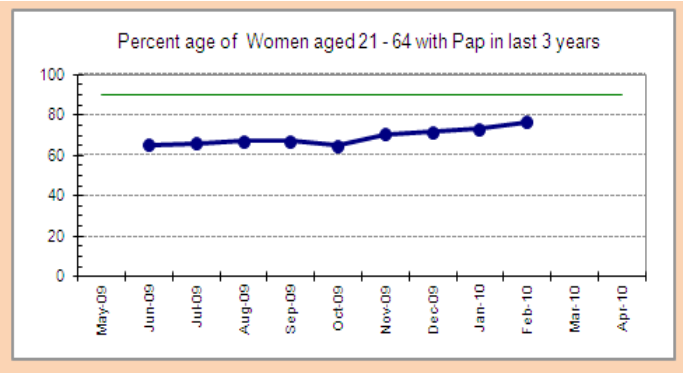
Analysis and interpretation of data are used in concert when a team reviews its performance. When a QI team has a process in place to collect and display performance data, it ensures sufficient time is reserved to review the data and learn from it.

A team begins this phase by reviewing the current performance and comparing it to the baseline, the previous month's performance, and its aim or goal. This analysis gives a general sense of progress toward the aim, if it is reachable, and if performance is improving. The interpretation process provides knowledge of the changes applied to the systems, special events with a potential impact, and lessons learned from the prior month's work that forms the next steps. One team's approach to analysis and interpretation of its data is illustrated in the following hypothetical example:

Example 4.1: A Women's Health Center's Use of a Run Chart to Analyze Improvement

The QI team from a women's health center is working to improve the rate of Pap smears for its patient population. The team's aim statement is:

> *Over the next 12 months, we will redesign the care systems of the women's health center to ensure that 90 percent of women aged 21 to 64 years have been screened for cervical cancer with at least one Pap test within the past three years.*



The QI team reviewed the run chart (right). The performance improved from a baseline of 62 percent to 79 percent over the last eight months. The team was glad to see improvement but realized it had a way to go to meet its aim of 90 percent in just four months. It interpreted this information by concluding that the rate of improvement was unlikely to achieve its aim by the end of the project period.

Occasionally, the picture is less encouraging when performance decreases or does not improve over a period of time. That is the time to go back and evaluate other opportunities to make changes to the system. The data indicates how the system is performing, but not why. The next section describes common scenarios that occur during analysis and interpretation, and potential actions a team may consider.

An organization may evaluate its performance against available benchmark data, which is beneficial when compared to the aim statement and goal developed at the inception of the project. This type of evaluation can indicate if a team set its improvement goal too high when creating its aim. Below is a list of organizations a team may use to benchmark its improvement data:

- **Aging Stats** (Administration on Aging (AOA) U.S.): Federal Interagency Forum on Aging-related statistics provides links to Excel charts, reports, presentations, and papers.
- **America's Children: Key National Indicators of Well-Being** (Federal Interagency Forum on Child and Family Statistics): This is a biennial report to the Nation on the condition of children in America. Nine contextual measures describe the changing population, family, and environmental context in which children are living, and twenty-five indicators depict the well-being of children in the areas of economic security, health, behavioral and social environment, and education.
- **America's Health Rankings** (United Health Foundation): This is a yearly assessment of the relative healthiness of the Nation, based upon analysis of comprehensive determining factors, such as, personal behaviors, the environment in which people live and work, the decisions made by public and elected officials, and the quality of medical care delivered by health professionals.

- **Cancer Trends Progress Report** (National Cancer Institute (NCI), NIH): This report summarizes progress in the United States against cancer in relation to Healthy People 2010 targets set forth by the Department of Health and Human Services. The report includes key measures of progress along the cancer control continuum and uses national trend data to illustrate where advancements have been made.
- **CDC Data and Statistics** (Centers for Disease Control and Prevention (CDC))
- **Data and Surveys** (Agency for Healthcare Research and Quality (AHRQ))
- **Gateway to Data and Statistics** (HHS Data Council, Department of Health and Human Services): This Web-based tool compiles key health and human services data and statistics.
- **GlobalHealthFacts.org** (Henry J. Kaiser Family Foundation (KFF)): Global data on HIV/AIDS, malaria, tuberculosis, and other key health and socio-economic indicators are found on this Web site. The data is displayed in tables, charts, and color-coded maps and can be downloaded for custom analyses.
- **Health Data** (Pan American Health Organization (PAHO))
- **Health, United States** (National Center for Health Statistics (NCHS), CDC): This is an annual report on trends in health statistics. The report consists of a chart book that illustrates major trends in the health of Americans, and a trend tables section with detailed data tables. Refer to Appendix I for data sources.
- **HRSA Geospatial Data Warehouse** (Health Resources and Services Administration (HRSA)): The Geospatial Data Warehouse and its associated applications provide access to information about HRSA programs and related health resources, including data on health professional shortage areas, medically-underserved areas, and primary care service areas.
- **Kaiser State Health Facts** provides free, up-to-date, and easy-to-use health data on all 50 States. Statehealthfacts.org provides data on more than 450 health topics and is linked to both the Kaiser Family Foundation Web site and KaiserNetwork.org.
- **Maternal and Child Health Bureau Data** (Health Resources and Services Administration (HRSA))
- **National Association for Public Health Statistics and Information Systems (NAPHSIS)**
- **National Center for Health Statistics (NCHS)** (Centers for Disease Control and Prevention (CDC)): The Nation's principal health statistics agency that review outcomes, access, literature synthesis, public reporting, underserved, quality, data collection methods, access data, reports, surveys, and tools.
- **National Health Interview Survey (NHIS)** (National Center for Health Statistics (NCHS), CDC): NHIS provides data on a broad range of health topics collected through personal household interviews.
- **National Notifiable Diseases Surveillance System** (Centers for Disease Control and Prevention (CDC)): This is a list of nationally notifiable diseases and summaries of reports submitted by health care providers and clinical laboratories to local, county, or State health departments.

- **National Program of Cancer Registries (NPCR)** (Centers for Disease Control and Prevention (CDC)): Data is collected by regional and State cancer registries. This site provides access to U.S. Cancer Statistics (USCS), the U.S. County Cancer Incidence Dataset, and the USCS Expanded Dataset.
- **SEER (Surveillance Epidemiology and End Results)** (National Cancer Institute (NCI), National Institutes of Health (NIH): SEER provides cancer statistics in the United States. It collects information on incidence, survival, and prevalence from specific geographic areas representing 26 percent of the U.S. population, and compiles reports on these plus cancer mortality for the entire Nation.
- **State Snapshots** (Agency for Healthcare Research and Quality (AHRQ)): The State Snapshots provide State-specific health care quality information, including strengths, weaknesses, and opportunities for improvement. The goal is to help State officials and their public- and private-sector partners better understand health care quality and disparities in their State.
- **Substance Abuse and Mental Health Statistics** (Substance Abuse and Mental Health Services Administration (SAMHSA)): This provides the latest national data on alcohol, tobacco, illicit drug use and dependence, and State treatment planning areas, and includes data on mental health topics, such as, depression, serious psychological distress, and suicidal thoughts and attempts.
- **Surveillance Research: Where can I find cancer incidence statistics?** (National Cancer Institute (NCI), NIH): This is a list of reports and research tools to find cancer incidence statistics.
- **Unintentional Injury Prevention and Behavioral Science Web Site** (Society for Public Health Education (SOPHE))
- **WHOSIS Statistical Information System** (World Health Organization (WHO)): This is an interactive database bringing together core health statistics for the 193 WHO Member States. It comprises more than 70 indicators, which can be accessed with a quick search by major categories, or user-defined tables.
- **Women's Health USA 2007** (Health Resources and Services Administration (HRSA)): Women's Health USA provides data and information on emerging issues and trends in women's health. Racial and ethnic, sex/gender, and socioeconomic disparities are highlighted where possible.

Part 5: Acting on the Data

The Plan-Do-Study-Act (PDSA) cycle is integral to rapid-cycle change methodology with emphasis on the "S" or *study* part of the cycle. In data management, *study* is the analysis and interpretation phase, and when it is completed, an organization can proceed to "A" or *acting* on the data. A team's analysis and interpretation of the data drives its subsequent actions on performance. The following summaries provide common scenarios that result from the study process and a team's actions based on that information.

When Progress is Insufficient

When a team decides there is insufficient progress, which may prohibit the organization to reach its goal within the specified time period, the team has the following options to guide its actions:

Ensure Data Systems Are Reliable

If the team is using a registry-generated report for performance data, the first step is to validate the reliability of its data systems. A current, updated registry, timely data entry, and compliance with the data collection methodology avoid a less-than-expected performance.

Re-evaluate Potential Causes of Underlying System Problems

At the start of the QI project, the team brainstormed on potential local factors that could impact the system's improvement. A team may want to re-evaluate those potential causes of system problems that can hinder progress. The fishbone diagram, shown in **Figure 5.1**, is the tool used by the QI team from the women's health center example to analyze why Pap smears were not occurring**.**
The team's analysis showed the internal systems to recall patients due for Paps, reduced no-show rates, and performed Paps when due, regardless of the reason for the visit; however, the issue of creating systems to retrieve documented Paps performed elsewhere was not addressed. The follow-up review of the data, in the context of the Quality Improvement Plan, provided an opportunity for the team to further improve its systems, and the team achieved its aim of 90 percent by the project due date.

Re-evaluate Changes Made for Improvement

A common cause of a change failing to result in improvement is because the change was implemented inconsistently or unexpectedly discontinued. There are a number of reasons this occurs--communication issues, insufficient training, or resistance to change are the typical challenges that may contribute to a unsuccessful change.

Increase Number of Changes per Week

When a team has insufficient resources or time, it may implement only one change every week or two, which slows the rate of performance improvement. A recommendation for this scenario is to include other staff members to assist with incremental tasks, such as testing the changes, so the QI team can work on multiple factors simultaneously to improve systems.

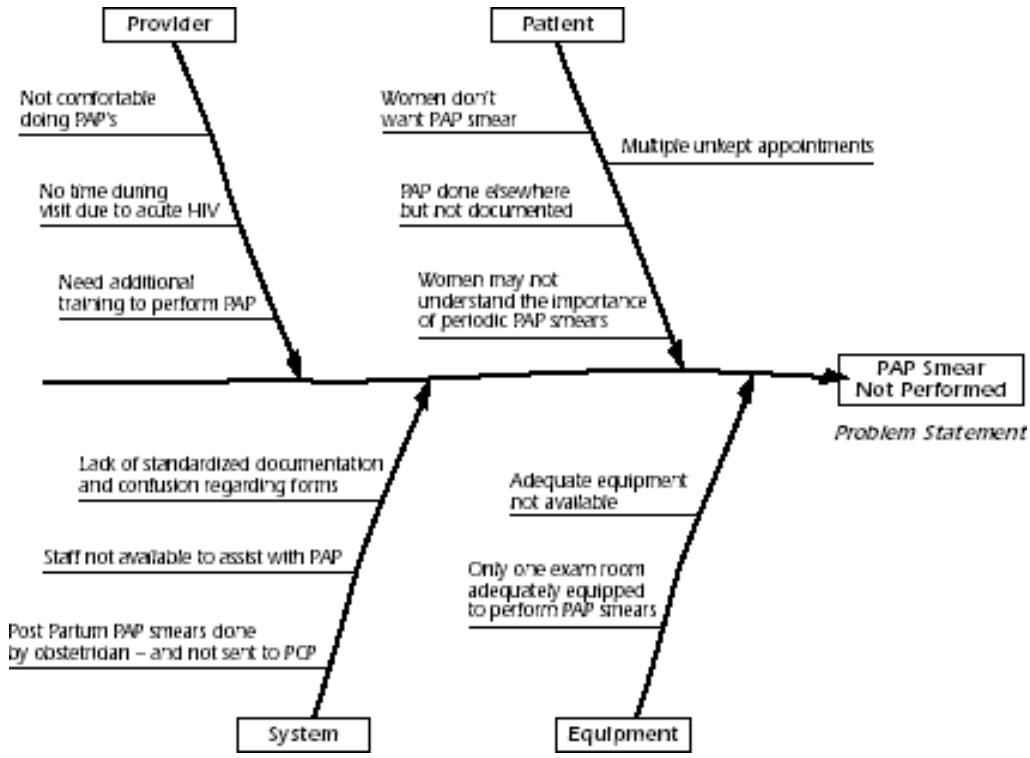


Figure 5.1: Fishbone Diagram Used by the Women's Health Center for Performance Analysis

Remove Barriers

Insufficient performance improvement may occur due to factors beyond an internal system change, such as barriers to care. Women who do not have access to mammography, or transportation issues that prevent patients to get routine HbA1c tests, are examples of barriers. One solution is for care providers to partner with other agencies, such as the Cancer Control Program, to schedule the mobile mammography van once a month, or seek funding to offer HbA1c tests on site. These types of creative solutions to common problems are included in the *Changes that Work* grids within each module.

When Progress is Sufficient

When an improvement project goes smoothly with steady incremental progress on pace to meet the aim, that is a time to celebrate the team's hard work and success. After the celebration, a team may need to look for other opportunities for improvement. With complex systems, it usually requires more than a few changes to meet the aim. In evaluating next steps, a team may consider these options:

- Continue on the same path

- Work on a different part of the system
- Test changes in more situations
- Spread the improvement

Continue on the Same Path

This action is appropriate especially for measures of annual screenings. If systems are honed so eligible patients receive their needed care during clinic visits, improvement efforts can focus on outreach and assurance that patients are seen in accordance with their care requirements. Over time, the number of patients who are current on their annual screenings will steadily increase.

Work on a Different Part of the System

Systems of care delivery may have multiple factors that have an impact on performance improvement. In this scenario, the QI team focused on increasing the rate of foot exams for diabetics. System changes, including patient and provider awareness, resulted in adequate improvement but performance eventually leveled off. The QI team considers potential improvements, such as, additional time to perform foot exams during the busy clinic schedule, or sufficient qualified personnel to perform foot exams. In this case, awareness needed for foot exams was improved, but the ability to meet that need was inconsistently met. The QI team is advised to look at the underlying critical pathway, which is especially helpful in these situations. Additional information on critical pathways is found within each module.

Test Changes in More Situations

When changes result in performance improvement as planned, a team may consider testing the changes further to ensure they will work under all conditions. The ultimate goal is to embed the new and improved process until it is consistently performed each time.

Spread the Improvement

When the team achieves success in its QI project for a population of focus (POF), the work should be spread to other providers, care teams, or sites within the organization. The same strategies, planning, methodologies, and tools discussed in this module are applicable for spreading the improvement to other POFs.

Part 6: Conclusion

The collection, tracking, analyzing, and interpretation of data followed by action continues periodically throughout the QI project. At the, end of the time period specified by the aim statement, the QI team consults with the organization's leadership and decides to either: 1) continue monitoring the measure; 2) leverage more improvement, 3) or focus on other topics. Considerations regarding these and related issues are covered in the **Quality Improvement** module.

Part 7: Resources

1. Building Measurement and Data Collection into Medical Practice, Annals of Internal Medicine - Eugene C. Nelson, DSc, MPH; Mark E. Splaine, MD, MS; Paul B. Batalden, MD; and Stephen K. Plume, MD http://annals.highwire.org/content/128/6/460.abstract
2. HRSA HAB Essential Steps in Data Flow http://careacttarget.org/library/rsr/EssentialStepsinDataFlow1111.pdf.
3. Control Charts http://www.itl.nist.gov/div898/handbook/pmc/section3/pmc31.htm
4. Improvement Tracker: http://app.ihi.org/Workspace/tracker/
5. CDEMS—Public Health Information & Data Tutorial: Health Statistics Module - (National Network of Libraries of Medicine (NN/LM)) - Online instruction on how to retrieve statistical information and access data sets relevant to public health.