

## Quality Improvement Abstracts

### VQI Annual Meeting 2018

June 20<sup>th</sup> & June 21<sup>st</sup>, 2018  
Hynes Convention Center, Boston MA



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## 1. Atrium Health (Charlotte, NC)

### Improvement Project: Reducing Infection Related Vascular Readmissions

**Authors: Leslie M. Doyle, MSML, BSN, RN**

**PROBLEM STATEMENT:** Unnecessary hospital readmissions are inconvenient to patients and result in additional expenses, decrease satisfaction and increase opportunity for infection. Vascular surgery patients are at elevated risk for unplanned 30-day readmissions due to multiple comorbidities and post-surgical complications. As part of the Affordable Care Act of 2010, the Hospital Readmission Reduction Program (HRRP) offers incentives to hospitals that develop successful strategies to reduce unnecessary readmissions while penalizing those with excessive readmissions. Although the HRRP is currently implemented for specific medical conditions, its expected expansion makes it imperative for hospitals to understand the root cause of vascular readmissions and implement solutions to reduce them.

**GOALS (OUTCOME MEASURES):**

- Baseline 30-day unplanned readmission data to the same facility from Nov 2015-Oct 2016 reflected an observed-to-expected ratio (O/E) of 1.313, which is above national average. Thus, the following outcome measures were created:
- Target Goal- reduce Vascular MS-DRGs 30-day unplanned readmissions by 4% to 1.244 O/E by 10/31/17
- Stretch Goal- reduce Vascular MS-DRGs 30-day unplanned readmissions by 8% to 1.192 O/E by 10/31/17

**IMPROVEMENT STRATEGIES:** Sanger Heart and Vascular Institute vascular surgery patients at two of our facilities within Atrium Health were analyzed for readmissions. The primary driver of vascular readmissions was related to infections, with unnecessary variation in care identified as an opportunity for improvement. Standard work centered around implementation of evidence-based preventive measures in each phase of patient care; pre-operative, intra-operation and post-operative, to target surgical site infections. Through a partnership with Infection Prevention standard work was developed around a surgical site bundle, which consisted of: use of Hibiclens prior to admission, use of CHG wipes pre-operatively, appropriate use of pre-operative antibiotics, use of alcohol containing skin prep, normothermia intra-operatively and glucose control post-operatively. Process measures for each element of the bundle were developed and compliance data were reported monthly to a leadership team.

**RESULTS:** Combined Vascular MS DRG readmissions decreased by 20% to 1.049 O/E by October 31, 2017, exceeding the stretch goal. Individual facility readmission rates also exceeded stretch goal and the number of infection-related readmissions decreased. One hundred percent compliance was obtained on all four process measure metrics by the end of calendar year 2017. These processes will continue to be monitored for sustainment.

**CHALLENGES / LESSON LEARNED:** Changes in culture and established norms are time intensive. A thorough understanding of the rational, importance and long-term benefits for our patients is required for success. While teammate education is a key to standardization, education alone does not change behavior. Multiple strategies were used to assist the team to be successful with preventive measure implementation.

**SUCCESS FACTORS:** Data-driven improvement projects help foster momentum and build accountability within a team. Data helps identify current state, guides the directions for improvement, and can help identify if implement strategies are effective. A multi-disciplinary team fosters the sharing of best practices across multiple service lines, ensuring successful infection prevention practices utilized by other teams across the hospital were identified and implemented. Support of Executive Sponsors and the Leadership team facilitate buy-in and accountability.

## 2. Carle Foundation (Urbana, IL)

### Achieve 100% compliance in PVI data submission

**Authors: Julie Cundiff, RN, BSN, Steve Hong, MD, DABR, RPVI**

**PROBLEM STATEMENT:** VQI PVI data submissions were incomplete due to missing data. 27% of cases submitted for January and February, 2017 were not validated. The missing data affects reporting accuracy which potentially skews national benchmarking results.

**GOALS:** Achieve 100% compliance in PVI data submission.

**IMPROVEMENT STRATEGIES:** Submission data were reviewed to identify the data points routinely missed. Data base coordinators engaged the physicians to identify obstacles toward capturing the required data. The most common barrier was difficulty remembering the required data. Laminated sheets, containing the required elements and their definitions, were developed and distributed to all the physicians. Unfortunately, there was no improvement in compliance. Therefore, we collaborated with the Information Technology team to develop a template to guide physician documentation in the procedure note. The template included the required data elements with the various options available. To keep the template concise and easy to use, questions in the template were limited to address routinely missed elements. The template corresponded to the data elements and definitions on the laminated sheets so physicians can easily find definitions when necessary.

**RESULTS:** Over the past two months, we reached our goal of 100% data submission with validation. Due to the success of the template, physicians requested additional templates for the CAS registry and WIFI scoring, which are now implemented at our facility.

**CHALLENGES/LESSON LEARNED:** The primary obstacle was developing an efficient system that would make the process less onerous for the physicians to document the necessary data elements. We learned that by providing answer options on the template that are worded exactly as required by the database, ease of use and accuracy of the data was drastically improved. This also lowered the barrier for physician compliance.

**SUCCESS FACTORS:**

- Engaging physicians in discussions to identify barriers and processes to improve documentation
- Increasing physician compliance by having a quality director to champion usage of the templates
- Ongoing education on the VQI definitions
- Collaborating with Information Technology to develop easy-to-use templates

### 3. Henry Ford Health System (Detroit, MI)

## Cross-Clamp Location and Peri-operative Outcomes after Open Abdominal Aortic Aneurysm Surgery

**Author: Ziad Al Adas, MD**

**PROBLEM STATEMENT:** Suprarenal aortic clamping during abdominal aortic aneurysm (AAA) repair has traditionally been associated with an increased risk of post-operative renal and cardiac morbidity and mortality. Studies comparing suprarenal vs infrarenal aortic clamping, however, are limited by small sample sizes.

**GOALS:** By analyzing national VQI data for patients undergoing open infrarenal AAA repair, we sought to better characterize the effects of suprarenal clamping on post-operative outcomes.

**PROCESS:** We performed a retrospective analysis of the prospectively collected national Vascular Quality Initiative (VQI)<sup>®</sup> database for all open infrarenal AAA repairs performed between 2003 and 2017. All operations performed on symptomatic or ruptured AAAs were excluded. AAA repairs were divided into four groups based on the aortic clamp position: infrarenal, above one renal, above two renals, and supraceliac. Variables analyzed included patients' demographics and comorbidities, procedural details and complications. The four groups were univariately compared with respect to the latter variables followed by multivariate logistic regression for four primary outcomes: acute kidney injury (AKI, defined by the VQI as creatinine increase by more than 0.5 mg/dl), post-operative dialysis, cardiac complications (post-operative myocardial infarction [MI], heart failure or arrhythmia), and mortality.

**RESULTS:** During the study period, 9068 open AAA repairs were recorded in the VQI; of these 6422 were elective cases. Aortic clamp level was infrarenal in 58%, above one renal in 14%, above both renals in 21%, and supraceliac in 7%. The average age was 70 years, and males comprised 74% of the cohort. Multivariate analysis for AKI revealed the following risk factors: suprarenal cross-clamping (all three positions), clamp time, BMI  $\geq$  30, hypertension, and lower pre-operative hemoglobin. Post-operative dialysis was associated with supraceliac clamping only, hypertension, procedure time, and respiratory complications. Cardiac complications were associated with supraceliac clamping only, increasing age, history of coronary artery disease, increasing procedure time, and AKI. Cardiac complications were not correlated with clamp time. And finally, 30-day mortality was associated with increasing age, clamp time, post-operative MI, arrhythmia, stroke, respiratory complications, dialysis requirement, and bowel ischemia, but not clamp position.

**CHALLENGES/LESSONS LEARNED:** Although suprarenal clamping, at any level, was associated with an increased risk of AKI, only supraceliac clamping was associated with increased cardiac morbidity and dialysis requirement. Perioperative mortality was unaffected by clamp level. During infrarenal AAA repair requiring aortic clamping proximal to a renal artery, the proximal clamp site chosen may be less important than the duration of clamping.

## 4. Indiana University Health (Indianapolis, IN)

### Improvement in Carotid Stent Embolic Protection Device Usage

**Authors: Lillian Camino, MD, RPVI, RVT**

**SUMMARY STATEMENT:** Embolic protection devices (EPD) are used to capture emboli and debris that may dislodge during carotid stenting. Multiple clinical trials have demonstrated their safety and efficacy<sup>1,2</sup>. EPD can be defined as distal embolic protection devices (filters) and/or flow reversal. In addition, National Coverage Determination (NCD)<sup>3</sup> encourages usage of EPD. Indiana University Health (IUH) wanted to ensure best practice utilization for the carotid stent population.

**GOALS / OBJECTIVES:** Multiple subspecialties (Vascular Surgery, Interventional Radiology, Interventional Cardiology, and Interventional Neuroradiology) participate in carotid stenting procedures at IUH Methodist Hospital. The team sought to develop a process for accurate data collection and compliance with NCD guidelines.

#### **IMPROVEMENT STRATEGIES:**

The Integrated Vascular Process Improvement team was formed to improve education and align clinical practice with guidelines within all disciplines. Physician education and reminder prompts were considered methods to improve compliance with CAS reporting.

**PROCESS:** The multi-professional Integrated Vascular Quality Improvement Team reviewed accepted National Guidelines with stakeholders every 6 months (among multiple mini-refreshers) along with outcomes. As CAS procedures were performed in multiple departments, IUH sought to develop a process to ensure accurate data capture within the EMR. A “CAS Data Requirement form” was developed for physicians to document all data elements (figure 1). When the Data Coordinator noticed a missed field, the physician was contacted for correction/addendum. Multiple communications with the governing body were performed during the study period to ensure accurate interpretation and compliance with updated guidelines and protocols.

One on one educational internal conversations occurred to communicate external requirements. Physician Reference Cards were developed incorporating mandatory data elements to improve documentation and reminders of high surgical risk criteria per NCD (figure 2). Pre-intervention “Vascular Indication Meetings” were performed in which challenging cases were discussed among physicians to determine best course of action and consensus achieved within all disciplines.

**RESULTS:** Using 2014 as baseline for performance, there is over a 27% observed improvement in “all patients” for 2017 performance (Table 1) for the utilization of EPD. The subpopulation of ‘urgent and emergent’ cases observed a 120% improvement in 2017, compared to baseline. The results showed that the incidence of postoperative ipsilateral neurological events (Table 2) observed an improvement rate of nearly 80% with occurrence rate changes from 10.53% (2014) to 2.13% (2017).

Table 1: Improvement in usage of Embolic Protection Devices

EPD usage	2014 (Baseline)	2015	2016	2017	Improvement rate of 2017 to baseline
All patients	68.42%	66.67%	88.89%	87.23%	27.49%
Electives only	75%	75%	94%	93.75%	25%
Urgent and Emergent	33.33%	0%	25%	73.33%	120%

<sup>1</sup> Carotid Revascularization Endarterectomy Versus Stenting Trial (CREST)

<sup>2</sup> SAPHIRE Worldwide: Stenting and Angioplasty with Protection in Patients at High-Risk for Endarterectomy

<sup>3</sup> National Coverage Determination (NCD) for Percutaneous Transluminal Angioplasty (PTA) (20.7)

Table 2: Improvement on New Neurological Event (Transient Ischemic Attack and/or Stroke)

All patients	2014 (Baseline)	2015	2016	2017	Improvement Rate of 2017 to baseline
New Ipsilateral Neurological	10.53%	3.70%	1.85%	2.13%	79.77%

**CONCLUSIONS:** The Integrated Vascular Process Improvement meeting provides a routine meeting to review performance data and identify educational opportunities or operational adjustments to ensure our patients are provided with evidence based practice. “Pre- intervention Vascular Indication meetings” have proved useful by improving compliance with NCD Data Determination guidelines on Carotid stenting and improving outcomes. Standardization on Carotid Stent Documentation across all subspecialties, as well as the improved education on CAS Guidelines provided to stakeholders and physician, resulted in a decrease in addendum requests which saved time for both the providers and the Data Coordinators. The multiple interdisciplinary approaches standardized the processes and documentation which lead to improved patient outcomes.



Addendums:

Figure 1 Indiana University Health CAS Data Requirement Documentation

## Carotid Stent Documentation: CMS CAS Data Requirements

Patient Sticker

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Include in patient's medical records

\_\_\_\_\_ Pt Symptomatic (Y/N)

\_\_\_\_\_ Meets High Surgical Risk Criteria (Y/N). Specify: \_\_\_\_\_

\_\_\_\_\_ mRS (0-6, NA): Indicate if ANY history of stroke (present or remote)

\_\_\_\_\_ % stenosis 1<sup>st</sup> lesion (0-99) (must be by ANGIOGRAM)

\_\_\_\_\_ % stenosis 2<sup>nd</sup> lesion (0-99, NA) (must be by ANGIOGRAM)

\_\_\_\_\_ Embolic protection device used (Y/N)

**The Modified Rankin Scale (mRS)**

0 - No symptoms

1 - No significant disability (Able to carry out all usual activities, despite some symptoms.)

2 - Slight disability. (Able to look after own affairs without assistance, but unable to carry out all previous activities.)

3 - Moderate disability. (Requires some help, but able to walk unassisted.)

4 - Moderately severe disability. (Unable to attend to own bodily needs without assistance, and unable to walk unassisted.)

5 - Severe disability. (Requires constant nursing care and attention, bedridden, incontinent.)

6 - Dead.

**CEA high surgical risk criteria as per CMS**

1. Age >80.
2. MI within 1 mo.
3. Left Ventricle EF<30%
4. Contralateral carotid occlusion.
5. HF NYHA class III/IV.
6. Unstable angina: Canadian Cardiovascular Society (CCS) class III/IV
7. Renal failure: end stage renal disease on dialysis.
8. Common Carotid Artery (CCA) lesions below the clavicle
9. Severe pulmonary disease
10. Clinically significant cardiac disease (one of the following: Congestive Heart Failure (CHF), abnormal stress test, OR need for open heart surgery)
11. High cervical internal Carotid Artery (ICA) lesion(s).
12. Restenosis of prior carotid endarterectomy (CEA).
13. Tracheostomy.
14. Contralateral laryngeal nerve palsy.
15. Previous neck radiation

**OR**


Participant NCD Covered Investigational Studies:

- Crest-2 registry (C2R)
- Roadster-2 registry, or
- Carotid revascularization from primary prevention of stroke (CREST-2)
- SVS VQI-TCAR Surveillance Project

Interventionist Signature \_\_\_\_\_

Date and Time: \_\_\_\_\_

Quality Metric




9 1 0 8 2

Remember: this information must be documented in Pts medical record as per CMS mandates.

Figure 2 Indiana University Health VQI Reference Cards

## CAROTIDS



**Things to document for All Extracranial Carotid Stents:**

- Is the pt symptomatic?
- PreOp Mod Rankin Score (in case of any remote or present stroke)?
- Does pt meet High Surgical Risk Criteria? Which?
- % Stenosis by ANGIOGRAPHY (of treated lesion(s))
- Was embolic protection device used?
- Complications during hospitalization (Stroke, MI, Death).

**CMS CAS High Surgical Risk Criteria (indicate which criteria is met)**

- Age  $\geq 80$ ;
- Recent (< 30 days) MI;
- LVEF <30%;
- Contralateral carotid occlusion;
- NYHA Class III or IV congestive heart failure;
- Unstable angina: Canadian Cardiovascular Society (CCS) Class III/IV;
- Renal failure: end-stage renal disease on dialysis;
- Common Carotid Artery (CCA) lesion(s) below clavicle;
- Severe chronic lung disease;
- Previous neck radiation;
- High cervical Internal Carotid Artery (ICA) lesion(s);
- Restenosis of prior (CEA);
- Tracheostomy;
- Contralateral laryngeal nerve palsy

**Modified Rankin Scale**

0 - No symptoms.

1 - No significant disability. Able to carry out all usual activities, despite some symptoms.

2 - Slight disability. Able to look after own affairs without assistance, but unable to carry out all previous activities.

3 - Moderate disability. Requires some help, but able to walk unassisted.

4 - Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted.

5 - Severe disability. Requires constant nursing care and attention, bedridden, incontinent.

6 - Dead.

## 5. Indiana University Health-Methodist Hospital (Indianapolis, IN)

### Peripheral Vascular Intervention (PVI) Discharge Medications

**Author: Melissa Easterday, BS**

**SUMMARY STATEMENT:** Patients diagnosed with Peripheral Arterial Disease (PAD) are at a high risk of Heart Attack, Stroke, and Vascular death. Best practice has shown patients with PAD benefit from being placed on an aspirin and/or antiplatelet and statin. Indiana University Health (IUH) wanted to ensure that all eligible PAD patients were being discharged on the recommended dual medications of an aspirin and/or antiplatelet and a statin.

**GOALS / OBJECTIVES:** IUH Methodist Hospital set a goal of achieving less than 10% of eligible patients being discharged without the recommended dual medication therapy. To analyze our data, we excluded deceased patients. Patients that were not placed on dual medications for “not for medical reason” or contraindication were included.

**IMPROVEMENT STRATEGIES:** The IUH VQI Data Coordinators along with the Integrated Vascular Process Improvement Team worked to develop a process to ensure appropriate discharge medications were prescribed. There were two strategies for improvement. The first was to ensure all contradictions were accurately captured in the medical record. Emphasis was put on the importance of the team properly documenting “not for medical reason” when there are contraindications (allergy, intolerance, etc.).

Once the ineligible population was removed from the measurement, the second opportunity was to increase compliance for all eligible PAD patients. An individual scorecard was made available to each physician displaying individual outcomes. An educational letter was created to be given to patients to provide awareness to the importance of dual medication therapy at discharge. A second letter was made available to primary care physicians to use as an educational tool to support alignment efforts during the care continuum.

All of these efforts occurred during the monthly Integrated Vascular Process Improvement Meetings. Data was presented in a “blinded” manner to all physicians to show a comparison in individual progress (Figure 1).

**RESULTS:** Physician engagement improved and all three sub-specialties that perform PVI procedures achieved the goal that was set in place. The number of patients discharged with an antiplatelet prescription at discharge increased over 15% from 2013 to 2017. Calendar year 2013 showed a performance of 80.8% (253/313) and 2017 was 96.4% (214/222).

Similar improvement trends were observed for statins at discharge with 2013 performance of 67.4% (211/313) and 2017 performance of 88.7% (197/222).

As a result, dual medication at discharged increased over 22% with 2013 performance of 63.5% (199/313) compared to 86.4% (192/222) 2017 performance. The positive trends are continuing in 2018 with 95.6% year to date performance for all three categories.

**CONCLUSIONS:** Adopting the VQI initiative of focusing on the importance of ensuring patients with PAD are discharged on the appropriate medications, assisted the team in improvement efforts. Focusing on physician documentation to assist with identifying true opportunities for improvement helped drive the teams’ success. The next steps taken to sustain our success are to collaborate with multiple stakeholders

(ex: physicians, pharmacists, information systems) to revise current and develop standardized order sets for physician use when documenting discharge medications. Succeeding in our efforts will continue to help improve patient quality of care and outcomes.

Figure 1. Physician Scorecard Example

Misses on Discharge Combo Medication (Antiplatelet AND Statin) on Arterial Cases						
Discharged without Combo Medication "Antiplatelet AND Statin"	Percentage of All patients w/o combo meds 2012-2016	Fraction of All patients w/o combo meds 2012-2016	Percentage of All patients w/o combo meds 2017	Fraction of All patients w/o combo meds 2017	Amount of improvement since Jan 2017	up (improved) or down (worsen)
GOAL	< = 5%		< = 5%			
All Active MD	24%	416/1748	15%	52/358	9%	⬆️
MD-36	0%	0/2	N/A	0/0	Non-calculable	Non-calculable
Misses on Discharge Statin on Arterial Cases						
Discharged without Statin	Percentage of All patients w/o Statin 2012-2016	Fraction of All patients w/o Statin 2012-2016	Percentage of All patients w/o Statin 2017	Fraction of All patients w/o Statin 2017	Amount of improvement since Jan 2017	up (improved) or down (worsen)
GOAL	< = 5%		< = 5%			
All Active MD	21%	360/1748	11%	40/358	10%	⬆️
MD-36	0%	0/2	N/A	0/0	Non-calculable	Non-calculable
Misses on Discharge Antiplatelet (Aspirin and/or P2Y12 inhibitors) on Arterial Cases						
Discharged without Combo Medication "Antiplatelet" (ASA and/or P2y12)	Percentage of All patients w/o "Antiplatelet" 2012-2016	Fraction of All patients w/o "Antiplatelet" 2012-2016	Percentage of All patients w/o "Antiplatelet" 2017	Fraction of All patients w/o "Antiplatelet" 2017	Amount of improvement since Jan 2017	up (improved) or down (worsen)
GOAL	< = 5%		< = 5%			
All Active MD	9%	165/1748	6%	22/358	2%	⬆️
MD-36	0%	0/2	N/A	0/0	Non-calculable	Non-calculable

## 6. Jobst Vascular Institute, Toledo, OH (ProMedica)

### Improving Long Term Follow-Up for CEA Patients

**Authors: J. Mason, R. Acino, T. Russell, B. Oriowo, F. Lurie**

**PROBLEM STATEMENT:** Following the implementation of a new electronic medical record (EMR) system and subsequent abstraction of VQI data for one-year patient follow-up, we identified a large number of patients who were not returning for annual surveillance following carotid endarterectomy (CEA). Unfortunately, we discovered that the existing list of patients for annual surveillance was not carried over to the new system.

**GOALS:** Identify patients who have failed to return for post-CEA care and re-engage them into an annual surveillance program including face-to-face physician visits and duplex testing. Develop and implement a standardized follow-up process and apply new communication practices for patient contact to minimize those lost to follow-up.

**IMPROVEMENT STRATEGIES:** A number of strategies were identified, first of which was an agreement with all providers of the largest local vascular practice to standardize their follow-up regimen for postoperative care, thus eliminating variation among physicians and decreasing confusion in office staff. A second strategy was for quality personnel to work directly with office schedulers to notify them of patients due for follow-up and to ensure they were on their office recall list. Last, patients who were identified as overdue for annual surveillance were subject to new, additional measures including a series of three outreach phone calls and a letter to reestablish a connection with the patient. If those attempts failed, a letter would be sent to their primary care providers (PCP) to notify them that their patient was overdue for annual surveillance. PCPs were encouraged to continue surveillance either through the vascular service or their own office to order and review annual surveillance testing.

**RESULTS:** Following implementation in 2016, the rate of patient annual surveillance is showing promising signs of success. Prior to this initiative, only 61.1% of patients who underwent CEA from 2013 to 2015 were seen for face-to-face follow-up and of those only 74.6% had duplex testing. For 2016 CEA patients, results so far demonstrate that face-to-face contact and duplex testing have increased to 77.3% and 77.7% respectively. A portion of 2016 patients remain in the open follow-up window based on procedure date.

**CHALLENGES/LESSONS LEARNED:** Our health system's transition to a new EMR as well as considerable staff turnover in the vascular office contributed to poor annual surveillance results in CEA patients. These two factors resulted in delinquent recall lists and lost contact with patients for annual surveillance and ongoing routine care.

**SUCCESS FACTORS:** A dedicated physician champion led this quality improvement project and a small multidisciplinary work group was tasked with implementation. Following implementation of these initiatives, continual monitoring, improved patient/office communication, and a revamped process for vascular lab surveillance are factors that drive success of this project.

## 7. Jobst Vascular Institute, Toledo, OH (ProMedica)

### Using VQI as a Tool to Drive Improvement in IVC Filter Follow-Up and Retrieval

**Authors:** R. Acino, J Mason, A. Seiwert, F. Lurie, B. Oriowo

**PROBLEM STATEMENT:** Prior to ProMedica's participation in VQI, patient follow-up and retrieval of temporary filters were recognized as areas with great opportunity for improvement. The filter retrieval rate was a dismal 13% and only 40% of patients with a retrievable filter had a follow-up visit post filter placement.

**GOAL:** Use VQI's platform and reporting tools to improve patient care post IVC filter placement. Key goals of the project were to use data and analytic reports to increase the number of patients seen for follow-up filter care, minimize the number lost to follow-up, and increase the number of filter retrievals with temporary indication.

**IMPROVEMENT STRATEGIES:** Using VQI as our management tool for historical and real-time data, process initiatives were developed to address the following areas: patient education, discharge instructions, follow-up visit scheduling, and clinical office communication. Details included enhanced patient education materials and discharge instructions, implementation of follow-up appointment scheduling completed prior to hospital discharge, data sharing between quality personnel and clinical office staff for patients due for follow-up, and collaboration between providers (Interventional Radiology, Vascular Medicine & Vascular Surgery) for clinical decision making on appropriate retrieval timing.

**RESULTS:** ProMedica began participating in the IVC Filter Registry in 2015, and in 2016, Jobst Vascular Institute developed a Quality Improvement (QI) team focused solely on IVC filters. This multidisciplinary team was successful in identifying system process issues where patient education and discharge instructions were weak, clinical office follow-up was inconsistent, and patients were being lost to follow-up. New processes hardwired into care have improved follow-up and retrieval rates. Patient follow-up has doubled to over 80% and retrieval rates (including failed retrieval) have increased from 36%\* to 45% over the past three years. (\*2017 patients are still in follow-up and currently have a 36% retrieval/attempted retrieval rate).

**CHALLENGES/LESSONS LEARNED:** While progress has been made, challenges still exist. The most difficult patient populations are those who simply choose not to return and those who have challenges with co-morbidities and living situations (such as long-term care) that make follow-up visits difficult. In addition, extension of the follow up window to extend beyond 21 months may improve rates allowing capture of very late retrievals of filters.

**SUCCESS FACTORS:** The commitment and leadership of clinical staff including vascular surgeons, interventional radiologists, quality team members, radiology technicians, clinical affiliates and clinical office staff are key to this project. Furthermore, the continual monitoring and reporting established as part of this QI project team has continued to be an essential part of maintaining success.

## 8. New York Presbyterian Hospital - Weill Cornell Medicine (New York City, NY, and Cornell, NY)

### Implementation of a Structured Protocol to Improve Rates of VQI Registry Vascular Patient Follow-Up

**Authors: Melissa R. Katzman, PA-C, Katherine E. Greger, PA-C, Ashley Graham, BS,  
Andrew J. Meltzer, MD, and Darren B. Schneider, MD**

**INTRODUCTION:** Close patient follow-up post vascular surgery is paramount to promoting long-term vascular health. We sought to improve our patients' vascular care by increasing our rates of follow up. In 2015, we implemented a protocol to improve patient follow-up compliance and herein report the impact on our follow up rates and present an analysis of patient factors associated with poor follow up compliance.

**METHODS:** Beginning in November 2015, we implemented a protocol consisting of monthly generation of a list of patients without scheduled follow-up appointments, who were subsequently contacted by phone, and mailed follow-up reminder cards. To determine patient factors associated with follow-up non-compliance the patient cohort that returned for follow-up were compared to the patient cohort that did not return for follow-up. Patient factors analyzed included: procedure type, ambulatory status, age, gender, insurance coverage and travel distance. Percentage rates of patient follow up between 2012 and 2015 were calculated using semi-annual VQI Regional Quality Reports.

**RESULTS:** After implementation of the new protocol, our overall follow-up rate increased from an average of 71.0% from 2012-2014 to 86.3% in 2015. Two-hundred and seventeen patients were contacted; 140 patients (64.5%) returned for follow-up and 65 patients (30.0%) did not return. Of those patients who did not return, 13 patients (20.0%) permanently resided outside of the US, and 52 patients (80.0%), despite several contact attempts, did not respond at all. Of note, 12 (5.5%) of the 217 patients contacted were deceased and were not included in our statistical analysis. By univariate analysis, patient factors associated with follow-up non-compliance included: wheelchair dependence (P=0.033), Medicaid insurance (P=0.036), no insurance coverage (P=0.003) and increased driving distance (P=0.034). Procedure type, age and gender were not associated with poor follow-up compliance.

**CONCLUSIONS:** Implementation of a structured outreach protocol resulted in a significant improvement in VQI follow-up rates. Wheelchair dependence, lack of insurance/Medicaid insurance and travel distance were associated with poor follow-up compliance and represent an opportunity for development of targeted strategies to achieve greater follow up compliance.

## 9. Stony Brook Medicine (Stony Brook, NY)

### The Benefits of a Nurse Practitioner (NP) Lead Venous Thromboembolism (VTE) Team

**Authors: Kristan Probeck ANP, Doreen Elitharp ANP, Antonios Gasparis MD, Apostolos Tassiopoulos MD, Nicos Labropoulos PhD**

**PROBLEM STATEMENT:** VTE is an alarming cause of preventable morbidity and mortality in hospitalized patients. Institutional review of VTE rates and related practices revealed underutilization of prophylaxis and suboptimal treatment. An FDA alert in 2010 advised practitioners of multiple complications related to inferior vena cava filters (IVCFs) (2005-2010, n=921) and strongly suggested removal of temporary IVCF when no longer needed. Physicians and hospitals were advised to implement programs to follow such patients to optimize safe and timely filter retrievals.

#### **GOALS:**

- Decrease nosocomial VTE rates
- Optimize appropriate VTE prophylaxis and treatment
- Reduce unnecessary IVCF placements (i.e. prophylactic or for treatment of distal DVT) and improve IVCF retrieval rates

**IMPROVEMENT STRATEGIES:** A VTE team consisting of an NP and a vascular surgery attending physician was assembled in 2008 to enhance patient safety and satisfaction, improve quality of care and ranking and minimize fiscal loss. At the beginning of the program, about 200 VTE patients' charts were reviewed annually for best practice and improvement opportunities. Between the years 2007-2009, 32% of IVCFs placed were for pure prophylaxis, with only 9% retrieved overall. As team responsibilities grew, an additional NP was added in 2013 and a phlebology fellow in 2015. More charts were reviewed for compliance with appropriate VTE prophylaxis and treatment. In addition, A VTE team lead interdepartmental quality improvement project lead to significant changes in existing IVC filter insertion and management practices. Beginning in 2013 all VTE events were recorded in an Access database for data management. VTE team interventions also included contact with providers to guide best practice and to facilitate VTE related electronic medical record enhancements.

**RESULTS:** One year after initiation of the program, the rate of VTE decreased by 29%. In review of the Access database between 2013 and 2017, despite the increase in the number of patients evaluated, the rate of nosocomial VTE decreased (35% to 23% respectively). Additional VTE team members afforded greater vigilance and oversight demonstrated by the increased number of VTE events reviewed, decrease in VTE rates and ultimately, decrease in unnecessary IVCFs. In 2015, 3% of IVCF were placed for prophylactic indications. Follow up increased resulting in 75% of filters implanted as a temporary indication to be retrieved.

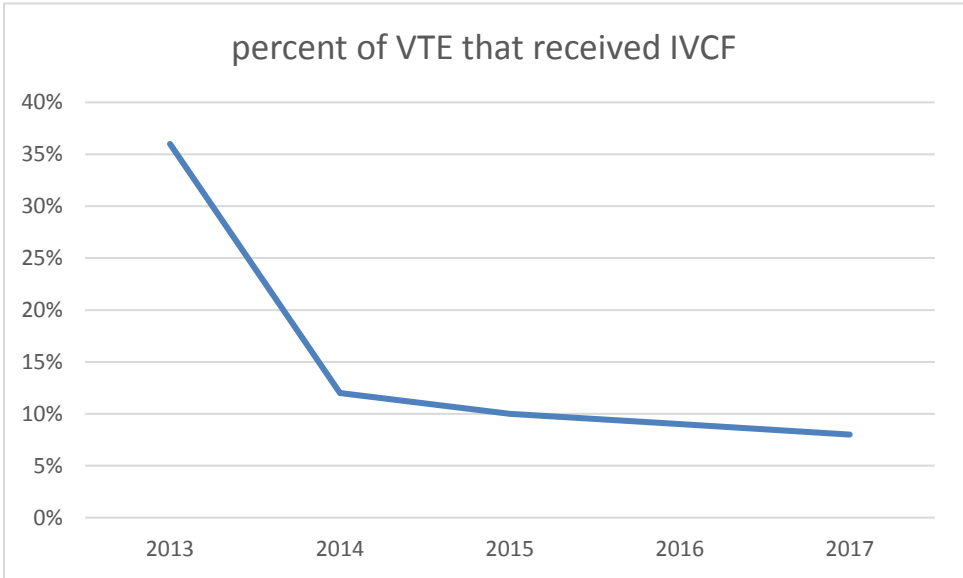
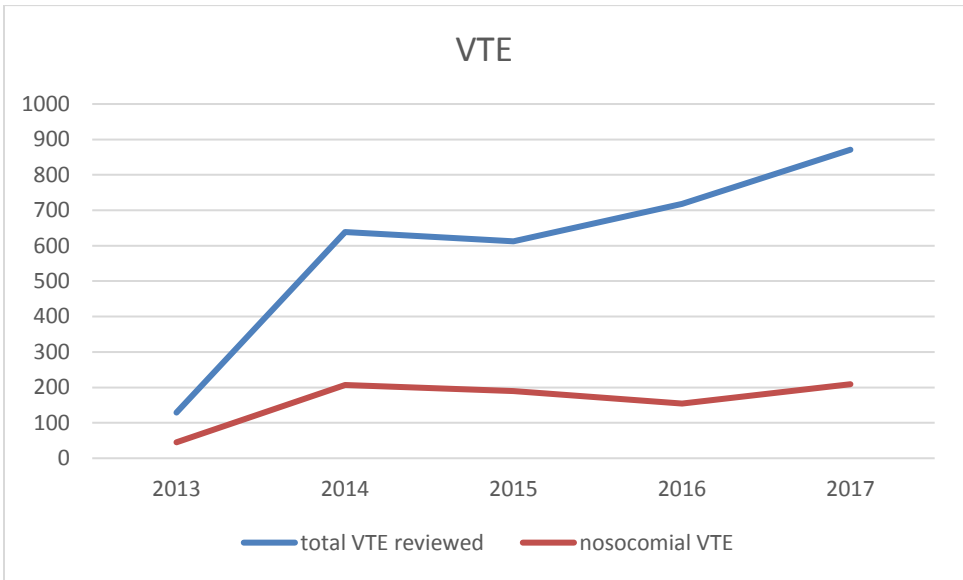
#### **CHALLENGES/ LESSONS LEARNED:**

- University hospitals staff consistently changes necessitating continued education
- Although standard guidelines for VTE risk assessment, prophylaxis and treatment exist, they are frequently underutilized. Continuous monitoring is needed to ensure appropriate prophylaxis and documentation
- Consistent oversight by the team is needed to maintain efficient follow up of IVCF patients



**SUCCESS FACTORS:**

- Improved VTE prophylaxis and monitoring resulted in decreased number of nosocomial VTE
- Decreased admissions for VTE and length of stay, cutting costs
- The VTE team has increased accountability and education throughout the institution
- The team are champions in VTE as quality improvement coordinators, information technology consultants and inferior vena cava filter coordinators



## 10. University of Kansas Health System (Kansas City, KS)

### Increasing Compliance with Discharge Medications

**Authors:** Laura Goubeaux MSN, BSN, RN and Tamara Thomas BSN, RN

**PROBLEM STATEMENT:** We observed that University of Kansas Hospital did not meet the Fall 2016 VQI benchmark of 77% of patients prescribed both antiplatelet and statin medications at discharge following vascular procedures, with only 73% of our patients receiving both. How can we improve our compliance and provide consistent, evidenced-based care?

**GOALS:** We set our goal to be 100% compliant with discharge medications, knowing that this goal was the best outcome for our patients.

**IMPROVEMENT STRATEGIES:** As our quality committee was forming at this time, there were many conversations with our multidisciplinary team regarding the specifics of this metric. It was decided that the best way to ensure these medications were addressed on every vascular patient, it needed to be included in our electronic health record (EHR). In February 2017, a patient quality measures question was added to all discharge order sets. The question is a “hard stop” meaning that it has to be addressed to continue with discharge orders. The first question asks if the patient had a vascular procedure on the encounter. If answered “yes”, the provider had to address three questions, regarding a discharge antiplatelet, statin, and anticoagulant. This not only provided an opportunity to review discharge medications, but it also gave providers a location to document contraindications to be captured by the abstractor. Education was delivered to all providers on this change in the EHR and they were then responsible for the education of medical residents each month.

**RESULTS:** As of the Spring 2018 report, we reached 95.2% of patients receiving both antiplatelet and statin at discharge. The compliance per quarter and per procedure type are also examined. In Q2 2017, our compliance was 98.8% and Q3 2017 was 98%.

**CHALLENGES/LESSONS LEARNED:** In our academic medical center, we have several different disciplines that could be managing the care of the patient, and it can be challenging to communicate the goals of the vascular surgery team to all members of the other care teams. This is an ongoing effort to ensure that regardless of the service discharging the patient, the quality measures question must be answered to ensure the patient is discharged on the appropriate medications.

**SUCCESS FACTORS:** The success of this project is owed to the dedication of the vascular team, ensuring that physicians, advanced practice providers, and residents in several disciplines are aware of the need to prescribe appropriate medications as well as capture appropriate documentation.

## 11. University of Kansas Health System (Kansas City, KS)

### PVI for New Data Managers

**Authors: Tamara Thomas BSN, RN and Laura Goubeaux MSN, BSN, RN**

**PROBLEM STATEMENT:** We observed that as new data managers to VQI at The University of Kansas Hospital there was a learning curve for the recently added PVI module. How can we improve our documentation to comply with new data elements and demonstrate competent, accurate data abstraction?

**GOALS:** We hosted and presented at Mid-America Vascular Study Group Regional meeting April 2017. We set our goal to be a forum for new data managers to collaborate and share common hurdles. This was an excellent platform for the Mid-American region to reflect and gain understanding as well as challenge the data dictionary and the evidence to back it. As autonomous leaders, our goal was to instill the importance of awareness and transparency in partnering with VQI. We value that the proficiency of the abstractor is a key element directly impacting the integrity of the data.

**IMPROVEMENT STRATEGIES:** During the regional meeting, we presented on tabs needing clarification that were directly from the website's abstraction pages. Such as: previous Inflow or leg treatment under the "History" tab. Or treatment of native artery to maintain bypass patency under the "History" tab. Case studies were shared as well as visual aids for difficult anatomy. There was presentation focus on hot topics such as: physician documentation of "outflow vessels, residual stenosis, TASC, total occlusion length, and total treated length." We discussed how our multidisciplinary quality committee was utilizing a TASC form as an augment to the EHR. In the interim transition to smart templates, we are tracking TASC documentation compliance. In Q2 2017, we rolled-out a revised TASC, TOL, and TTL form.

**RESULTS:**

- Q1 2017 TASC form compliance 0%
- Q2 2017 TASC form compliance 55% (Revised form)
- Q3 2017 TASC form compliance 48% and dictation 19%
- Q4 2017 TASC form compliance 12.2% and dictation 26.5%
- Q1 2018 TASC form compliance 42.8% and dictation 14.2%

We are anticipating a turn of the tides towards dictation with continued surveillance and team ownership.

**CHALLENGES/LESSONS LEARNED:** As the MAVSG group was able to discuss, we found many commonalities and shared FAQ's. Examples of our TASC form were dispersed among the regional group for feedback and suggestions. As a teaching institution, with multiple Vascular services, (Cath Lab, CVOR, IR) it has been a rewarding experience to face the challenges of multispecialty partnerships. It has taken a year to hold it down under one umbrella, but we are building a unified force.

**SUCCESS FACTORS:** The accessibility of key leadership at VQI joining us in person provided the best avenue for transparent positive working-groups. We were able to request possible changes to the logistics of how the webpage is visually organized as well as evidence-based definitions, and identify VQI resources. To our hospital Vascular team, accolades are due to the diligence and buy-in of our quality committee members and leaders. Our institution is committed to the ideal of impactful and meaningful data to improve patient outcomes.

## 12. Toronto General Hospital (Toronto, ON, Canada)

### Smoking Cessation Rates among Patients Undergoing Vascular Surgery in a Canadian Center

**Authors: Seamus Mark McHugh,<sup>1,2</sup> Naomi Eisenberg,<sup>1</sup> Janice Montbriand,<sup>1</sup> and Graham Roche-Nagle,<sup>1</sup> Toronto, Ontario, Canada and Dublin, Ireland**

**BACKGROUND:** Smoking is the single most important modifiable risk factor for patients with vascular disease. The aim of this study was to determine the prevalence of smoking and cessation rates among patients undergoing vascular surgery in a Canadian center.

**METHODS:** As part of the Vascular Quality Initiative, a prospectively maintained database was used to identify the patients undergoing vascular surgery between 2010 and 2013. Smoking prevalence data were collated pre-procedure, post-procedure, and at year follow-up after intervention at a median of 13 months (mean  $\pm$  14.4  $\pm$  7.8 months). Cessation rates at 13-month follow-up were assessed to determine any statistically significant univariate factors. These factors were then used to build a model through backwards logistic regression. Multicollinearity was tested by assessing both variance inflation factors and tolerance.

**RESULTS:** Overall, 624 patients had complete follow-up data. Of these, 209 (33.5%) were smokers pre-surgically. At 1-year follow-up, of those 209 patients who were smokers preoperatively, 87 (41.6%) had stopped smoking while 122 (58.4%) had not. Patients who were male and aged >70 years were more likely to be smokers preoperatively (P  $\approx$  0.001 and P < 0.001, respectively). Cessation rates were increased in those aged >70 years (P  $\approx$  0.005) and in those with chronic obstructive pulmonary disease (P  $\approx$  0.016). Gender was also statistically associated, with cessation rates higher in females (P  $\approx$  0.011).

**CONCLUSIONS:** More than one-third of patients who underwent surgery in a Canadian vascular center continue to smoke. Uniquely, we report a statistically significant association between gender and postoperative cessation rates. The VQI database provides a platform to monitor smoking habits up to a year post surgery.

*\*This paper has been published Ann Vasc Surg 2017; 45: 138–143 and this abstract has been adapted from the original.*

## 13. University of Alberta - Grey Nuns Hospital (Edmonton, AB, Canada)

### Improving Critical Discharge Medication Adherence: A Vascular Quality Initiative (VQI)

**Authors:** M A Assmus, R McLarty, P Dawe, R Tomkiewicz, Y Abdulrehman

**PROBLEM STATEMENT:** Admission to hospital provides an ideal opportunity to ensure appropriate morbidity and mortality improving medical therapies are prescribed. Anti-platelet (AP) medications (ex. ASA, clopidogrel) and HMG-CoA reductase inhibitors (statins) (ex. rosuvastatin) have class 1A evidence for initiation in patients with peripheral arterial disease (PAD). Similarly, perioperative AP and statins reduce mortality following vascular surgery, however a large proportion of patients often have neither prescribed<sup>1</sup>. Improving discharge medications is a current national quality initiative and VQI provides an ideal platform to evaluate adherence at our center, implement a comprehensive discharge prescription improvement protocol and compare outcomes between sites.

**GOALS:** Establish a 5-component patient discharge improvement program that results in higher statin and AP adherence upon discharge. Our overall target is that all eligible patients have a statin and AP medication prescribed at the time of discharge.

**IMPROVEMENT STRATEGIES:** We used the Evidence-based Practice for Improving Quality (EPIQ) model to create a comprehensive and systematic discharge protocol to improve both statin and AP therapy adherence for vascular surgery patients at a Canadian center. Following completion of EPIQ workshop training at the University of Alberta our multi-disciplinary team within the Division of Vascular Surgery collaborated to identify 5 key components/steps in the discharge process that could improve medication adherence. Our intervention was initiated on July 24, 2017 for patients admitted to the Grey Nuns Hospital in Edmonton, Canada under the Division of Vascular Surgery. Prospective data have been collected and maintained within our regional VQI chapter with results reviewed monthly. To date, we have evaluated 6 months prior and 6 months after our intervention.

**RESULTS:** 485 eligible patients were added to our local VQI database between Jan 1, 2017 and Dec 31, 2017. Prior to our discharge intervention, 73.3% of patients were appropriately discharged on both AP and statin medications. Following our intervention, the average medication adherence upon discharge increased to 84.4%. Of the remaining patients that did not have indicated medications at the time of discharge, 17% were missing an AP agent and 7.5% were missing a statin.

**CHALLENGES/LESSONS LEARNED:** One key challenge we identified was creating effective interventions that required minimal time commitments, since time constraints were a commonly reported barrier to adopting change. We did identify patient related challenges since many vascular surgery patients may be averse to additional medications as they are already on multiple medications or may be non-compliant with medical advice. Additionally, ensuring our improvements are durable over time presents challenges, as care providers often have early uptake of change followed by a potential decline in adherence.

**CONCLUSIONS/SUCCESS FACTORS:** Overall, this VQI initiative helped us improve key steps in discharging patients from our centralized vascular surgery center. We improved medication adherence for morbidity and mortality improving AP and statin therapies. Engaging our entire multi-disciplinary team early in the process was critical to its success. With this intervention, our medication adherence is higher than regional and national averages over the same time and our frequent outcome updates help reinforce provider efforts and encourage a sustained effort.

#### Reference:

1. De Martino RR, Eldrup-Jorgenson J, Nolan BW *et al.* Perioperative management with antiplatelet and statin medication is associated with reduced mortality following vascular surgery. *J. Vasc Surg.* **2014.** 59:1615-21.

## 14. University of Pittsburgh Medical Center (UPMC), Heart and Vascular Institute, UPP Vascular Surgery (Pittsburgh, PA)

### Successful Continuation of EVAR Patient Compliance Utilizing VQI for Long Term Follow-Up

**Authors: Ali Arak BS, Fern Schwartz BS, Robin Brown BA, Jason Wagner MD, Theodore Yuo MD, Mohammad Eslami MD, Michel Makaroun MD, Michael Singh MD**

**ABSTRACT.** Lifelong surveillance after endovascular aneurysm repair (EVAR) is necessary to identify early problems and additional aneurysmal degeneration. Loss to long term follow-up (LTFU) however is quite frequent and can be as high as 50% in some reports. Strategies to improve compliance with follow-up are essential for good long-term outcomes. Our team utilizes the VQI database as a resource to facilitate patient compliance. To accomplish this goal, an assembly line model was created to more efficiently contact patients who may be otherwise lost to follow up. Implementing VQI and the assembly line method has produced a 100 percent compliance rate in 2015 for long term EVAR follow ups. In comparison, the Great Lakes region and overall VQI achieved 75 percent and 70 percent EVAR follow up rate, respectively. At our center, ninety six percent of eligible EVAR patients had imaging performed and were seen in the outpatient clinic. The remaining four percent completed a phone follow up. In 2016, the assembly line method continued to successfully produce a 100 percent follow up rate, with 98 percent of patient receiving imaging and were seen in the outpatient clinic. The remaining two percent received a phone follow up. The assembly line approach to data entry and follow-up scheduling maximizes data capture and minimizes patient loss to follow-up, all while improving patient care.

**PROBLEM STATEMENT.** Losing endovascular aneurysm repair (EVAR) patients to long term follow-up is a giant hurdle for quality improvement initiatives. Long term follow-up (LTFU) is defined by VQI as a patient contact one year after the procedure date; with the acceptable capture period occurring between 9 and 21 months. Without proper surveillance, patients increasingly susceptible to device failure, endoleaks, remote aneurysm formation, or aneurysm sac expansion including remote rupture after EVAR. EVAR LTFU can also be used to gauge the effectiveness, cost-benefit analysis, and patient outcomes of vascular interventions and devices.

**GOALS/ OBJECTIVES.** The use of the VQI database as a resource for identifying long term EVAR follow-up patients enables our center to improve patient compliance with their scheduled one-year follow-up visits. In order to more efficiently manage data, our center needed to create a model that streamlined the follow-up effort. The assembly line model has increased our center's follow up rate for 2015 and 2016.

**IMPROVEMENT STRATEGY.** Creating an "assembly line" model simplifies the follow up efforts by clearly defining each team member's responsibilities to accurately capture EVAR LTFU. The assembly line model requires that each team member perform their individual part to create a successful follow up effort. The assembly line approach to data entry and follow-up scheduling maximizes data capture and minimizes patient loss to follow-up, all while improving patient care.

**PROCESS.** Assembly lines are renowned for efficiency. To ensure proper EVAR follow up, our quality team adopted an assembly line approach to data entry and LTFU coordination. Our VQI team supports eighteen physicians at nine hospitals performing in excess of 140 EVARs annually. Development of a streamlined method was crucial to efficiently manage data. There are four main components of our assembly line model: First, the attending physicians capture and submit EVAR procedures into the VQI registry. The physicians are responsible for entering each EVAR procedure into VQI following the completion of the procedure. The second component of the assembly line is completion of the VQI entry and submission of the EVAR procedure to VQI. Our lead data coordinator is responsible for the accuracy and completion of the VQI entry. The remaining components of the assembly line are performed twelve months later if the

first two components are properly entered into VQI. If the procedures are not properly entered into VQI, the remaining part of the assembly line is unable to complete a follow up since there will be no documented record of the procedure in VQI. The cohesive effort of the four components of the assembly line must simultaneously work collectively and independently.

The third component of the assembly line is the appropriate identification of timely LTFU. Each month a follow up abstractor reviews a list from the VQI follow up tools. The target goal is to identify and complete the follow ups by twelve months. This ensures adequate time to contact patients, and to give the patient the maximum amount of time to conveniently schedule follow up appointments before the 21-month deadline. At our center, the average time of patient contact occurs at 12.2 months and the range of follow ups performed is from nine to twenty months. The fourth and final component of the assembly line involves suitable contact measures if required. Once identified, patients who lack a one-year follow up visit are entered into a local database. These patients are contacted by the follow up abstractor and reminded of the clinical importance of EVAR LTFU. Special emphasis is placed on the risks associated with failing to follow up, including the lack of imaging to assess the durability of EVAR success. The VQI team ensure all patients are rescheduled for their follow up visits. If a patient is unable to be contacted via telephone, post cards and certified mail are sent to the patient's address in attempt to reach the patient.

If the patients are unable to be contacted, alternative tools are utilized to verify the patient is still alive. The VQI team utilize the social security death index tool in VQI, and scan obituaries within the region to ensure the patient is not deceased. All information is then inputted into the VQI. If a patient is adamant they do not want follow-up, then the VQI team obtains a phone follow up, and the information collected is documented and conveyed to the physician. This data is then entered into the VQI database. At our center, a phone follow-up is viewed as the least favorable method to obtain data, in part due to the lack of imaging, and is only used as a last resort. If a patient has relocated to another state, the patient will be asked to submit their records from their new vascular physician.

**RESULTS.** The implementation of this assembly line method at our center has enabled a 100-percent compliance rate for 2015 EVAR LTFU. In comparison, the Great Lakes region and VQI nationally only report 75 percent and 70 percent compliance rate, respectively (Figure 1). In 2016, a 100 percent compliance rate has been maintained.

**CHALLENGES/LESSONS LEARNED.** Incorporating VQI into our assembly line model endorses an additional resource to verify our patients comply with EVAR LTFU. Our data management process improves patient care because potentially life-threatening circumstances can be mitigated through proper follow up visits. There are many challenges faced with EVAR LTFU. One challenge is relocation of patients. Patients sometimes migrate between healthcare systems within the same city. Due to insurance restrictions, some post-operative patients cannot be seen at our institution for LTFU. The patient may still be within our local area, yet be unable to follow up in person. Regardless, it is the responsibility of the quality team to request the follow up records from institutions outside our health network and properly document the findings in VQI and the patient's medical record. Sometimes patients relocate to other states or even other countries. Depending on where the patient may have relocated, obtaining an adequate contact number may be challenging. If the patient has moved outside of the United States, it becomes even more difficult to contact them.

Furthermore, most vascular patients have other co-morbidities and other pressing health issues. These patients are sometimes less likely to return for follow up due to their constant health issues and visits to other physicians. Moreover, some elderly patients have difficulties with unassisted travel, and thus rely on third-parties for conveyance to clinic and imaging appointments. Transportation and monetary factors have a known deleterious impact on patient compliance with prescribed follow up. With these challenges in mind, proper guidance and assistance from the quality team is vital to achieve LTFU capture and improved quality of patient care. Proper communication with these patients and requesting healthcare records, adequately assuring and convincing reticent patients to follow up, sufficiently facilitating transportation, and other related services are all daunting tasks which the quality team must navigate properly. Implementing the assembly line model assists in the proper allocation and completion of these

tasks, and this model is pivotal in enabling our team to achieve a 100 percent EVAR LTFU compliance goal in 2015 and in 2016 and to successfully continue a 100 percent compliance goal in 2017.

**CONCLUSIONS/SUCCESS FACTORS.** In addition to the assembly line model, another major driver of successful LTFU at our center is the design of the follow up clinic. The presence of ICAVL-certified PVLs in all of our outpatient clinics allows the patients to receive imaging immediately prior to seeing their physician in the same office location. This decreases the number of appointments a patient must schedule as well as the locations a patient must travel to for their follow up. A recent VQI survey showed only 19 percent of responding sites performed imaging at the same location as the office visit (Figure 5). A third of responding centers indicate that imaging is performed within the same building as the outpatient clinic, but not within the same office location. The remaining half of responding centers indicated that imaging is performed at a separate location from the outpatient clinic. The separate location of the imaging and the outpatient clinic may leave patients susceptible to failing to follow up, or having an inadequate follow up without imaging performed. Adopting a seamless process provides convenience to the patients and guarantees that all of the steps required for proper follow up are done simultaneously.

The culture at our center clearly plays a role in our EVAR LTFU success. The quality team understands the continuing efforts to maintain an exemplary EVAR LTFU compliance rate. This culture translates to our patients. Our department motto states “once you become an EVAR patient, you are a vascular patient for life.” Patient education of the expectations and commitments to return each year for their EVAR follow up visit is thoroughly explained by our physicians before any intervention is initiated. These same points are also directly communicated to these patients’ primary care providers. These factors play a crucial role in ensuring our center continues this exemplary EVAR LTFU rate.

Our center also strives to not only achieve a high LTFU rate, but it is equally important for the patients to have imaging performed. Many publications have shown that EVAR patients who receive imaging with their LTFU have lower mortality rates compared to patients who receive either phone follow ups or do not obtain imaging<sup>1</sup>. Not only did our center achieve a 100 percent EVAR LTFU compliance in 2015, but ninety-six percent of eligible EVAR patients had imaging performed and were seen in the outpatient clinic (Figure 2). The remaining four percent were unable to be seen in the office, and completed phone follow ups. In 2016, a 100 percent compliance rate has been maintained with ninety-eight percent of eligible EVAR patients obtaining imaging and were seen in the clinic (Figure 3). The remaining two percent were unable to be seen in the outpatient clinic and completed a phone follow up. Not only did the compliance rate remain steady from 2015 to 2016, but the proportion of EVAR patients that received imaging in 2016 increased (Figure 4). The assembly line model has verified that each patient was contacted, and all measures were utilized to capture a comprehensive follow up with imaging.



Figure 1:

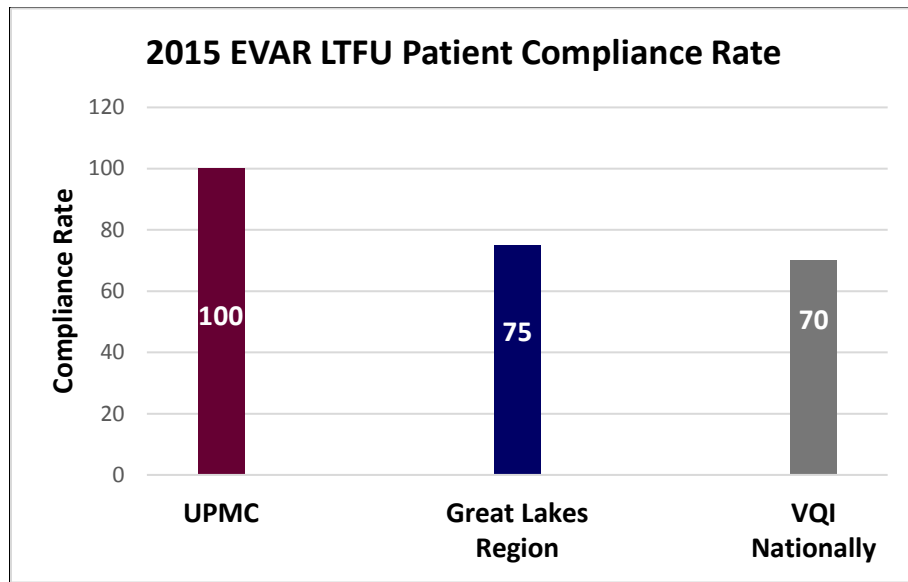


Figure 2:

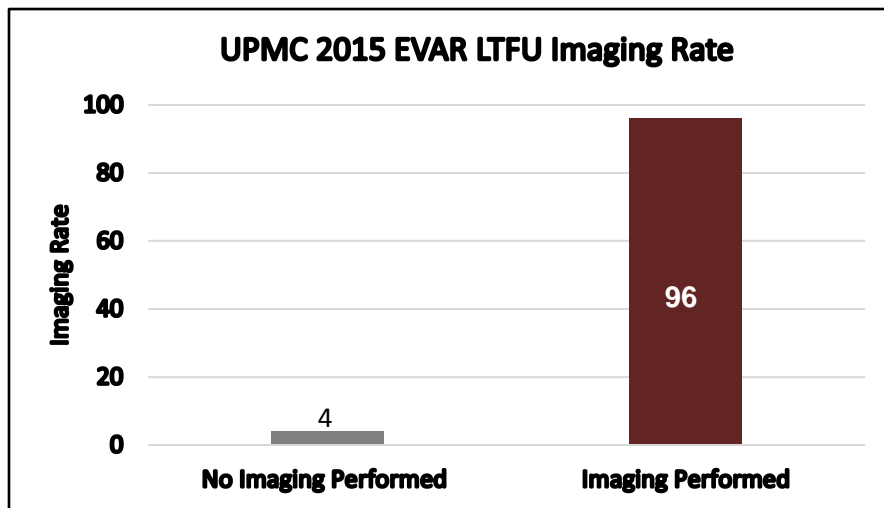


Figure 3:

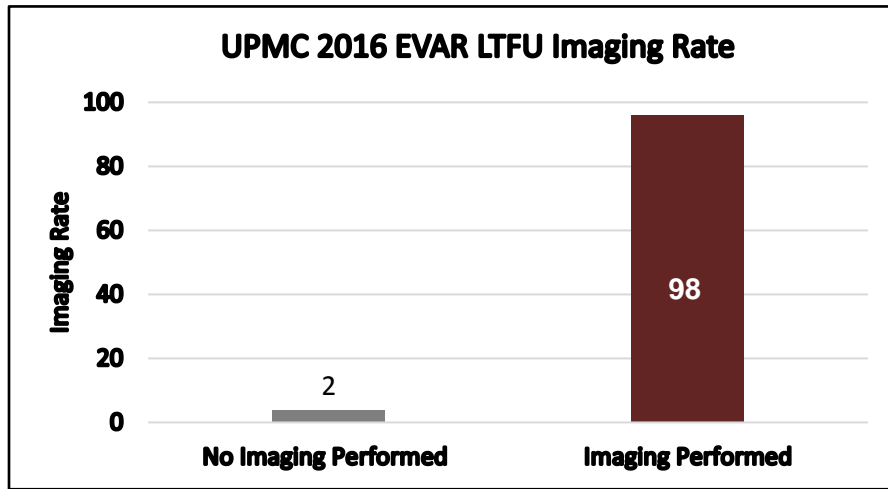


Figure 4:

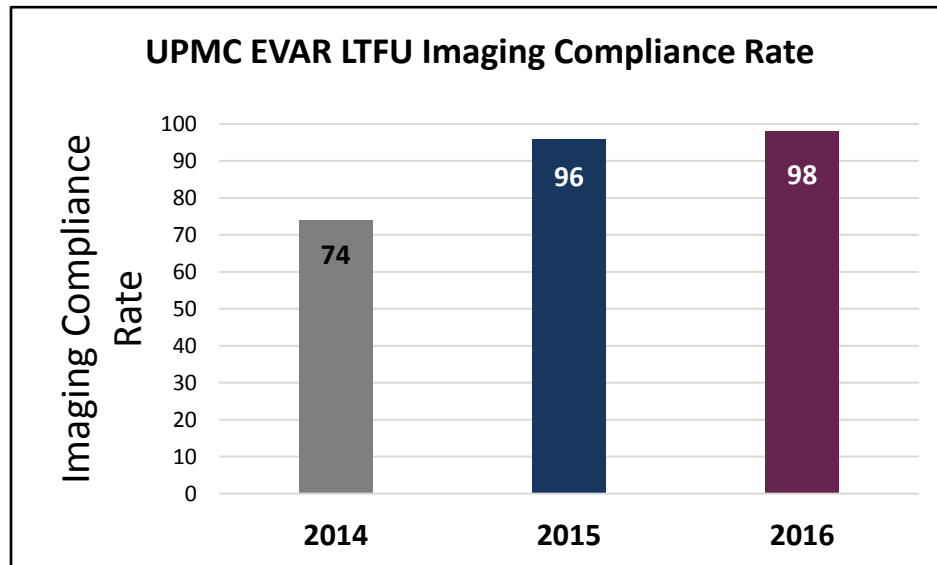
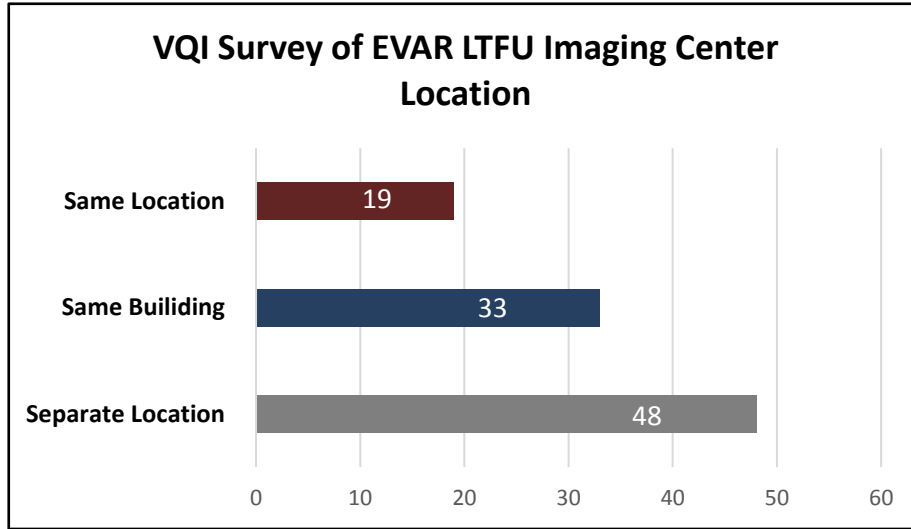


Figure 5:



Reference

1. Hicks et al. (2017). Endovascular aneurysm repair patients who are lost to follow- up have worse outcomes. *Journal of Vascular Surgery*. doi:10.1016/j.jvs.2016.10.106

## 15. University of Rochester (Rochester, NY)

### Integration of VQI and SVS Wifi into an EMR Population Health Registry

**Authors:** Mark Balceniuk, MD, Michael Stoner, MD

**BACKGROUND PROBLEM:** The Vascular Quality Initiative (VQI) is a national repository for the collection, storage and analysis of vascular surgery data based on procedural selection criteria. To date, this registry has existed outside of the electronic medical record (EMR). Merging VQI data into an active registry allows for population management and identification of patient groups of interest. Successful integration sets the foundation for vascular surgery population health management.

**GOALS/OBJECTIVES:** To develop cross-referenced patient EMR reports that utilize VQI patient information, in order to track specific patient outcomes and implement intervention strategies.

**IMPROVEMENT STRATEGIES:** Using the tools associated with an EPIC ambulatory and inpatient software installation, a series of templated (SmartPhrase) notes were created with discrete variable elements. Each VQI phrase includes a Boolean variable (Smart Data Element or SDE) indicating at least one inclusion variable, and a lack of any exclusion variable for a specific VQI module. Registry inclusion rules were then created based on the presence of an inclusion SDE. Additional SmartPhrases were created for the Society for Vascular Surgery Wound, Ischemia, and foot infection (Wifi) score.

**PROCESS:** We have developed individual and grouped patient reports specifically for patients with critical limb ischemia (CLI). In addition, a separate Wifi registry was created to track patients with critical limb ischemia. The CLI registry is able to track current and initial component scores in order to identify patients CLI status changes over time. Both registries can be used to successfully track CLI patients undergoing revascularization or non-operative management. Furthermore, both the VQI and Wifi registries can be combined with other registries (diabetes health, coronary intervention, cancer) to examine the public health outcomes and resource utilization of patients in the VQI registry. Revenue cycle integration ultimately lends to value-based population analytics.

**RESULTS:** A VQI-procedural based registry was successfully created, and n=2591 patients are enrolled to date. The Wifi registry (n=117 patients to date) has been implemented with promising results. We have been able to combine the CLI and Wifi registries and have begun to compile the patient database. As the database continues to grow, we will start cross-referencing the CLI and Wifi registries with the diabetes and coronary intervention registries.

**CONCLUSIONS, CHALLENGES, LESSONS LEARNED:** Merging VQI data into individual patient registries will allow for development of institutional patient health outcome intervention programs. As this process continues to grow, it is important to integrate the information technology department so that building the EMR can be as functional as possible. As we build the registry, we will grow this process to include more diagnoses and surgical procedures.

## 16. Toronto General Hospital (Toronto, Canada)

### Acute and Chronic Renal Dysfunction Post Open and Endovascular Abdominal Aortic Aneurysm Repair

**Authors:** Brandon Van Asseldonk, A El Zahabi, Naomi Eisenberg, Janice Montbriand, Graham Roche-Nagle, MD

**OBJECTIVES:** Abdominal aortic aneurysms (AAA) remain an important health problem specifically for men over age 65. Distinct aspects of both endovascular (EVAR) and open repair place patients at risk for renal dysfunction in the short and long term. Kidney injuries increase the risk of postoperative morbidity, mortality and a prolonged hospital stay. The current study analyzed the incidence of acute and chronic renal dysfunction as well as contributing factors in patients post AAA repair.

**METHODS:** Retrospective chart review of patients who underwent either open or endovascular repair of abdominal aortic aneurysm at Toronto General Hospital (TGH) from Aug 1<sup>st</sup> 2010 to June 30<sup>th</sup> 2016 yielded 587 patients from the Vascular Quality Initiative (VQI) database. Demographics, comorbidities, operative details, preoperative and follow up creatinine values were obtained for patients via electronic medical records.

**RESULTS:** Of the population of patients generated from chart review (n=587), a total of 521 remained after application of exclusion criteria which included preoperative dialysis or kidney transplant, postoperative creatinine within 90 days of repair or any absent primary outcome. The open and endovascular repair groups consisted of 149 (28.6%) and 372 (63.4%) patients, respectively. The majority of patients were male (82.7%) and the mean age was 78.8 in the EVAR group and 71.5 in the open group (t= 9.9 p < .0002). Group comparison is included in table 1.

Preoperative creatinine values were not significantly different between the two groups (p=.11). There was a significantly higher than expected number of patients in the open group (n= 30, 20.1%) compared to the EVAR group (n= 21, 5.6%) who experienced acute renal dysfunction (p < 0.0002,  $\chi^2=25.3$ ) which was defined as a creatinine increase of >44.2  $\mu\text{mol/L}$  or dialysis in hospital. In this group, new dialysis was required in 2 (0.5%) patients post EVAR and 3 (2%) patients post open repair. Follow up creatinine was obtained at a mean 1283 days (42.2 months) postoperatively. Change in creatinine (preoperative to follow up) was significantly greater at 31.8  $\mu\text{mol/L}$  (sd=71.74) in the EVAR group vs 16.7  $\mu\text{mol/L}$  (sd=71.33) in the open group (p = .0006, MWU=23430).

**CONCLUSIONS:** Open repair was associated with increased incidence of acute renal dysfunction post operatively. At long term follow-up, the EVAR group had a significantly increased change in creatinine over the open group.

Table 1:

	Method of Repair (sd)		Statistical test (if appropriate)	P value
	Open	EVAR		
N	149	372		
Average Age at Repair yrs	68.3 (8.0)	76.0 (7.4)	t-test equal variances assumed	p < 0.0002
Percent Male (%)	119 (79.9)	312 (83.9%)	Chi square test	p =0.27
Average Preoperative Creatinine (μmol/L)	89.0 (31.8 )	94.9 (38.0 )	MWU	p =0.11
Average Length of Stay (days)	13.9 (32.2)	6.1 (22.4)	MWU = 7168.5	p = .0002
Urgency				
Elective	117 (78.5)	327 (87.9)	Chi square test	<p>p(<math>\chi^2=8.0</math>, = .018)</p> <p>a. A higher than expected number of elective surgeries in the EVAR group</p> <p>b. A higher than expected number of ruptured surgeries in the open group.</p>
Symptomatic	13 (8.7)	22 (5.9)		
Rupture	19 (12.8)	23 (6.2)		
Diabetes (%)	23(15.4)	73 (19.6)	Chi Square	P = .27

Average Estimated Blood Loss (mL)	1954 (1762)	261.1 (280.78)	MWU	MWU= 1912, p <0.0002
Average Procedure Duration (minutes)	237.9 (81.8)	152.8 (70.1)	MWU	MWU= 9704, p <0.0002
Average Total In-Hospital Blood Transfusion (uPRBC)	1.9 (2.1)	0.6 (4.6)	MWU	MWU= 21329, p <0.0002
Average Crystalloid (mL)	3889.9 (2018)	2082.9 (1003)	MWU	MWU= 8458.5, p <0.0002
Average Contrast Dose (mL)		120.0 (60.4)		

## 17. UCSF Health (San Francisco, CA)

### Improving Data Accuracy & Efficiency by Implementing VQI-specific Brief Op Notes

**Authors: Joyce Nacario, BSN, RN, CNOR and Kamal Soni, IT**

**PROBLEM STATEMENT:** UCSF Health started with Vascular Quality Initiative (VQI) in April 2015 with four modules and added four more modules in 2016. We have several ways of abstracting data from EPIC by pulling into a report all discreet data such as demographics, lab values, history, imaging, etc. but the specific details of the procedure are often the most difficult to find. We tried to capture missing data elements using an Excel spreadsheet designed with a dropdown menu to align the answers with the registry. It takes up to 41 days (median) days lag time waiting for the forms to be emailed back to the data manager for pathways submission. Documentation is done far behind from the time of procedure making accuracy and completeness of data a major challenge.

**GOALS/OBJECTIVES:** Our goal is to improve VQI data collection process, reduce abstraction time, effort, and missing VQI specific variables, create EPIC data tools to capture documentation more accurately, and to move data collection as close as possible to the procedure time.

**IMPROVEMENT STRATEGIES:** Create eight structured, easy to use VQI specific Brief Op Notes in EPIC to capture complete VQI specific data more efficiently. Design discreet data fields for future data import automation.

**PROCESS:** We acquired UCSF IT/EPIC Leadership approval to design and build eight VQI Brief Op Notes using standard EPIC clinical documentation tool called the Smart Block. We streamlined the content so that the source of truth of existing data fields in EPIC/EMR are taken into account. Utilizing a structured customized template for each VQI module allows the surgeons to specifically choose the correct VQI procedure and appropriately select the answers that match the VQI registry definition and nomenclature. The six of eight Vascular Surgery templates are LIVE (March 8, 2018) and each VQI Brief Op Note expands to a longer form dependent on the answers provided by the surgical fellows.

**RESULTS:** After going LIVE with the VQI templates in March 8, 2018, the time required to collect VQI *surgical* data decreased from 41 days (median) to 1 day. By having surgeons enter procedural data at the point of care, documentation is complete and accurate, decreasing the time and effort looking for missing VQI variables.

**PROJECT IMPACT:** Although we just went LIVE with only 25 charts to evaluate from March 8 –April 8, 2018, the utilization of a structured VQI brief op note to capture clinical data at the point of care, significantly improved efficiency in the data collection process. The project eliminated misinterpretation of the op notes during chart reviews.

**CHALLENGES/LESSONS LEARNED:** The success of our new process using EPIC/EMR is dependent upon the utilization of the VQI specific Brief Op Notes in a timely manner as close as possible to the procedure time. Understanding that improving clinical outcomes is only possible with reliable, accurate, and complete data; therefore, it is an imperative first step to implement structured op notes that are accessible at the point of care.



**SUCCESS FACTORS:** It was a long way from data collection using paper to Excel spreadsheets to EPIC Templates but worth the journey. Key factors include building content of the templates without redundancy of data, utilizing a VQI data expert who also has an in-depth knowledge of EPIC documentation, and collaborating consistently with the IT team and the Vascular Surgery Department.

## 18. University of Utah (Salt Lake City, UT)

### Utilization & Usability Assessment of VQI-Specific Electronic Medical Record Brief Operative Notes at 1-year Post Implementation

**Authors: Julie Beckstrom, RN, MSN, Larry Kraiss, MD, Joanna Lynch, PA-C; Benjamin S. Brooke, MD, PhD**

**PROBLEM STATEMENT:** The extraction, collection, and entry of data for vascular procedures remains a daily challenge for centers participating in the Vascular Quality Initiative (VQI). To improve the accuracy and efficiency of these processes, the University of Utah Vascular Surgery team developed VQI specific brief operative notes (BONs) within the Epic Electronic Medical Record (EMR) and implemented them into clinical practice for all 8 VQI Registries that the University of Utah participates in. However, VQI BONs were only utilized on average 60% of the time at our institution during the 2017 calendar year.

**GOALS:** To assess VQI BON usability, identify barriers or facilitators to use, and discover potential solutions to enhance access, design, and ease of use.

**IMPROVEMENT STRATEGIES:** We performed semi-structured interviews of 13 VQI BON primary users at the University of Utah, including Attending Surgeons, Fellows, and Advanced Practice Clinicians (APCs). An interview script included questions designed to assess provider understanding of the VQI BON templates, identify barriers, and facilitators to VQI BON use, and generate ideas to increase VQI BON usage. Thematic content analysis was performed using interview transcripts.

**RESULTS:** Non-use of VQI BONs via discipline are as follows: Attending Surgeons 16%, Fellows 54%, Surgical Residents 9%, and APCs 21%. Interviews were conducted with 4 Attending Surgeons, 1 Fellow, and 8 APCs. 38% of interviewees attributed forgetfulness and lack of time to decreased usage. If Fellows, Residents, and APCs were directly instructed by Attending Surgeons to use VQI BONs, compliance would likely increase. Knowing the rationale for the implementation of VQI BONs does not affect utilization. Many Providers are unsure how to access and navigate to/from VQI BONs from specific locations of the EMR. It is beneficial for the individual responsible for completing the VQI BON to contemporaneously document accurate procedure-specific data. Surgical Residents rotating for short periods of time on the Vascular Surgery service, as well as new APCs, are often not adequately introduced to VQI BONs.

**CHALLENGES/LESSONS LEARNED:** VQI BON continuing education for vascular surgery staff is needed to improve usage. Even experienced users of VQI BONs would benefit from repeated instruction on how to access and navigate notes from within the EMR.

**SUCCESS FACTORS:** VQI BONs provide an innovative approach to achieve efficient and accurate data collect for the VQI registry. VQI physician champions are effective in promoting their use and can help improve adoption across the Vascular Surgery service line.

## NOTES



**Join us next year for the  
VQI Annual Meeting 2019  
in National Harbour, MD, on  
June 11<sup>th</sup>/12<sup>th</sup>**