QI Project Guide

Society for Vascular Surgery
Patient Safety Organization®

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INTRODUCTION

The Vascular Quality Initiative® (VQI) is designed to improve the quality, safety, effectiveness and cost of vascular health care by collecting and exchanging information. The VQI consists of three components: the Society for Vascular Surgery Patient Safety Organization (SVS PSO), 17 Regional Quality Improvement Groups, and the vascular registry data collection and reporting system (M2S PATHWAYS). In addition to the legal safeguards, confidentiality and protections provided by the SVS PSO to VQI members, it also provides support, technical assistance and oversight on quality improvement programs. The SVS PSO has developed this practical QI Project Guide to assist VQI members in their quality-improvement (QI) efforts. The QI Project Guide contains directions and proven QI tools to support local and regional teams as they use VQI data to identify opportunities and produce measurable improvements.

The QI Project Guide was developed by QI experts and shaped by the experiences of VQI centers that were able to achieve positive results through use of VQI data and the methods highlighted in this document. The approach and tools described here are used by institutions using PDSA (Plan-Do-Study-Act), DMAIC (Define-Measure-Analyze-Improve-Control), and other proven QI methodologies.

This QI Project Guide is not a comprehensive tutorial for managing QI projects, nor will it substitute for the guidance provided by trained QI staff from participating VQI centers. QI project teams will not necessarily use all of the tools in this document, but this QI Project Guide can provide valuable direction for you and your teams.

VQI centers that partner with the QI departments at their institutions will benefit by exposure to new tools and insights gained from other VQI center projects. For those teams operating without the assistance of their institution's QI department, the QI Project Guide will provide sufficient direction to initiate, implement and monitor their own QI projects.

The SVS PSO plans to make this practical QI Project Guide a "living" document and relevant to all VQI centers, regardless of experience. As we receive more case studies and feedback from VQI centers, we will update this document and share it with those in the VQI community.

Nadine Caputo
SVS PSO Quality Director

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OVERVIEW

The QI Project Guide is designed to help VQI centers use the VQI Registries and the center- and physician-level analytic capabilities of the M2S PATHWAYS platform to identify opportunities and initiate projects to improve care and/or reduce costs.

This Guide defines the key steps needed to complete a data-driven, quality improvement (QI) project. It describes a small subset of the many QI tools available in the literature, provides guidance on how VQI reports can be used to drive projects to a successful endpoint, and presents examples from VQI center case studies.

For each step, a "typical timing" has been provided based on an overall project timeframe of 4-8 months. The project pace and duration will vary based on the type of project, availability of data, IT requirements, etc. While some variation is to be expected, keep in mind that it is difficult for project teams to maintain interest and momentum beyond nine months. Consequently, when projects are defined, it is important to ensure that the scope and timing be realistic and agreed upon prior to initiation.

Project Phase	Typical Timing	Change Management
1. Initiate Project	2-4 weeks	***Ongoing Throughout the Project***
2. Establish Baseline	2-6 weeks	
3. Identify Root Cause	3-4 weeks	
4. Develop Potential Solution	4-6 weeks	
5. Implement Improvement	4-6 weeks	
6. Evaluate	4-6 weeks / ongoing	
Total Duration	**4-8 months**	

Whether or not your projects adhere to the model described in this guide, sharing your project experience with the SVS PSO will provide valuable insights to the VQI community. This can be achieved via regional meetings, the VQI Annual Meeting, newsletters, or as updates to the QI Project Guide.

1. INITIATE PROJECT

Typical Timing: 2-4 weeks

A well-defined, properly scoped, and goal-oriented plan is critical to the success of any QI project. The first step to creating such a plan is to establish a "problem statement" that articulates an ongoing issue with patient quality. The problem needs to be important enough to the organization to justify the resources required to complete the project. After the problem statement has been crafted, other key elements should be defined by the project leader and organized into a one page "Project Charter".

The Project Charter is both an accountability tool and convenient way to describe the project to others. The key elements of the Charter are:

- **Problem Statement:** Provide a 1-2 sentence description without assumptions of cause or suggested solutions
- **Goal:** Include quantifiable target, direction of improvement, and timeframe to achieve the goal (i.e., goal should meet criteria of S.M.A.R.T.[1] goal)
- **Scope:** Clearly articulate what services are – and are not – to be included in the project (e.g., procedure type, nursing units, inpatient/outpatient)
- **Timing:** Provide deadlines for key project milestones
- **Team Members:** Identify Sponsors, Project Owner, and Process Manager

Selecting members of the Project Team is another critical step during the first few weeks. When creating a team, it is important to establish roles and ensure that each member can commit to time requirements necessary to complete the work. The key roles for a QI project are:

- **Executive Sponsor:** Provides overall guidance and accountability for the project; addresses organizational barriers; provides strategic oversight [VP Operations, COO]
- **Clinical Sponsor:** Responsible for reaching clinical consensus on guidelines, protocols and other clinical decisions [Medical Director]
- **Sponsor:** Responsible for timely and successful implementation of the project; addresses departmental project barriers; provides tactical oversight [Department Director or Manager]
- **Process Owner:** Responsible for implementing, controlling, and measuring project outputs and improvements [Department or Unit Manager]
- **Project Manager:** Responsible for project timeline and deliverables [QI or Process Improvement Leader]

The Project Manager will complete the Charter with input from Sponsors and a few key stakeholders. A standard Project Charter template is shown on the following page.

[1] *S.M.A.R.T.: **S**pecific **M**easurable **A**chievable **R**elevant **T**ime-based*

INITIATE PROJECT, *continued*

QI Tool

Project Charter

The Project Charter is a one page summary of the project. The Charter states the reason for the project, overall goal, timeline and those individuals responsible for its success.

Project Overview		
Problem Statement:		
Goal:		
Scope:		
Deliverable(s):		
Resources Required:		
Key Metrics	**Milestones**	
Outcome Metrics: **Process Metrics:**	**Milestone / Description:**	**Date (mm/yy):**
Team Members		
Exec Sponsor:	**Clinical Sponsor:**	
Sponsor:	**Process Owner:**	
Project Leader:	**Team Members:**	

INITIATE PROJECT, *continued*

Because most organizations have limited resources to complete QI projects, it is important that projects are managed effectively. This can be achieved by creating and monitoring a Work Plan. A Work Plan can help the team stay organized, meet deadlines and complete all the steps involved in the project. It enables the Project Leader to plan out every detail and, ultimately, will help ensure the work is completed on time.

QI Tool

Work Plan

A Work Plan can help you to stay organized, meet deadlines and complete all the steps involved in your project. It enables you to plan out every detail. Ideally, your Work Plan should span 4-8 months.

		Planned					
Task Name	**Responsible**	**Start Date**	**Finish Date**	**Duration (weeks)**	**Actual Start**	**Actual Finish**	**% Complete**
Initiate Project				0.0			0%
Interview stakeholders to understand process/issues				0.0			0%
Identify team members and process owners				0.0			0%
Define meeting schedule (team, process, owner, sponsor)				0.0			0%
Hold project kick-off				0.0			0%
Confirm charter				0.0			0%
Establish Baseline				0.0			0%
Identify metrics needed				0.0			0%
Create data collection plan for needed metrics				0.0			0%
Collect baseline measurements				0.0			0%
Create current state process map				0.0			0%
Create communication plan				0.0			0%
Identify Root Cause				0.0			0%
Create detail process map				0.0			0%
Confirm process map				0.0			0%
Perform data analysis				0.0			0%
Perform root cause analysis				0.0			0%
Identify and validate areas of opportunity				0.0			0%
Develop Solution and Implement Improvement				0.0			0%
Generate potential interventions				0.0			0%
Prioritize/Select interventions				0.0			0%
Define future state process				0.0			0%
Determine gaps between current and future state				0.0			0%
Create intervention implementation plan				0.0			0%
Pilot interventions				0.0			0%
Assess and modify interventions as needed				0.0			0%
Evaluate				0.0			0%
Develop monitoring process to track metrics				0.0			0%
Create evaluation/action plan				0.0			0%
Review with sponsors				0.0			0%
Transition full ownership to process owner				0.0			0%

2. Change Management

A successful QI project requires more than a good idea. It needs a project team that will manage expectations, engage stakeholders, and motivate colleagues and staff. The Elevator Speech and Stakeholder Analysis are two proven tools to help QI leaders earn the trust and support of hospital staff.

Change Management

Elevator Speech

An Elevator Speech is a simple-but-effective tool to ensure you can communicate your project quickly and effectively. It has the added benefit of helping your entire team communicate the same message, which avoids confusion and helps others learn by repetition.

Describe the need for your project and the vision of the future state by succinctly completing these phrases:

1. The project objective is to…
2. Here is why it is important to complete…
3. Success will look like…
4. Here's what we need from you… [*This is an elevator speech, so keep it simple – e.g., "Can I set up a brief meeting for next week?"*]

By keeping the speech concise and practicing it out loud, the project team will be able to convey a consistent message to key stakeholders and others in your organization. Here's an example:

In 2015, the average length of stay for elective Carotid Endarterectomy (CEA) patients at ABC Hospital was 3.1 days, which is 63% higher than the median LOS for similar hospitals. Longer LOS requires more resources and puts our patients at risk for post-operative complications. Our multi-disciplinary project team will focus on pre-operative education and improved discharge planning to lower the average LOS for CEA patients below 2.0 days by the end of 2016.

The QI Project Team should apply change management techniques throughout the project with particular emphasis during the Initiate Project and Implement Improvement phases. In the early stages of the project, it helps to make the case for change from both an analytical and an emotional perspective. Once the problem can be quantified and a S.M.A.R.T. goal can be established, people are also more likely to engage in the solution if they have a clear vision of the outcome.

After the improvement solution is selected, another significant change management effort is required for a successful implementation and sustained, long-term results. This is best achieved with thoughtful

CHANGE MANAGEMENT, *continued*

planning and significant communication. People are more likely to engage in the process changes when they understand why change is necessary, what the future state will be, and how it can be achieved.

Change Management

Stakeholder Analysis

A Stakeholder Analysis is an excellent tool for mobilizing commitment. The first step is to identify key constituents and why each is important to the project's success. A stakeholder is any person or group of people who is:

- Responsible for the final decision
- Likely to be affected, positively or negatively, by the outcomes you want
- In a position to assist or block achievement of the outcomes
- Can have influence over other stakeholders

Initially, stakeholder identification may start with larger groups (e.g. surgeons, OR staff), but to be effective we should identify stakeholders as individuals, if possible. In this way we can plan specific actions to close the gap between where we are and where we desire to be.

Although there may be many stakeholders, it is best to limit the group to 5-10 individuals. If the team's list is considerably longer, it probably contains individuals who are important to, but not essential to, launching the change effort. That said, it is important to have a representative of each key group of stakeholders, if possible.

1. Identify stakeholders
2. Assess current state of engagement with project
3. Determine desired state of engagement needed for project success
4. Employ strategies to reduce resistance, gain buy-in and build commitment to QI efforts

	Level of Engagement with QI Project				
Stakeholder	**Resistant** →	**Aware** →	**Understanding** →	**Bought-In** →	**Committed**
Surgeon	▢	→	X		
Director, Surgical Nursing		▢	→		X
VP, Operations		▢	→	X	
Director, IT			▢	→ X	

While this is a subjective analysis, the table above provides a useful format for documenting each stakeholder's initial (▢) and targeted engagement level (**X**). Note that it is not necessary for all stakeholders to be fully committed to the project for it to succeed. In some cases, a basic understanding or buy-in is sufficient.

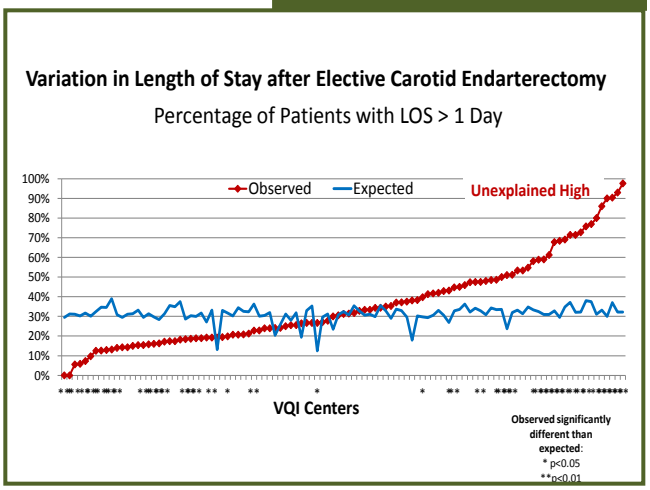
3. Establish Baseline

Typical Timing: 0-1 week (VQI Report) or 2-6 weeks (internal reports)

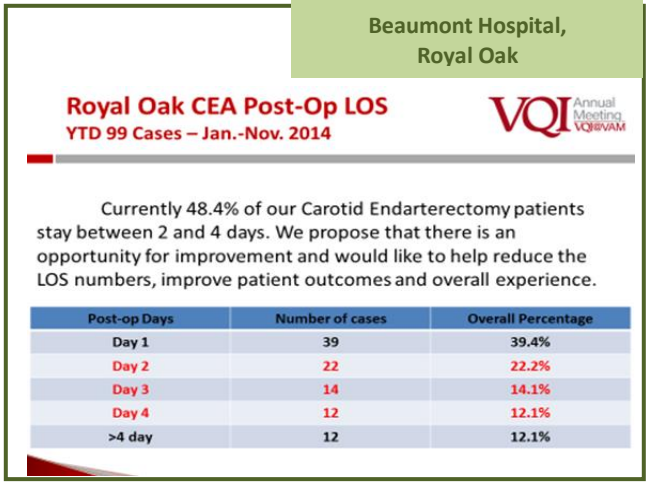
An important advantage of VQI membership is that baseline performance can be easily established by available reports, whereas defining baseline with other data sources would take 4-6 weeks to collect additional data. Further, VQI data can provide benchmark comparisons to help identify targets for improvement, such as in the report shown below.

It is important to define the measure and establish baseline performance prior to addressing the problem. These data may be found in internal performance reports, Center Opportunity Profile for Improvement (COPI) Report, regional or physician level reports, or via the VQI Registries. For the QI project, the center's priority is determining their performance. If this cannot be achieved with data from the VQI analytic engine, further data collection will be necessary.

VQI Report



VQI Case Study



Post-op Days	Number of cases	Overall Percentage
Day 1	39	39.4%
Day 2	22	22.2%
Day 3	14	14.1%
Day 4	12	12.1%
>4 day	12	12.1%

Whether the impetus for the project comes from a VQI COPI Report or Physician-level Report, internal reporting, or anecdotal evidence, a thorough data-driven assessment of baseline performance is required. Prior to collecting baseline data, the team should work with key stakeholders to develop the operational definition of the key metrics. Once the metrics are defined, a data collection (or data abstraction) plan should be created. The plan must ensure that sufficient data are collected to accurately reflect current operations and account for factors that could impact the outcome (e.g., equipment or procedural changes, day of week, surgeon). Creating a focused data collection plan will reduce the likelihood of rework and ensure that the baseline is quantified accurately. For VQI members, this work consists mainly of identifying which of many already-collected data elements are relevant to analyze for the specified project.

ESTABLISH BASELINE, *continued*

Another option for identifying potential QI projects and documenting baseline performance is to create a dashboard of key metrics comparing VQI center performance with national benchmarks. This is particularly useful if your organization needs to evaluate and prioritize project alternatives. In the example below, adapted from a dashboard developed by Memorial Hospital of South Bend, metrics are described in Columns A and B. Center performance (Column E) can then be compared with national average or top-decile performance (Columns F-H).

		[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
							Benchmarking Data		
	#	Metric Name	Metric Description	Weight	Physician Responsibility	Historical Performance	National Source	National Average	National Top Decile (Top 10 Percentile)
Quality Metrics 80%	1	Pre-surgical consult prior to PV Intervention	Elective peripheral vascular cases that will have a surgical consult prior to procedure	10.0%	50%	89.0%	Manual Audit by Quality Management	90.0%	99.0%
	2	Pre-procedure ABI documented for PV Intervention	Elective peripheral vascular cases that will have an ABI documented prior to procedure	10.0%	50%	99.0%	VQI	100.0%	100.0%
	3	TASC (lesion type) documented for PV Intervention	Peripheral vascular cases that have documented TASC (lesion type) in the report	10.0%	50%	88.0%	VQI	84.9%	99.0%
	4	Smoking Cessation Addressed	For patients that currently smoke or have quit within one year, educational materials will be provided and documented within PowerChart for vascular cases	10.0%	50%	92.0%	Manual Audit by Quality Management	90.0%	99.0%
	5	Vascular Surgical Cases with Post-Operative Sepsis	Maintain performance to benchmark comparison for the NSQIP Vascular CPT code group for VQI	10.0%	50%	0.7%	NSQIP	≤ 1%	0.3%
	6	Vascular Surgical Cases with Post-Operative Pneumonia	Maintain performance to benchmark comparison for the NSQIP Vascular CPT code group for VQI	10.0%	50%	1.1%	NSQIP	≤ 1%	0.2%
	7	Cardiac Surgeries (CAB only) with ≥ 4 units of blood usage post-op until discharge	Improve 2013 performance to national or top decile benchmark ranking	20.0%	50%	17.2%	Cedaron-STS	6.1%	3.0%
	8	Ischemic Stroke patients receiving Statins at discharge	Improve 2013 performance to national or top decile benchmark ranking	20.0%	50%	93.9%	Truven (CMS)	94.0%	100.0%
Operations 10%	9	IR: First case of the day on-time start	Number of first cases where pts "time out" is documented at or before 7:30 am, ±15 min as numerator; denominator = all first cases	50.0%	50%	81.0%	Department KPI	70.0%	90.0%
	10	Cath Lab: On-time starts for elective schedules cases	Number of first cases where pts "time out" is documented w/in 15 min of sched case start times as numerator; denominator = elective cases	50.0%	50%	30.0%	Department KPI	70.0%	90.0%
Engagement 10%	11	Cardiology	Improve 2013 performance to national or top decile benchmark ranking	33.3%	20%	37.0%	Advisory Board	40.7%	51.5%
	12	IR	Improve 2013 performance to national or top decile benchmark ranking	33.3%	20%	30.4%	Advisory Board	33.4%	51.5%
	13	Surgery	Improve 2013 performance to national or top decile benchmark ranking	33.3%	20%	23.6%	Advisory Board	25.0%	43.8%

ESTABLISH BASELINE, *continued*

In addition to quantifying baseline performance, it is important to document the current operation using another QI tool, the Process Map. The Project Team will gain important insights into the underlying operation from both the act of creating the Process Map and the map itself.

QI Tool

Process Map *(current)*

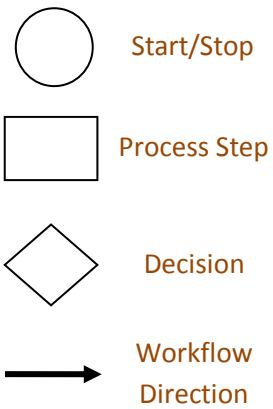
When establishing baseline performance and to gain a better understanding of the process to be improved, it is critical to develop an accurate Process Map. Creating a Process Map is challenging because teams must focus strictly on what is actually happening rather than what they think is happening.

Teams may struggle with drawing a map that represents reality. To guard against this, involve staff and other key stakeholders directly in the process. In addition to gaining their insight, you also may gain their trust, which will make them more likely to engage with the project.

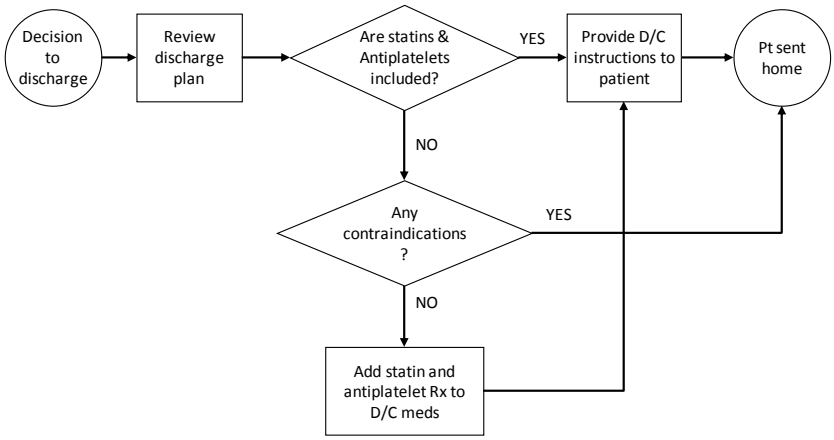
Benefits of Process Maps:

- Can reveal unnecessary, complex, and redundant steps in a process. This makes it possible to simplify and troubleshoot.
- Can compare actual processes against the ideal. Displays what went wrong where.
- Can identify steps where additional data can be collected.

Process Map Elements



Discharge Medication Process

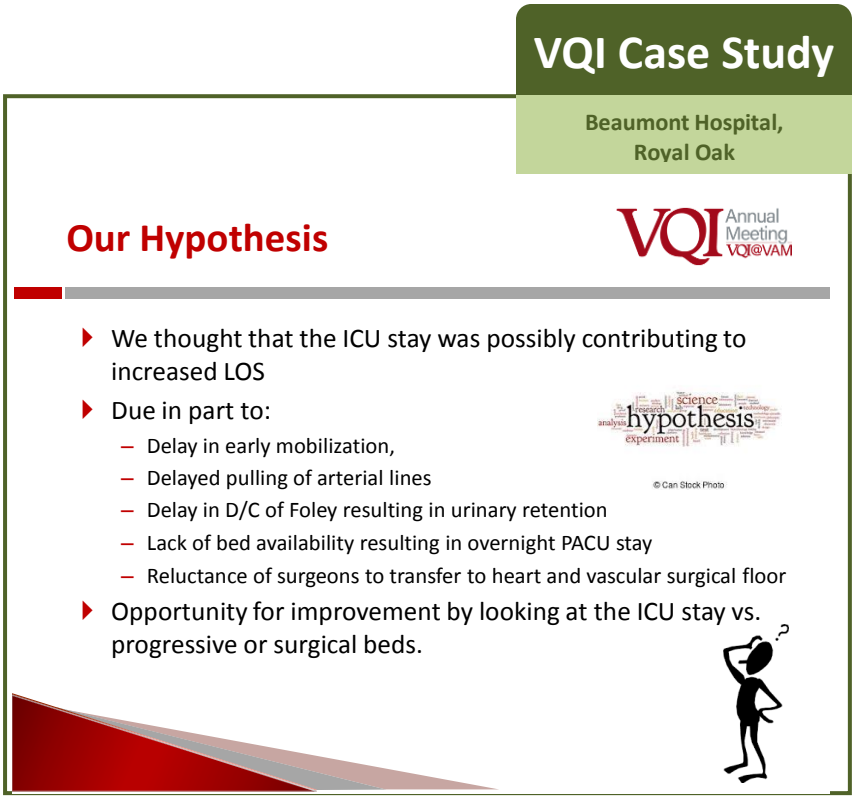


4. Identify Root Cause (Generate Hypothesis)

Typical Timing: 3-4 weeks

In this phase of the QI project, the objective is to identify all factors that have the potential to contribute to a negative outcome and then to winnow this list to those factors most likely to be causing the problem. There are three general aspects of the Root Cause Analysis. These aspects may occur in any sequence depending on the timing of information made available to the team.

- **Exploring**: Investigating the data and/or process with an open mind to gain insights
- **Generating hypotheses about causes**: Using new insights (such as those derived from the Process Map) to identify the most likely causes of negative outcomes
- **Verifying or eliminating causes**: Using data experimentation or further process analysis to verify which of the potential causes significantly contributes to the problem



Graphical display of performance data is an effective tool for both analytical and change management purposes. Presenting data in a graph or table will help to generate hypotheses about where, when and how the problem is occurring and whether any additional probing is necessary. Beyond general data stratification, useful tools include histograms, run charts and Pareto Charts (shown on next page).

IDENTIFY ROOT CAUSE, *continued*

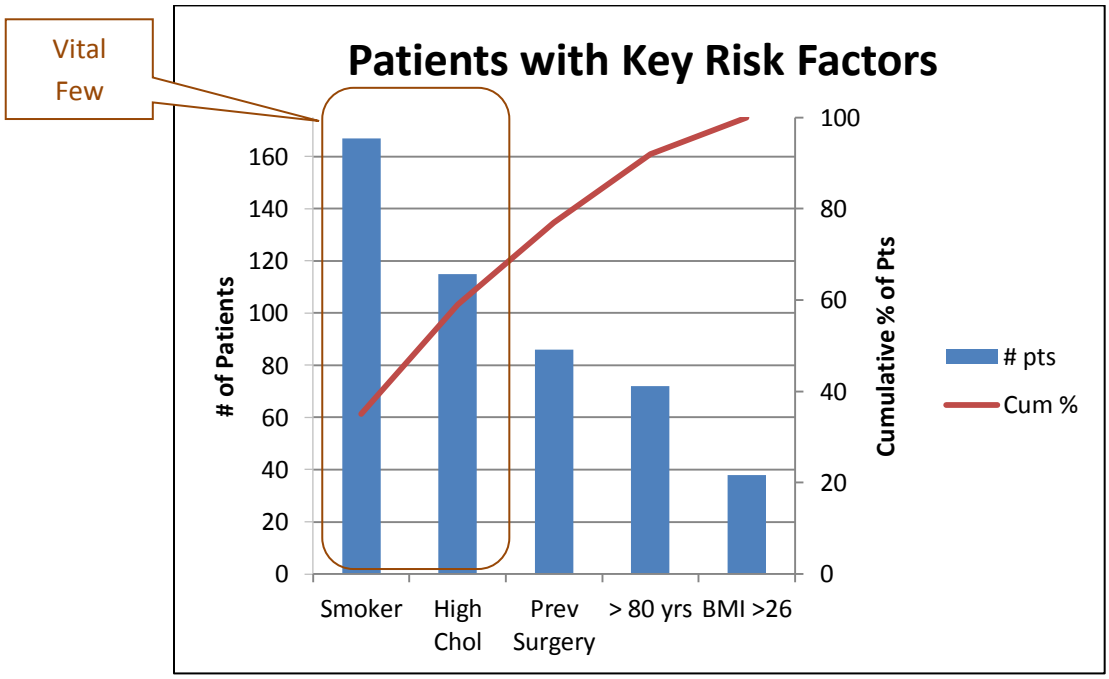
QI Tool

Pareto Chart

The "Pareto Chart" is a type of bar chart used to identify the components of the problem with the biggest impact. By organizing the values in descending order and representing the cumulative total with a line, this is an effective tool for visually identifying and prioritizing the primary contributor(s) to a negative outcome.

Detailed instructions for creating a Pareto Chart are included in the Appendix A3-1.

In this example, the "Vital Few" or root causes are displayed for more than 60% of patients.

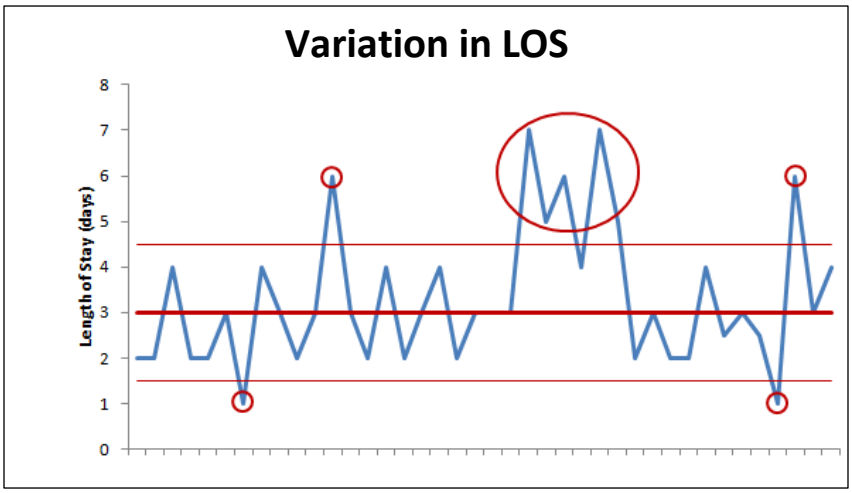


When data are reported over time (e.g., run chart), it is important to recognize that variation should not always prompt an intervention. Only special-cause variation should be acted upon.

- **Common-Cause Variation** ("Business as usual"): Variation in process data which is random and represents the expected variation of the process. We cannot normally associate any particular event in the process with this type of variation.
- **Special-Cause Variation** ("Something changed"): Variation in process data which is not random or expected. It is associated with a particular event or set of events in the process.

IDENTIFY ROOT CAUSE, *continued*

In the length-of-stay (LOS) chart below, common-cause variation is seen within the user-defined limits 1.5 – 4.5 days. The circled LOS values are beyond the acceptable limits and represent special-cause variation. These events should be evaluated to determine why the LOS was lower or higher than anticipated. M2S PATHWAYS Reports and the Analytic Engine offer great opportunities to identify these events and drill down on outlier values.



The VQI Center Opportunity Profile for Improvement (COPI) Report, is a tool that may help identify risk factors or other factors associated with outcomes and performance. In this example, key demographic factors affecting LOS are identified (e.g., age, race). A QI project could be initiated to provide additional services and develop more effective strategies for managing these patient populations.

Patient Safety Listed PSO Organization

COPI Report: Risk Factors and Predictors Associated with EVAR LOS

Your Center Opportunity Profile for Improvement (COPI)

Legend: Lowest 25th percentile; Highest 75th percentile

Reference is for risk factors having more than 2 categories and is the comparison category for the risk factor.

Excludes patients with procedures not on same day of admission or on weekend, patients admitted from a nursing home, death within 2 days after procedure, patients with prior aortic surgery, and nonelective procedures.

EVAR: Risk factors for LOS > 2 days

Patient Characteristics	Odds Ratio	% patients with risk factor: Your center	Your region	VQI
Female	1.7	19%	15%	19%
Person of color	1.9	12%	8%	7%
Age				
Less than 70 years	Reference			
70 to 79 years	1.2	53%	43%	42%
80 years or above	1.8	20%	23%	23%
COPD				
Non-COPD	Reference			
On Medication	1.3	17%	18%	17%
On Home Oxygen	1.4	5%	5%	4%
Procedure details				
Estimated Blood Loss				
<= 150 ml	Reference			
151 - 300 ml	1.3	17%	19%	25%
> 300 ml	2.1	13%	10%	14%
Procedure Time				
<= 120 minutes	Reference			
121 - 180 minutes	1.4	23%	22%	30%
> 180 minutes	2.5	19%	11%	19%
Complex procedure*	1.6	25%	26%	29%

IDENTIFY ROOT CAUSE, *continued*

Among qualitative approaches, the "5 Why's" technique can lead to greater understanding of a problem's root cause. To gain deeper insights into a problem, the Project Manager would ask key stakeholders why a problem exists and then continue to ask another "why" question using the prior answer as the basis for the next question. Several approaches may be used to verify and eliminate (prioritize) potential causes, including statistical tests, Failure Modes Effects Analysis (FMEA), and a control-impact matrix. Once the source(s) of the problem has been identified, the team can focus its attention on generating solutions.

QI Tool

Failure Modes Effects Analysis

A Failure Modes Effects Analysis (FMEA) is a useful tool for both prioritizing potential root causes and testing proposed improvements. Using a structured approach to prioritize potential failures for each step of a given process, the Project Team can identify the improvement opportunities that deserve the most attention. Once prioritized, action plans can be developed for each opportunity.

Here are the high-level instructions for conducting an FMEA (complete instructions are provided in Appendix A4):

1. **Define the FMEA topic**
2. **Assemble the team**
3. **Graphically describe the process**
4. **Conduct the analysis**
   a. Identify the **Failure Modes** for each process step.
   b. Score each Failure Mode on these 3 criteria (1=low, 2=moderate, 3=high)
      i. Severity (SEV): how bad is the effect?
      ii. Frequency (FREQ): how often does it happen?
      iii. Detection (DET): when it occurs, how difficult is it to know?
   c. Calculate Risk Priority Number (RPN) for each failure mode (RPN = product of scores)
5. **Develop action plans**

Sample rows from FMEA table for medications at discharge:

Process Step	Potential Failure Modes	SEV	FREQ	DET	RPN	Recommended Actions
Statins/AP prescribed at discharge	No Rx order placed	3	2	2	**12**	1. Create standard order set 2. Add reminder in discharge plan 3. Add pharmacist review
	Rx ordered, but not in discharge plan	1	3	2	**6**	
	Contraindication	3	1	2	**6**	
Patient takes medication	Rx not filled	2	1	3	**6**	1. Post-discharge call to patient 2. Add reminder to discharge checklist
	Missing or incorrect instructions	2	2	2	**8**	

5. Develop Potential Solution

Typical Timing 4-6 weeks

The Project Team and other key stakeholders should devote sufficient time to generate improvement ideas. Convening a multi-disciplinary group to brainstorm suggestions can produce several potential solutions as long as the brainstorming session is well planned and understood by the participants. When initiating the session, it helps to establish guidelines:

- Clarify, but do not evaluate or criticize ideas.
- Document every proposed idea.
- Do not let current constructs limit "crazy" ideas.
- Encourage participation from everyone.
- Allow time and opportunity to build on ideas.

Brainstorming methods include:

- **Open**: Team members call out potential drivers spontaneously.
- **Slip Method**: The leader asks members to write down their ideas on Post-it® notes. The ideas are collected, shared, and organized.
- **Gallery Walk**: Set up 3-4 focused topics around the room. Break the team into sub-groups and hold mini-open brainstorming sessions. Rotate the teams until each team has addressed all the topics.

Benchmarking is another effective approach that can help the team to develop potential solutions. This tactic is built upon the premise that other organizations have already solved the same problem or that evidence-based practices are not being followed. Whether this work is completed by an individual project team member or a group, the results should be reviewed by key stakeholders to ensure the validity of the comparators. Benchmarking sources include:

- **Internal**: Other practices or units within same organizations or system
- **Competitive:** Top performers with similar patient populations or operating characteristics
- **Functional**: Non-healthcare examples performing a specific process; requires some creativity, but can yield powerful insights (e.g., pre-flight check in; auto-race pit crew)

Once several (e.g., 5-10) potential solutions have been identified, the team will need to prioritize them and decide which 2-3 ideas are worth the time and resources to implement.

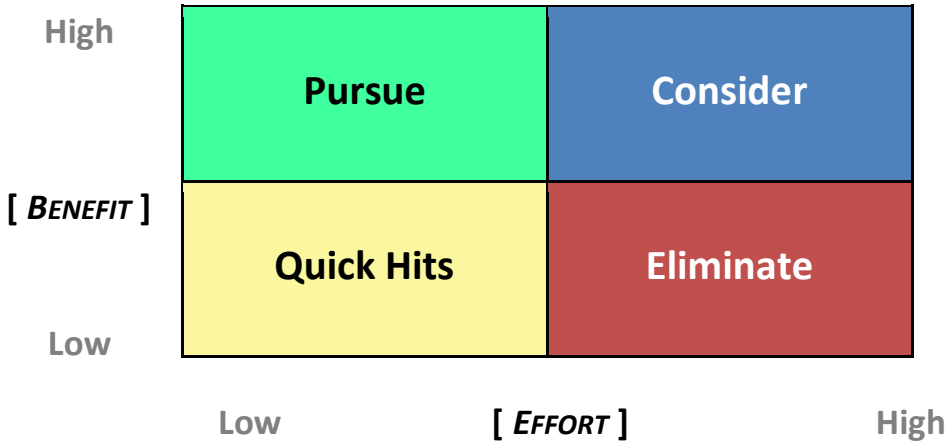
DEVELOP POTENTIAL SOLUTION, *continued*

The "Benefit/Effort Matrix" is a useful tool to prioritize potential solutions.

QI Tool

Benefit/Effort Matrix

This qualitative tool will help teams evaluate and prioritize potential improvement solutions. A Benefit/Effort Matrix looks at the relationship between the benefit expected from the solution and the effort it will take to implement.



Quick Hits: Easily implemented interventions that can help gain buy-in from the team/stakeholders.

- Take minimal effort to implement
- Are reversible
- Are measurable

6. Implement Improvement

Typical Timing: 4-6 weeks

The Project Team will likely have only one opportunity to implement the improvement, so careful planning and thoughtful change management strategies must be employed. If the affected clinicians and staff do not understand why the process is changing or do not have the ability to make the change, a successful implementation is unlikely.

Change Management

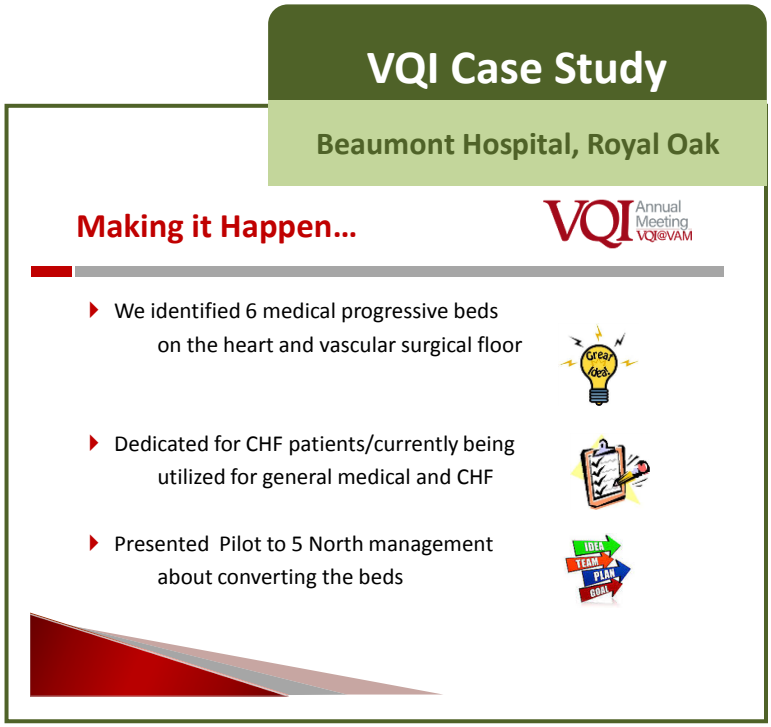
Implementation Plans

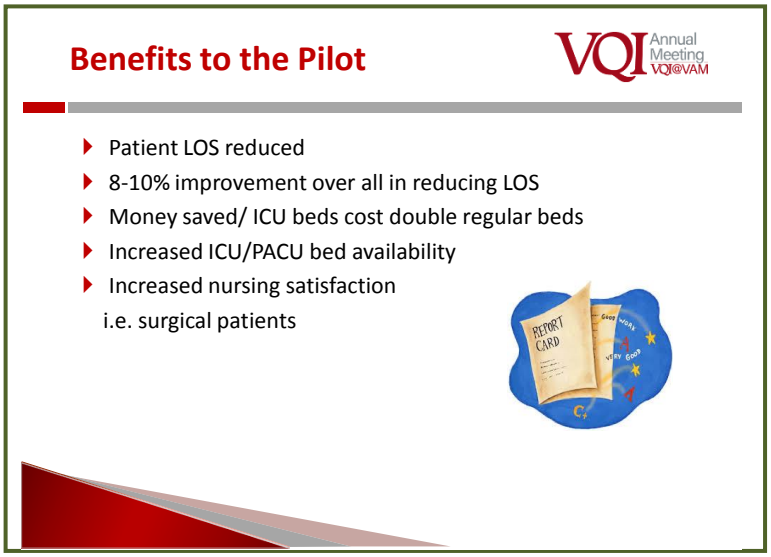
All QI projects will require a set of implementation plans to ensure that the selected improvement solutions will be integrated correctly into daily operations. Here are some of the common elements created in conjunction with the key project stakeholders:

- **Measurement**: How will the process and outcome be measured? What are the operational definitions for each measure? How frequently will performance be measured?
- **Communications**: Consider multiple mediums for articulating the why, what, and how of the proposed solution (e.g., email, meetings, posters, videos, websites).
- **Training**: Be sure to use a multi-disciplinary approach to the training; develop materials; offer many opportunities for staff to receive training.
- **IT**: Seek input from end users; test for unintended consequences; plan for and support go-live.

IMPLEMENT IMPROVEMENT, *continued*

Organizing a pilot study or other small-scale (reversible) rollout of the improvement solution is another proven tactic for implementing a new process. During the VQI Annual Meeting in June 2016, members of the William Beaumont Hospital, Royal Oak team presented the results of their successful pilot study.





7. EVALUATE

Typical Timing: 4-6 weeks / ongoing

Unless strong control measures are put in place, the initial gains resulting from the QI project are at risk of being lost. To sustain these gains, the Project Team will need to plan for this post-implementation period by identifying the responsible person(s) and establishing a process for measuring performance going forward.

The Evaluation & Action Plan will help ensure that the measurable gains generated during the project will be sustained after the project ends. After setting performance targets for the key metric(s), action plans are created in the event that performance falls below the established threshold. By proactively assigning accountability and creating plans, the organization will be able to make the adjustments necessary to maintain the targeted performance levels.

QI Tool

Evaluation/Action Plan

Evaluation & Action Plan Steps
1. Review outcome metric each month to determine whether performance is in control. 2. If performance is beyond threshold, bring together control plan owners and determine which interventions will be used. 3. Control plan owners complete their actions. 4. Re-calculate threshold target if significant change to process has occurred.

Evaluation				
Metric	**Goal**	**Threshold For Action**	**Timing**	**Owner**
A)				
B)				

Action Plan (if necessary)			
Metric	**Intervention**	**Description**	**Owner**
A)	Action #1 Action #2	• • • •	
B)	Action #1 Action #2	• • •	

EVALUATE, *continued*

Most organizations have dashboards or scorecards to monitor the status of key metrics. Including the project's key outcome or process metric in an organizational dashboard is an effective way to hold clinicians and staff accountable.

VQI Case Study

Memorial Hospital of South Bend
Quarterly reviews for all indicators – Pay for Performance (P4P) and non-P4P

Vascular Score Card: 2014-15

Vascular	National Average	Top Decile	Baseline 2014	2015 YTD
Pre surgical consult prior to PV intervention	(goal) 90%	99%	n/a	99.40%
Pre procedure ABI documented prior to PV intervention	100%	100%	54.50%	96.20%
TASC (lesion type) documented prior to PV intervention	85%	99%	36.40%	93.70%
Stain plus ASA or Coumadin or Plavix (or other appropriate antiplatelet therapy) on discharge/ or documented contraindications for PVI	60.40%	90%	65.90%	92.20%
Smoking cessation addressed across all VQI modules	(goal) 90%	99%	n/a	94.10%
Contrast use(ml)-Carotid Artery Stent (mean)	< 92.7ml		n/a	59.4ml
Contrast use(ml)- EVAR (mean)	<100.2 ml		157.6ml	111.4ml
Contrast use(ml)- PV Intervention (mean)	< 97.6 ml		118.9ml	92.7ml
Flouroscopy Time(min)-PV intervention (mean)	17.5 min		16.2min	12.1min

Vascular Surgery	National Average	Top Decile	Baseline 2014	2015 YTD
Vascular Surgery with post-op sepsis	<1%	0.3	6.7%	0.96%
Vascular surgery with post-op pneumonia	<1%	0.2	0%	1.9%

All successful projects need to be celebrated. Recognition of the team's hard work and improved outcomes can take many forms. Examples include formal recognition by senior leaders, an article in organizational newsletter/intranet, poster at a quality program and, of course, food.

Lastly, as a benefit to the VQI community, please share your QI project experience with the SVS PSO so this Guide can be updated. Our goal is to maintain the relevance of this document by including project experience and best practices from VQI centers. Your participation is appreciated.

QI RESOURCES

The material provided in this QI Project Guide is a small subset of the publicly available material detailing quality improvement work. Additional resources can be found in the books and websites noted below.

Quality / Lean Six Sigma

1. *Health Care Quality: The Clinician's Primer* – David Nash, MD MBA
2. *Lean Six Sigma for Hospitals* – Jay Arthur
3. *On the Mend: Revolutionizing Healthcare to Save Lives and Transform the Industry* - John Toussaint, MD (former CEO of Thedacare) and Roger Gerard
4. *The Toyota Way* – Jeffrey K. Liker
5. *Transforming Healthcare: Pursuing the Perfect Patient Experience (Virginia Mason Medical Center)* – Charles Kenney

Change Management

1. *ADKAR: A Model for Change in Business, Government and Our Community* – Jeff Hiatt
2. *Leading Change* – John Kotter
3. *Switch: How to Change Things When Change is Hard* – Chip & Dan Heath

Professional Organizations

1. ASQ (American Society for Quality) – www.asq.org/divisions-forums/health/
2. IHI (Institute for Healthcare Improvement) – www.ihi.org
3. SHS (Society for Health Systems) – http://www.iienet2.org/SHS/details.aspx?id=18218

QI Tools & Training Materials

1. AHRQ Quality Indicators™ Toolkit for Hospitals
   http://www.ahrq.gov/professionals/systems/hospital/qitoolkit/index.html
2. ASQ Quality Tools & Applications
   http://www.asq.org/enews/healthcare-update/tools-apps-index.html
3. IHI Model for Improvement
   http://www.ihi.org/resources/Pages/HowtoImprove/default.aspx
4. Joint Commission Center for Transforming Healthcare
   http://www.centerfortransforminghealthcare.org/
5. HRSA (Health Resources and Services Administration)
   http://www.hrsa.gov/quality/toolbox/methodology/qualityimprovement/

M2S PATHWAYS Step-by-Step Reporting Tools

The next update of this guide will include M2S PATHWAYS Step-by-Step Reporting Tools and Instructions.

APPENDICES – QI TOOLS AND SAMPLE VQI REPORTS

1. QI Tools
   - Project Charter (Appendix A1)
   - Work Plan (Appendix A2)
   - Pareto Chart (Appendix A3)
   - Failure Mode Effects Analysis (FMEA) (Appendix A4)
   - Evaluation & Action Plan (Appendix A5)

2. Sample VQI Reports (PDF Samples)

   The VQI Center Opportunity Profile for Improvement (COPI) Reports provide centers with regional and national benchmark comparisons and an analysis of risk factors that help identify areas for quality improvement. The VQI Physician Reports provide information for individual physicians on how their performance compares to their peers and suggests opportunities for improvement.

   - COPI Report - 30 Day Stroke Rates and One Year Survival after CEA in Asymptomatic Patients (Appendix A6)
   - VQI Physician Report – Proportion of Asymptomatic Patients Undergoing Elective CEA Who Have Greater than 5% Risk of Death Within One Year (Appendix A7)

Project Charter

Project Overview		
Problem Statement:		
Goal:		
Scope:		
Deliverable(s):		
Resources Required:		
Key Metrics	**Milestones**	
Outcome Metrics: **Process Metrics:**	**Milestone / Description:**	**Date (mm/yy):**
Team Members		
Exec Sponsor:	**Clinical Sponsor**:	
Sponsor:	**Process Owner**:	
Project Leader:	**Team Members**:	

Project Charter – Guiding Questions

Project Overview

Problem Statement:

"What is wrong with our current process? Why do we care?"

- create a statement that is specific, measurable, and relevant; include data or use placeholders until you get the data

Goal:

"What specifically do we want to achieve as measured by X, and when do we want to achieve it?

- e.g., "Reduce LOS by 0.5 days for elective EVAR patients by the 4th quarter."

Scope:

"For this project: (1) What areas will we improve and over what time period will we do the improvement? (2) What are the limitations of resources?)"

- e.g., "This project will include Surgical units, not Medicine units, for the first two quarters of the fiscal year."

Deliverable(s):

"What new processes will we deliver in order to achieve our goals?"

Resources Required:

"What people, materials, and/or finances will be needed to conduct the project? Who must be kept informed?"

Key Metrics

Outcome Metrics:

"How will you know the project is successful?"

e.g., LOS, surgical site infection rates

Process Metrics:

"How will you ensure the interventions you implement are being completed?"

e.g., % pts on progressive care unit, % discharged patients on statins and anti-platelets Rx

Milestones

Milestone / Description:	Date:
Complete "QI Project Overview"	Month 1
Confirm baseline outcome metric	Month 2
Identify root cause / hypothesis	Month 3
Identify potential improvement(s)	Month 4
Implement improvement(s)	Month 4-5
Evaluate progress & confirm action plan	Month 6

Team Members

Exec Sponsor:

Sponsor:

Project Leader:

Clinical Sponsor:

Process Owner:

Team Members:

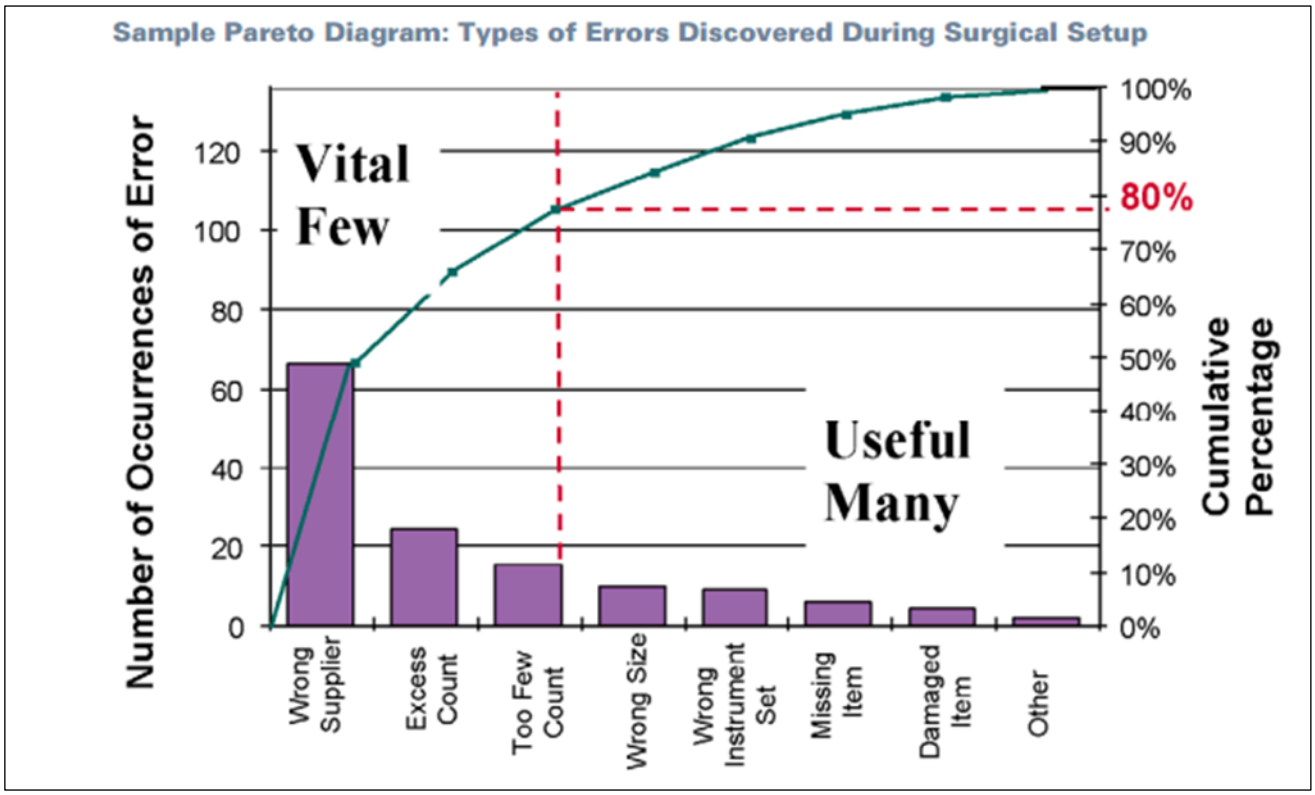
Project Work Plan

		Planned					
Task Name	**Responsible**	**Start Date**	**Finish Date**	**Duration (weeks)**	**Actual Start**	**Actual Finish**	**% Complete**
Initiate Project				0.0			0%
Interview stakeholders to understand process/issues				0.0			0%
Identify team members and process owners				0.0			0%
Define meeting schedule (team, process, owner, sponsor)				0.0			0%
Hold project kick-off				0.0			0%
Confirm charter				0.0			0%
Establish Baseline				0.0			0%
Identify metrics needed				0.0			0%
Create data collection plan for needed metrics				0.0			0%
Collect baseline measurements				0.0			0%
Create current state process map				0.0			0%
Create communication plan				0.0			0%
Identify Root Cause				0.0			0%
Create detail process map				0.0			0%
Confirm process map				0.0			0%
Perform data analysis				0.0			0%
Perform root cause analysis				0.0			0%
Identify and validate areas of opportunity				0.0			0%
Develop Solution and Implement				0.0			0%
Generate potential interventions				0.0			0%
Prioritize/Select interventions				0.0			0%
Define future state process				0.0			0%
Determine gaps between current and future state				0.0			0%
Create intervention implementation plan				0.0			0%
Pilot interventions				0.0			0%
Assess and modify interventions as needed				0.0			0%
Evaluate				0.0			0%
Develop monitoring process to track metrics				0.0			0%
Create evaluation/action plan				0.0			0%
Review with sponsors				0.0			0%
Transition full ownership to process owner				0.0			0%

Pareto Chart

Guidance from the Institute for Healthcare Improvement (IHI)[2]:

1. Collect data about the contributing factors to a particular effect (e.g., the types of errors discovered during surgical setup).
2. Order the categories according to magnitude of effect. If there are many insignificant categories, they may be grouped together into one category labeled "other".
3. Write the magnitude of contribution (e.g., frequency of error) next to each category and determine the grand total. Calculate the percentage of the total that each category represents.
4. Working from the largest category to the smallest, calculate the cumulative percentage for each category with all of the previous categories.
5. Draw and label the left vertical axis with the unit of comparison (e.g., "Number of Occurrences of Error", from 0 to the grand total).
6. Draw and label the horizontal axis with the categories (for example, "Type of Error"), largest to smallest from left to right.
7. Draw and label the right vertical axis "Cumulative Percentage", from 0 to 100 percent, with the 100 percent value at the same height as the grand total mark on the left vertical axis.
8. Draw a line graph of the cumulative percentage, beginning with the lower left corner of the largest category (the "0" point).
9. Analyze the diagram to indicate the cumulative percentage associated with the "vital few" (e.g., three error types account for 80 percent of all errors).



[2] http://www.ihi.org/resources/Pages/Tools/ParetoDiagram.aspx

Failure Modes Effects Analysis (FMEA)

An FMEA can be used to identify drivers or to pre-test a solution. FMEAs pair well with detailed process maps. Here are the high-level instructions for conducting an FMEA:

1. **Define the FMEA topic** – This may be the entire focus of the project or a sub-component
2. **Assemble the team** – Include staff and key stakeholders that represent all aspects of the process; assembling a multi-disciplinary team will ensure that the FMEA is thorough and the results are credible
3. **Graphically describe the process** – Create a process map and clearly identify which steps are in and out of scope
4. **Conduct the analysis** –
    a. Identify the **Failure Modes** for each process step. Failure modes are the different ways that a process or sub-process can fail to provide the anticipated result.
    b. Score each failure mode. Assign a risk score of 1, 2, or 3 points for severity, frequency of occurrence, and probability that the failure would be detected and corrected before harm could occur.
        i. *Severity* – how bad is the effect?
        ii. *Frequency* – how often does it happen?
        iii. *Detection* – when it happens, how hard is it to know?
    c. Calculate a Risk Priority Number (RPN) for each failure mode by multiplying the assigned value for severity, occurrence, and detection. [*RPN = severity x occurrence x detection*]
5. **Develop Action Plans** – Prioritize the process steps with highest RPN and develop action plans for each of these steps. These action plans should include specific due dates and persons with assigned responsibility for carrying out the plans.

For more information on FMEA, please visit the VA National Center for Patient Safety web page: (http://www.patientsafety.va.gov/professionals/onthejob/hfmea.asp)

Process Step	Potential Failure Modes	Sev	Freq	Det	RPN	Recommended Actions
Statins/AP prescribed at discharge	No Rx order placed	3	2	2	**12**	1. Create standard order set 2. Add reminder in discharge instructions 3. Add pharmacist review
	Rx ordered, but not included in discharge plan	1	3	2	**6**	
	Contraindication	3	1	2	**6**	
Patient takes medication	Rx not filled	2	1	3	**6**	4. Post-discharge call to patient 5. Add reminder to discharge checklist
	Missing or incorrect instructions	2	2	2	**8**	

Evaluation/Action Plan

Evaluation/Action Plan Steps
1. Review outcome metric each month to determine if performance is in control. 2. If performance is beyond threshold, bring together control plan owners and determine which interventions will be used. 3. Control plan owners complete their actions. 4. Re-calculate threshold target if significant change to process has occurred.

Evaluation				
Metric	**Goal**	**Threshold For Action**	**Timing**	**Owner**
A)				
B)				

Action Plan (if necessary)			
Metric	**Intervention**	**Description**	**Owner**
A)	Action #1 Action #2	• • • •	
B)	Action #1 Action #2	• • • •	

SOCIETY FOR VASCULAR SURGERY
SVS PSO
PATIENT SAFETY ORGANIZATION

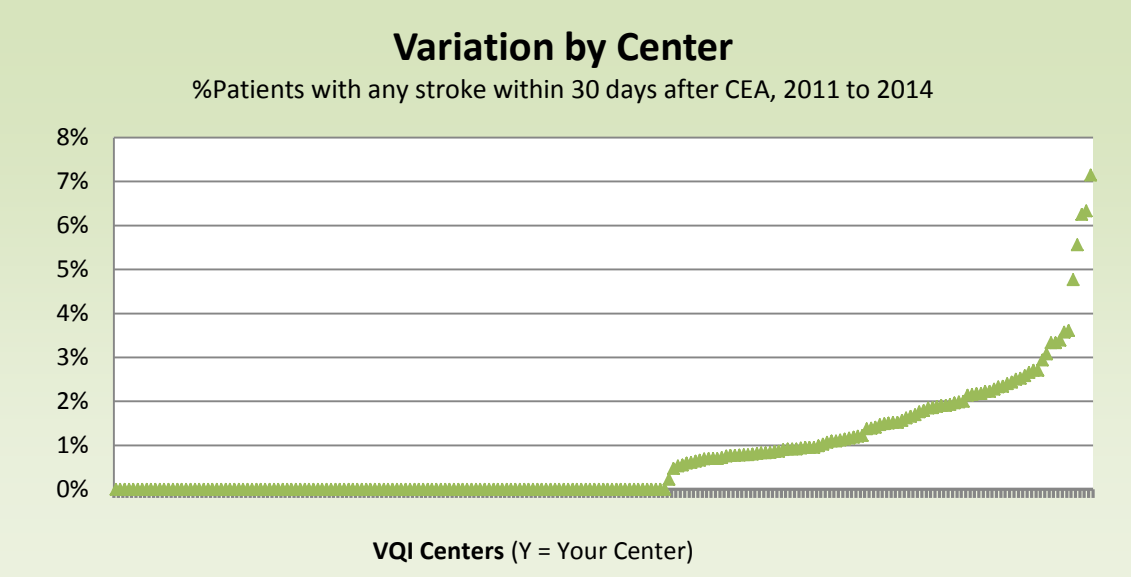
The mission of the SVS PSO is to improve patient safety and the quality of vascular health care delivery by providing web-based collection, aggregation and analysis of clinical data submitted to the registry.

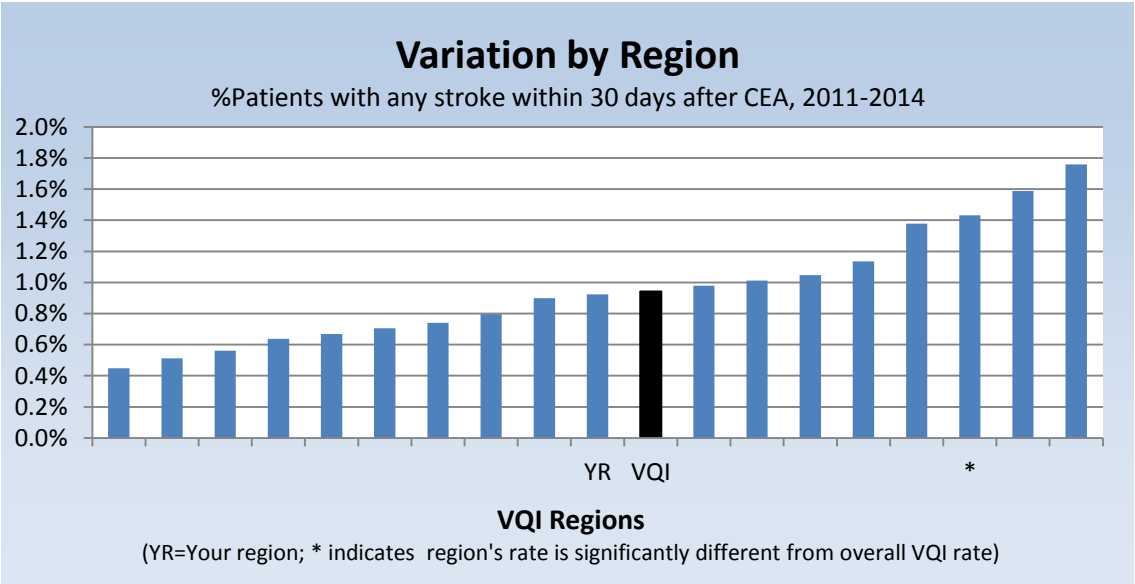
In our continuing effort to improve the quality, safety, effectiveness and cost of vascular health, the Vascular Quality Initiative® (VQI) is pleased to provide you with this Center Opportunity Profile for Improvement (COPI) report concerning 30-day stroke rates and one-year survival after elective carotid endarterectomy (CEA) in asymptomatic patients.

CEA for asymptomatic internal carotid artery stenosis is a prophylactic procedure intended to reduce stroke risk. Since the stroke risk without CEA is not high, patients must have both a low risk of perioperative stroke and long expected survival to gain benefit from the procedure. This COPI report provides insight into the 30-day stroke rate after CEA in asymptomatic patients as well as their late survival, to potentially allow better patient selection.

Any Stroke Within 30 Days After CEA, 2011-2014

Many centers perform CEA with a 30-day stoke rate under 1%, but variation exists across centers and regions in this important outcome. The graph below shows the center variation in the percent of patients with any 30-day stroke after CEA across VQI centers (from 2011 through 2014) for elective and asymptomatic patients.





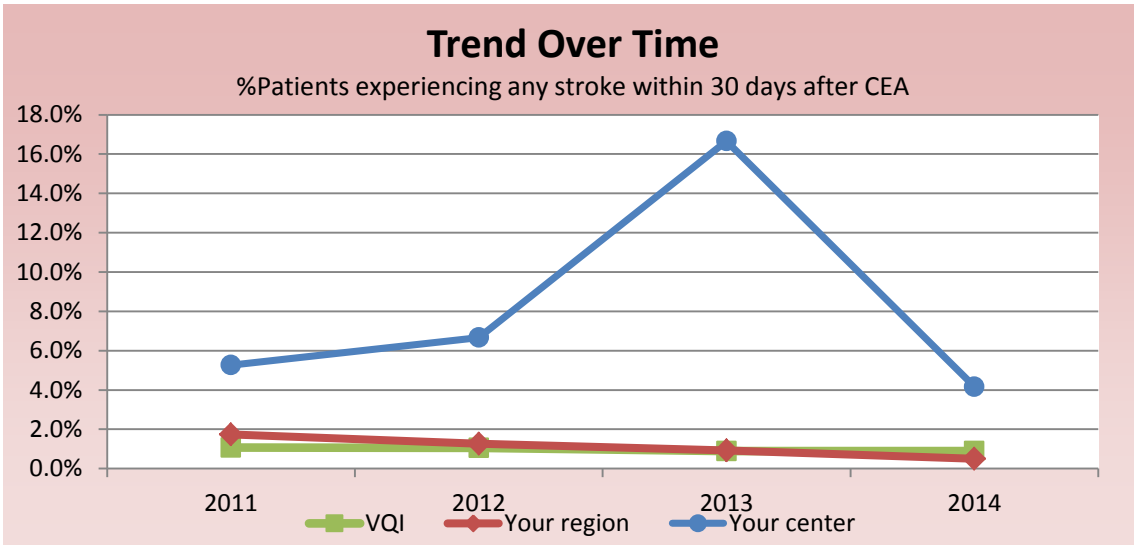
The regional variation chart above shows that only one region has a 30-day stroke rate that is significantly different from the overall VQI rate.

Your center's CEA volume is shown in the table below, as well as the volume for your region and for the VQI overall. In addition, your center's 30-day stroke rate is shown, with statistical calculations of whether your rate differs significantly from the rates for your region and for the VQI overall.

	Your center	Your region	VQI
Number of procedures, 2011-2014	132	3807	37678
Number of procedures excluded*	53	1316	13471
Number of procedures included	79	2491	24207
30-Day Stroke Rate**	6.3%	0.9%	0.9%
Is your center's rate significantly different from the regional rate?	**p<.01**	Center rate is significantly higher than regional rate	
Is your center's rate significantly different from the overall VQI rate?	**p<.01**	Center rate is significantly higher than VQI rate	

*Patients with non-elective admission and/or prior ipsilateral cortical, ocular or vertebrobasilar event are excluded
**Stroke is defined as any minor or major stroke (excluding TIA) within 30 days of date of surgery

The line graph below shows the percentage of patients experiencing stroke within 30 days after CEA in your center over time, compared with all VQI centers and centers in your region.



In order to decrease the risk of stroke within 30 days after CEA, it is necessary to understand which factors are independently associated with postop stroke. To determine this, we performed multivariable logistic regression regarding patient characteristics, procedure details and post-op complications that might affect the likelihood of stroke. Significant predictors of stroke are listed in the Center Opportunity Profile for Improvement (COPI) report on the next page.

The COPI report lists all risk factors independently associated with stroke after CEA in asymptomatic patients along with the percentage of patients at your center with that risk factor. Factors are highlighted in red if your center was above the 75th percentile (indicating a potential opportunity to reduce your stroke rate) and green if your center was below the 25th percentile (indicating less opportunity). The report also contains the odds ratio (OR) for each risk factor from the logistic regression model. This shows how much each risk factor contributes to the likelihood of stroke. An OR of 2 means patients with this risk factor have twice the odds of stroke compared to a risk factor with an OR of 1. Thus, ORs are a way to rank the risk factor's impact on the chances of stroke.

Patient characteristics that increase the likelihood of stroke can usually not be modified, but can help in patient selection. Procedure details are potentially modifiable and represent opportunities to reduce chances of stroke. Post-operative complications have a very large influence on the likelihood of stroke and represent the greatest opportunity for improvement.

For more information about your report, contact Carrie Bosela at C.Bosela@svspso.org.

Jack Cronenwett, MD, SVS PSO Medical Director

Your Center Opportunity Profile for Improvement (COPI)

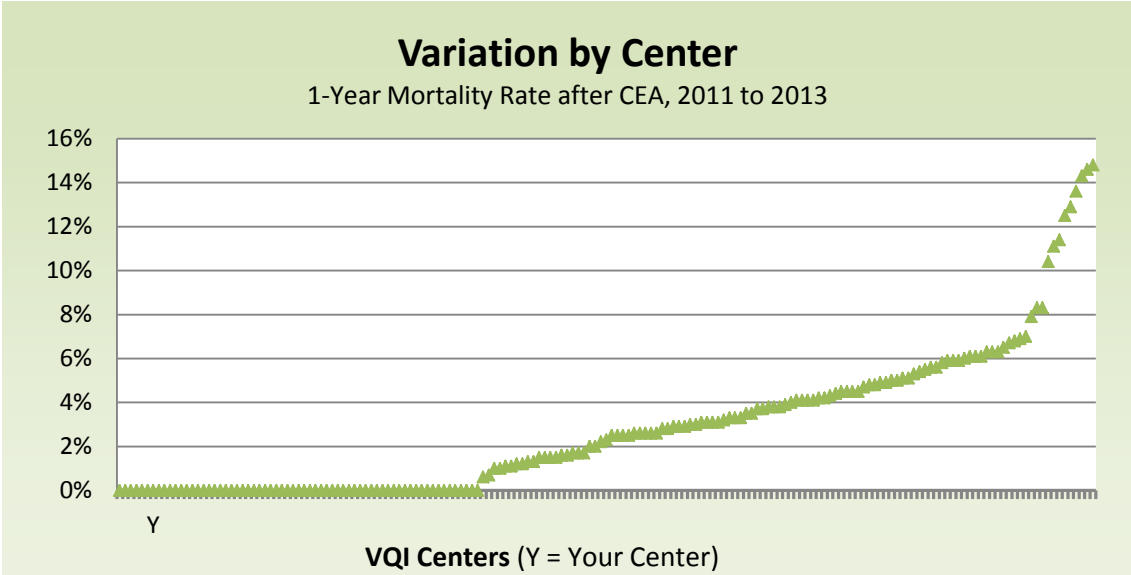
Legend: ≤ 25th percentile | ≥ 75th percentile

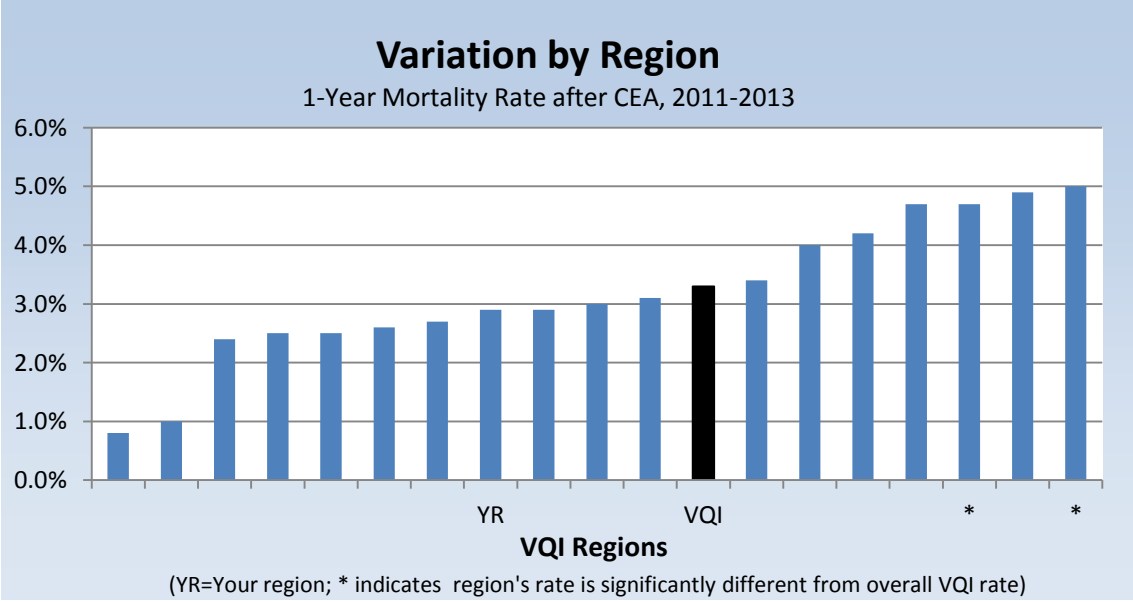
Excludes patients with non-elective admissions and patients with prior cortical, ocular or vertebrobasilar events.

Risk factors for 30-Day Stroke After CEA		% Patients with risk factor, 2011-14		
Patient characteristics	**Odds ratio**	**Your center**	**Your region**	**VQI**
Female (vs. Male)	1.6	58.0%	42.1%	40.7%
History of aneurysm repair	2.2	0.0%	2.6%	3.2%
Preop ASA only (vs. ASA+P2Y12 antagonist)	2.0	53.1%	65.3%	62.0%
Neither preop ASA nor P2Y12 antagonist (vs. both)	2.8	7.4%	8.1%	12.7%
History of ipsilateral CEA	2.2	4.9%	2.2%	2.1%
Contralat. stenosis >70% (vs. <50%)	1.6	20.6%	19.3%	18.7%
Contralateral occlusion (vs. <50% stenosis)	2.7	7.4%	5.6%	5.5%
Procedure details				
Reexplore after closure	9.1	1.3%	1.5%	1.5%
Postop complications				
Cranial nerve injury	3.6	2.5%	1.8%	2.9%
Any postop MI	1.9	1.3%	1.4%	2.0%
Dysrhythmia	3.8	0.0%	0.5%	0.8%
IV meds for hyper/hypotension postop	2.2	24.1%	30.1%	26.4%
Reperfusion symptoms	29.3	0.0%	0.1%	0.1%

One-Year Mortality After CEA, 2011-2013

Patients with asymptomatic > 60% internal carotid artery stenosis have been estimated to have ipsilateral stroke risk from 1-2% per year under best modern medical management. Perioperative stroke risk after CEA in asymptomatic patients varies by center, as shown previously. In any case, patients must live at least several years to offset perioperative stroke risk with later stroke reduction. The data below show 1-year mortality among asymptomatic patients who were treated with CEA. If this rate is not very low, it suggests that patient selection could be improved, to avoid unnecessary or potentially harmful surgery.





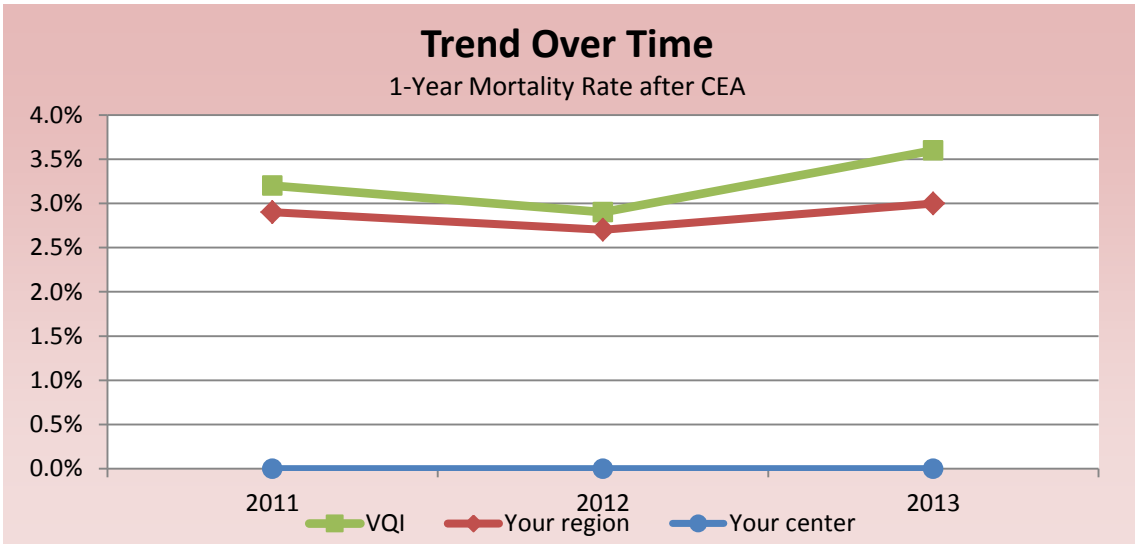
The regional variation chart above shows that only two regions have a 1-year mortality rate that is significantly different from the overall VQI rate.

The table below shows your center's 1-year mortality rate, with statistical calculations of whether your rate differs significantly from the regional and overall VQI rates.

	Your center	Your region	VQI
Number of procedures, 2011-2013	96	2356	22983
Number of procedures excluded*	39	840	8209
Number of procedures included	57	1516	14774
1-Year Mortality Rate	0.0%	2.9%	3.3%
Is your center's rate significantly different from the regional rate?	**NS**	Center rate not significantly different from regional rate	
Is your center's rate significantly different from the overall VQI rate?	**NS**	Center rate not significantly different from VQI rate	

*Patients with non-elective admission and/or prior ipsilateral cortical, ocular or vertebrobasilar event are excluded

The line graph below shows the percentage of patients who died within 1 year after CEA in your center over time, compared with all VQI centers and centers in your region.



To determine the factors that are independently associated with 1-year mortality after CEA, we performed multivariable logistic regression regarding patient characteristics, procedure details and post-op complications that might affect the likelihood of death. Significant predictors of mortality are listed in the table on the next page.

As in the previous table for 30-day stroke, the table below shows all risk factors independently associated with 1-year mortality after CEA, along with the percentage of patients at your center with that risk factor. Factors are highlighted with red if your center was above the 75th percentile (indicating a potential opportunity to reduce your mortality rate) and green if your center was below the 25th percentile (indicating less opportunity). The report also contains the odds ratio (OR) for each risk factor from the logistic regression model.

Your Center Opportunity Profile for Improvement (COPI)

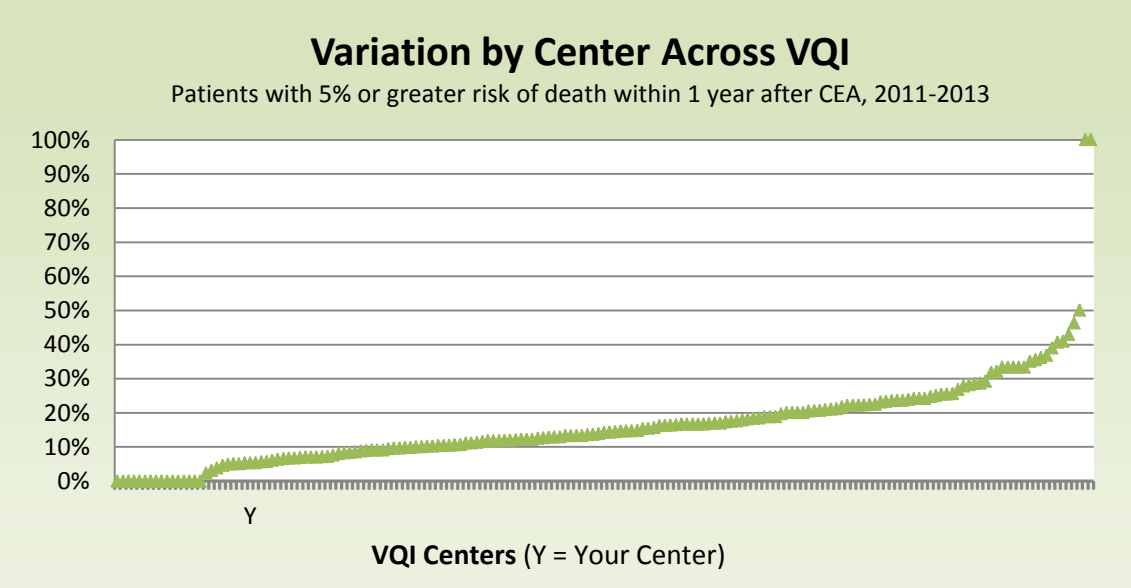
Legend: ≤ 25th percentile | ≥ 75th percentile

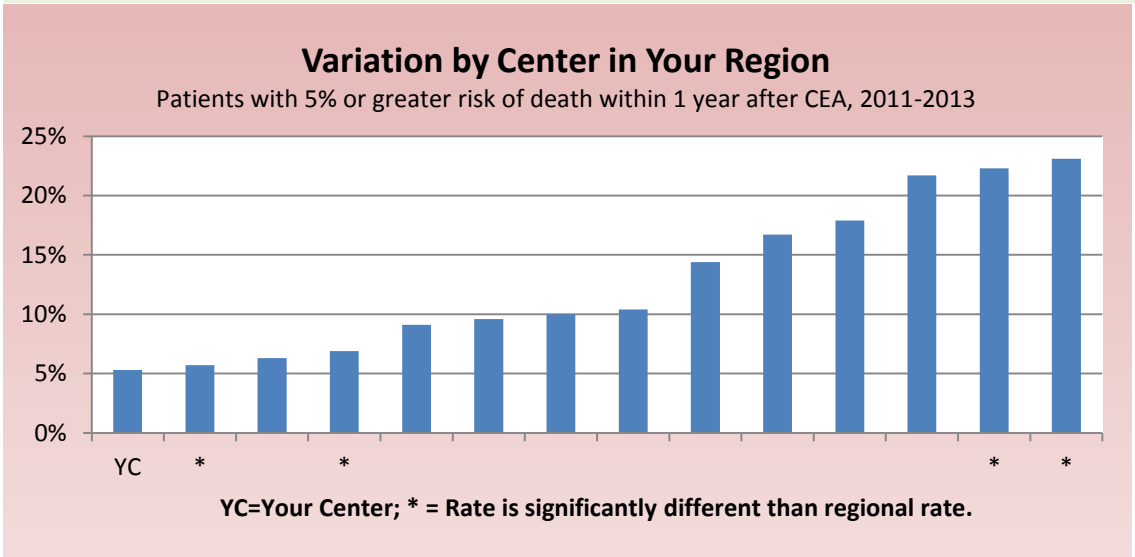
Excludes patients with non-elective admissions and patients with prior cortical, ocular or vertebrobasilar events.

Risk factors for 1-Year Mortality After CEA		% Patients with risk factor, 2011-2013		
Patient characteristics	**Odds ratio**	**Your center**	**Your region**	**VQI**
Age 80-89 (vs. Age <60)	2.2	21.1%	12.2%	16.4%
Age 90+ (vs. Age <60)	3.8	3.5%	0.7%	0.7%
Prior or current smoker	1.3	70.2%	77.3%	76.6%
Any CHF	1.8	3.5%	8.4%	9.9%
COPD treated with medication (vs. None)	2.0	12.3%	12.9%	12.0%
COPD treated with home oxygen (vs. None)	2.5	0.0%	1.4%	1.9%
30≤ eGFR <60 (vs. ≥90)	1.6	31.6%	34.0%	33.2%
15≤ eGFR <30 (vs. ≥90)	3.0	5.3%	3.0%	3.3%
eGFR < 15 or on dialysis (vs. ≥90)	3.9	0.0%	0.8%	1.5%
HGB <12 g/dl (vs. >12)	2.4	28.1%	23.7%	24.9%
History of bypass/PVI	1.3	19.3%	15.6%	14.7%
No preop P2Y12 antagonist or ASA (vs. Both)	1.6	7.0%	7.7%	13.1%
Preop P2Y12 only (vs. Both P2Y12 and ASA)	1.8	7.0%	3.6%	4.3%
Contralateral occlusion (vs. ≤50% stenosis)	2.1	5.3%	4.7%	5.4%
Postop complications				
IV meds for hyper/hypotension postop	1.5	15.8%	29.5%	26.7%
Dysrhythmia	2.0	1.8%	1.6%	2.1%
Postop CHF	2.3	0.0%	0.6%	0.6%
Reperfusion symptoms	19.1	0.0%	0.1%	0.1%
Return to OR	2.5	1.8%	1.2%	1.7%
Discharge medications				
No ACE_I Inhibitor (vs. Any)	1.4	50.9%	47.2%	48.2%

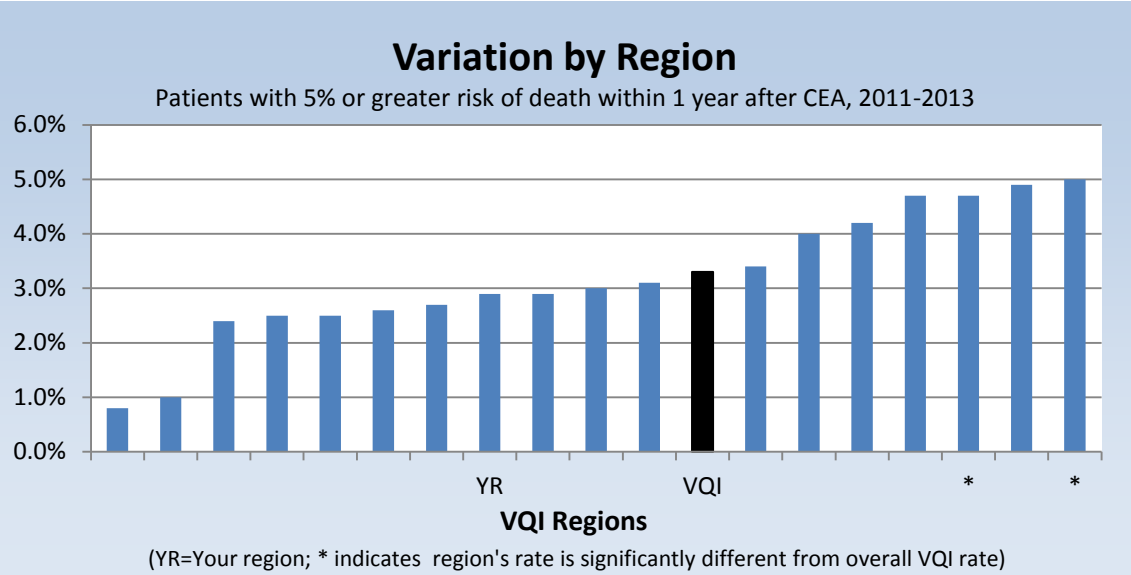
It is difficult to predict who will survive long enough to benefit from prophylactic CEA. To assist in describing overall patient selection at your center and across VQI, we used the multivariable logistic regression model presented in the table above to estimate the probability of death within 1 year for each patient. We then used these probabilities to determine the proportion of patients treated at each center who had a 5% or greater risk of death within 1 year after surgery, assuming that a patient with 5% risk of death in a year would gain little benefit from CEA for asymptomatic disease. The following table and graphics show the proportion of patients with 5% or greater risk treated at your center, in your region and in the VQI overall and the variation across centers in your region and across regions in the VQI. Since these represent estimates, this information can be used to assess and improve overall patient selection for CEA at your center.

	Your center	Your region	VQI
Number of included procedures, 2011-2013	57	1516	14774
Proportion of patients with 5% or greater risk of death within 1 year	5.3%	13.6%	16.3%





The variation charts above demonstrate the proportion of asymptomatic patients undergoing CEA with a 5% or higher risk of death at one year. Across VQI centers, this varied from 0% to 100%. The center variation chart demonstrates your center compared to other centers in your region.



The regional variation chart compares your region to other regions for this metric. This demonstrates two regions have a proportion of patients with 5% or greater risk of 1-year death that is significantly different thant the overall VQI rate.

VQI Physician Report:

Proportion of Asymptomatic Patients Undergoing Elective CEA Who Have >5% Risk of Death Within 1 Year (2012-2015)

Includes only patients with no prior neurological symptoms undergoing elective procedures. Risk of death within 1 year is estimated by a statistical model that adjusts for patient and procedural factors and post-op

CEA for asymptomatic internal carotid artery stenosis is a prophylactic procedure intended to reduce stroke risk. Thus, patients must have good survival to offset the upfront risk of the procedure, and thus gain overall benefit.

At a minimum, most would agree that asymptomatic patients must live at least one year after CEA to benefit from the procedure. We developed a model to predict which asymptomatic patients undergoing prophylactic CEA in VQI would die within one year of surgery due to various comorbidities. If asymptomatic patients have a predicted one-year mortality of 5% or more, it is unlikely they will benefit from the stroke risk reduction vs. operative stroke risk conferred by CEA.

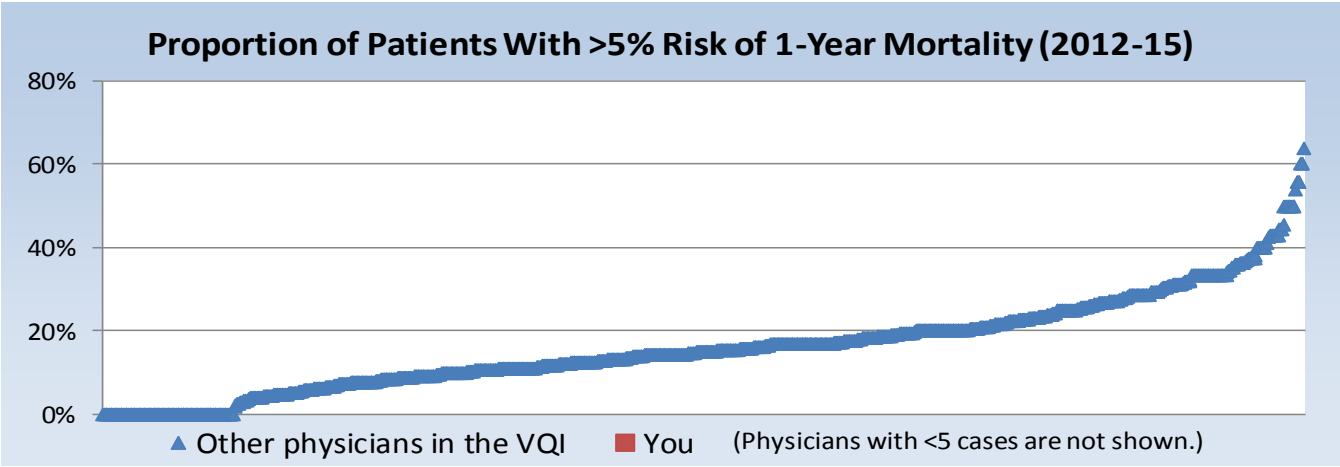
This report provides two metrics that describe your patient selection of asymptomatic patients for CEA. First is the percentage of asymptomatic patients for whom you performed elective, prophylactic CEA who had >5% risk of one-year mortality at the time of surgery. While this percentage is estimated based on an overall statistical model, it should be low, and if not, may provide insight into opportunities to improve patient selection by avoiding surgery in patients with short life expectancy.

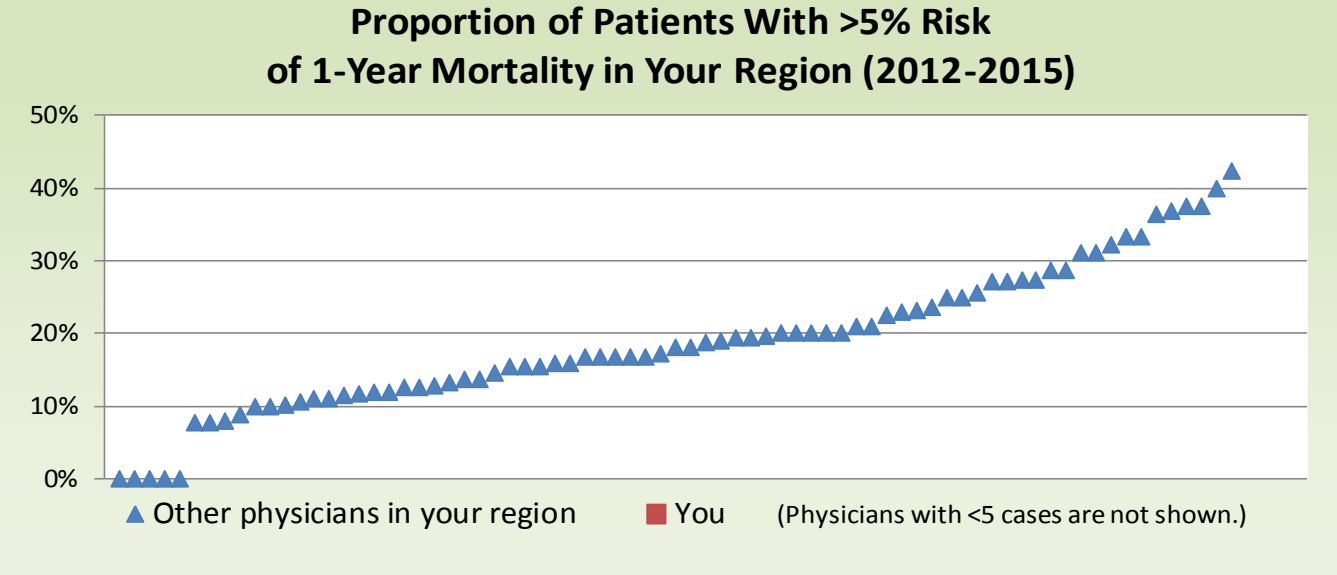
Second, we have provided you with the actual 1-year mortality rate of patients for whom you performed prophylactic CEA. Although it is apparent that most providers have a low 1-year mortality rate, this actual rate may underrepresent your patients' actual risk due to the low number of patients treated by any one physician. Please review both sets of data to determine how this may assist with optimal patient selection in your practice.

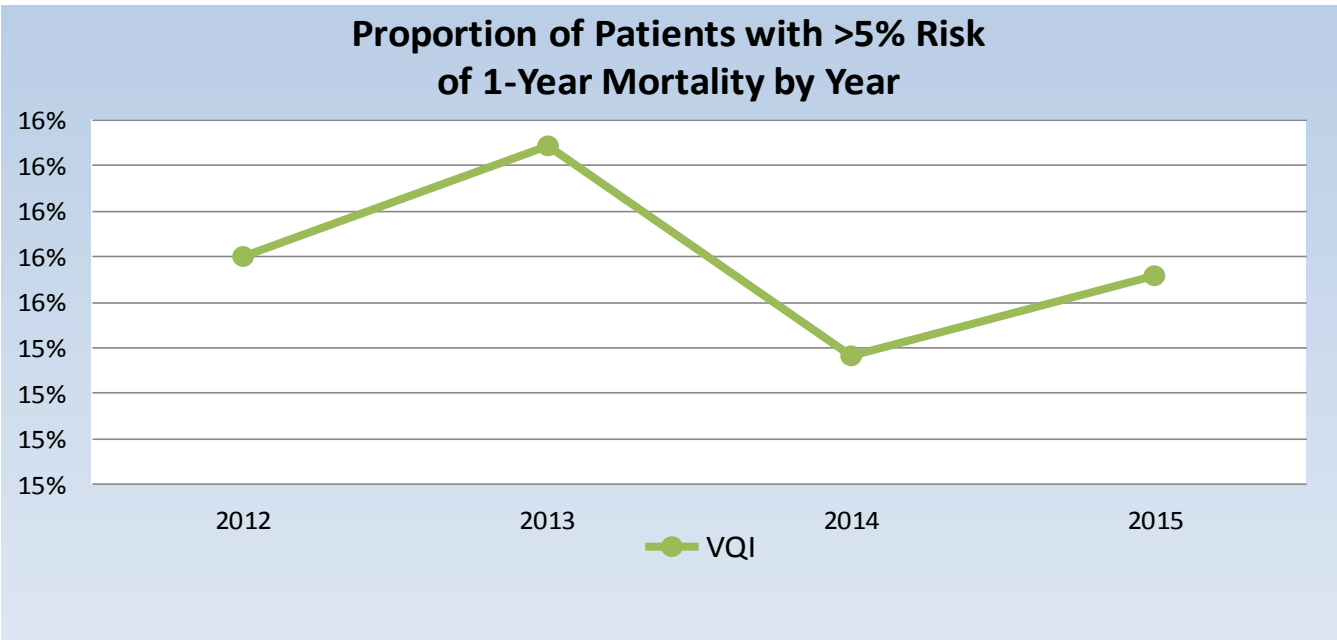
Proportion of Patients With >5% Risk of 1-Year Mortality

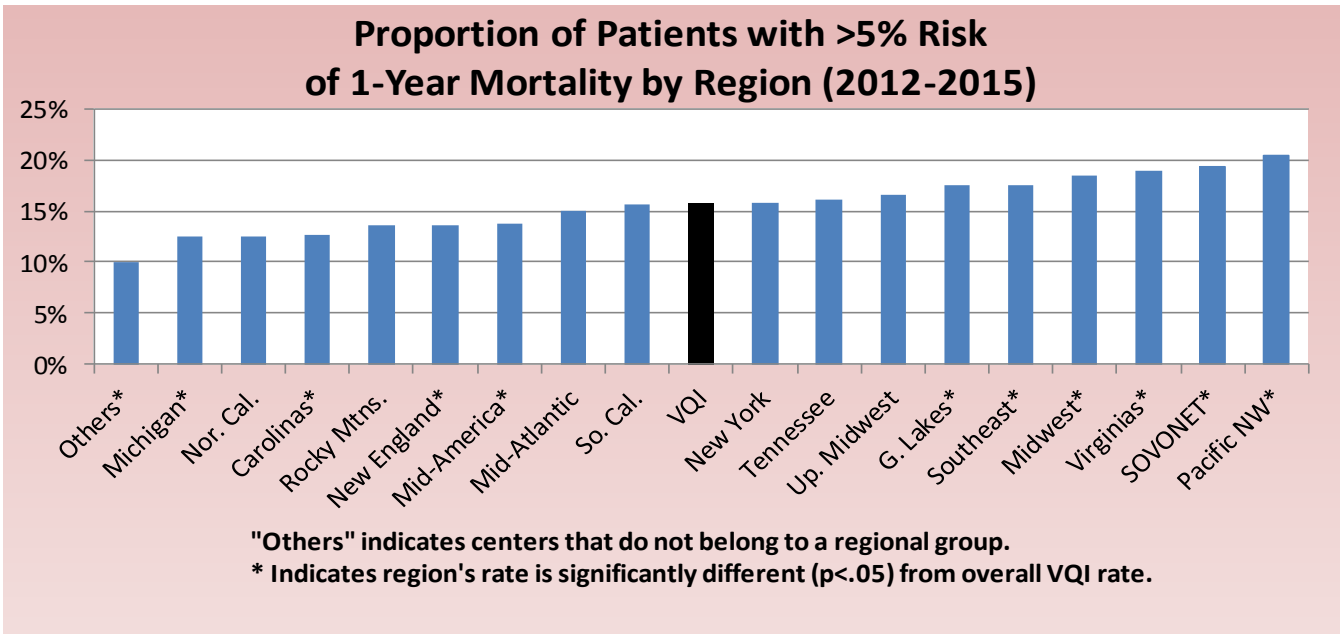
To provide perspective, we have compared the percentage of asymptomatic patients selected for CEA who had >5% predicted one-year mortality across all surgeons in VQI. This shows how you compare with your peers in this element of patient selection.

	You	Your Region	VQI
Number of cases (2012-2015)			31593
Proportion with >5% risk of 1-year			16%
Is your rate significantly different from your region's rate?			
Is your rate significantly different from the overall VQI rate?			




Proportion of Patients With >5% Risk
of 1-Year Mortality in Your Region (2012-2015)
50%
40%
30%
20%
10%
0%
Other physicians in your region
You
(Physicians with <5 cases are not shown.)


Proportion of Patients with >5% Risk
of 1-Year Mortality by Year
16%
16%
16%
16%
16%
15%
15%
15%
15%
2012
2013
2014
2015
VQI


Proportion of Patients with >5% Risk
of 1-Year Mortality by Region (2012-2015)
25%
20%
15%
10%
5%
0%
Others*
Michigan*
Nor. Cal.
Carolinas*
Rocky Mtns.
New England*
Mid-America*
Mid-Atlantic
So. Cal.
VQI
New York
Tennessee
Up. Midwest
G. Lakes*
Southeast*
Midwest*
Virginias*
SOVONET*
Pacific NW*
"Others" indicates centers that do not belong to a regional group.
* Indicates region's rate is significantly different (p<.05) from overall VQI rate.

Actual 1-Year Mortality After CEA

Additionally, we have compared the actual 1-year mortality rate of patients selected for prophylactic CEA in your practice to all surgeons in VQI. Based on the number of patients treated in your practice, this raw value may not represent the actual risk profile of those selected, but can be used in conjunction with the above information to optimize patient selection in your practice.

	You	Your Region	VQI
Number of cases (2012-2014)			21879
Observed 1-year mortality rate			3%
Is your rate significantly different from your region's rate?			
Is your rate significantly different from the overall VQI rate?