VQI Annual Meeting
VQI@VAM

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VQI Annual Meeting
Quality Improvement Abstracts
2020 & 2021

VQI Annual Meeting VQI@VAM

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1. Boston University - High Rate of 30-day Hospital Utilization Following Lower Extremity Revascularization Emphasizes Need for Improved Post-Procedure Care

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Supported by a Vascular Study Group of New England Quality Improvement Award

Problem Statement:
Patients who undergo lower extremity revascularization have high 30-day post-discharge hospital utilization rates (readmission and/or re-presentation to the emergency department), which are associated with poorer outcomes and are used as quality metrics for institutions and physicians. However, determinants of 30-day hospital utilization and time to re-presentation are not well described.

Goal:
We aimed to determine risk-factors for 30-day hospital utilization and timing of re-presentation in patients undergoing lower extremity bypass (LEB) and peripheral vascular intervention (PVI), in order to formulate successful strategies to reduce hospital utilization.

Improvement Strategies:
We characterized all patients who underwent lower extremity revascularization at our institution from June 2018-June 2019 using the institutional VQI database supplemented by chart review. The primary outcomes of our study were 30-day hospital utilization and time to re-presentation. Patient characteristics, procedure characteristics, and discharge characteristics were analyzed based on: (1) procedure type and (2) 30-day hospital utilization.

Results:
Of 114 revascularizations, the 30-day hospital utilization rate was 37% (30% readmission, 7% ED without admission). Hospital utilization occurred at a median 11 days post-discharge [IQR 5,18]. At discharge, vascular surgery follow-up was scheduled in 86% at a median 24 days [IQR 16,28] and PCP follow-up was scheduled in 26% at 14 days [IQR 9,32]. LEB was performed in 26% and PVI in 74%. PVI patients were more likely to be discharged from a non-surgical service (46% vs 7%, P<0.001) and had a longer interval until scheduled vascular surgery follow-up (27 days [IQR 20, 29] vs 18 days [IQR 10,23], P<0.001). There was no difference in 30-day hospital utilization based on procedure type (50% LEB vs 32% PVI, P=0.1), however LEB patients had a higher 30-day readmission rate (47% vs 24%, P=.04). Regardless of intervention type, patients who had 30-day

hospital utilization were more likely to have coronary artery disease (CAD) (52% vs 26%, P=0.008) and were less likely to be prescribed ACEI/ARBs (14% vs 36%, P=0.02). Patients with 30-day hospital utilization had longer index length of stay (8.5 days [IQR 5,14] vs 6 days [IQR 1,10;] P=0.005) and were less likely to have been discharged home (48% vs 74%, P=0.01). On multivariable analysis, CAD (OR 3.3 [95% CI 1.4-8.1, P=0.008) and non-home discharge (OR 2.6

[95% CI 1.1-6.4], P=0.04) were predictive of utilization and ACEI/ARB was protective (OR 0.29 [95% CI 0.1-0.9], P=0.03).

Challenges/Lessons Learned:

30-day hospital utilization rates are high following lower extremity revascularization in a safety-net population, typically occurring within 2 weeks of discharge. Vascular surgery follow-up is often scheduled outside of this window and PCP follow-up is infrequent. Developing a system of earlier communication and follow-up is crucial, particularly when patients are not discharged home.

Success Factors:

Our study allowed us to identify an actionable deficit in our current discharge care. In addition to scheduling earlier surgical follow-up, we are currently developing a targeted discharge instrument to teach patients how best to seek care when issues develop in the early postoperative period and we are piloting an interactive text-based post-discharge care algorithm.

2. Catholic Health System - Implementation of providing patients with surgical site care instructions and supply kits on day of discharge to decrease surgical site infections.

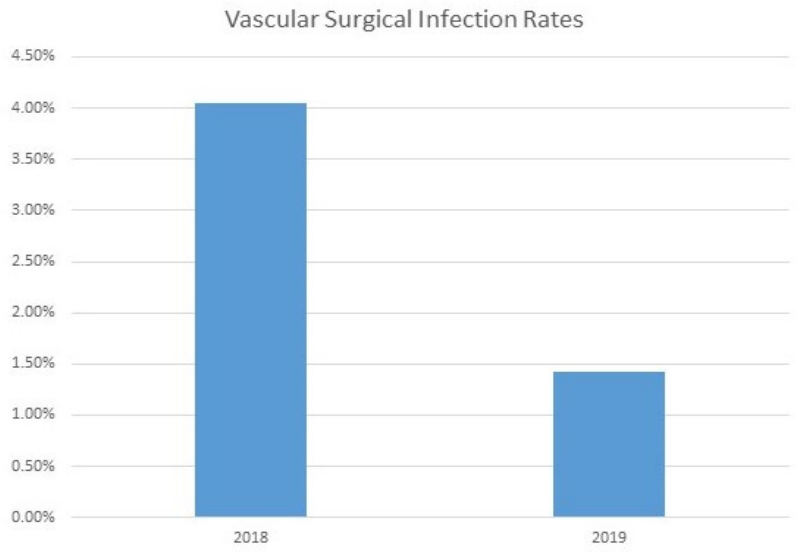
Authors: Susan Nappo, RVT, MBA, Jill Bennett, RN, BSN, Sarah Bialecki, RN, BSN, Paul Anain, MD, Melissa Kitson

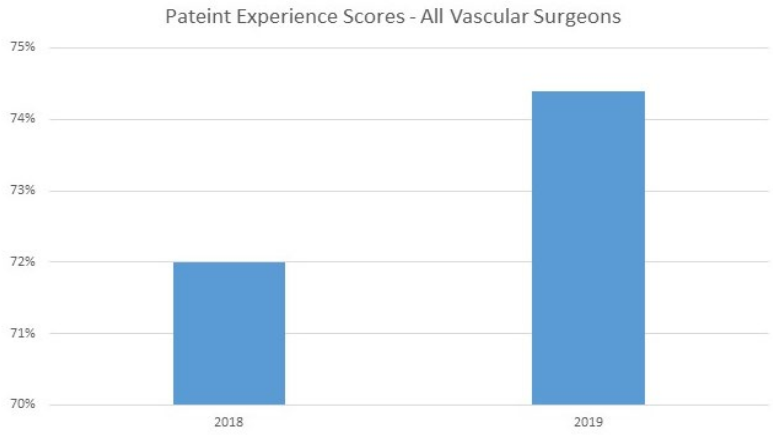
Problem statement:
We identified a trend of increasing surgical site infections over the past three years, starting with 18 infections in 2016, 19 infections in 2017, increasing to 22 infections in 2018. After an in depth chart review and discussions with providers and the vascular staff, we decided to focus on the care of the patient post procedure.

Goals:
Decrease the number of surgical site infections in our vascular surgery patient population (patients undergoing EVAR, open AAA, supra and infra inguinal bypass, carotid endarterectomy, and femoral endarterectomy).

Improvement Strategies:
We developed a plan to educate the patients prior to discharge on the appropriate care of their surgical site and also provide them with the supplies necessary to properly care for their surgical site. Nurses would provide this education to patients and respective caregivers as needed on the morning of discharge. The patients would be given a discharge kit including printed instructions and supplies. The supplies included shampoo, body wash, dial soap, nail brush, pack of washcloths, under pads, and disposable T-shirts and/or underwear (depending on the surgical site).

Results: There has been a decrease in surgical site infection rate from 4% in 2018 to 1.4% 2019 in our vascular surgery patient population. There were 9 surgical site infections in 2019, a significant decrease from 2018. There has also been an increase in patient satisfaction rates during this same period.





Challenges/Lessons Learned:

The first challenge was determining the budget for the additional supplies. This was especially difficult during current budgetary constraints. The second challenge was finding the personnel to commit the time necessary to prepare the discharge kits so they are readily available on the day of discharge for the patients.

Success Factors:

While the nurses are providing the surgical site care education, patients are also using this time to ask additional questions about their procedures and care, leading to an increase in patient satisfaction. With the decreased surgical site infection rates, we are experiencing decreased readmission rates and decreased re-intervention rates. We were able to offset the cost of the kits by securing a grant from the hospital foundation to purchase the supplies for almost 200 kits. We also used our volunteer staff to prepare the kits so they are readily available on the nursing unit at time of discharge. The collaboration of our surgeons, quality team, nursing staff, and volunteers paired with the support of our foundation was key to the success of this project.

3. Concord Hospital - Implementing a Smoking Cessation Program

Christina Swanberry, MSN, RN, CCRN-K, SCRN, Diane Davis, DNP, MHA, RN, and Bethany Bourcier, RN, MSHA

Problem Statement:

Smoking is the leading preventable cause of cardiovascular disease (American Heart Association, 2018). Smoking impacts the rate of progression of the disease and negatively impacts the recovery after a vascular procedure. Reducing prevalence of smoking may help to reduce the incidence of vascular diseases and associated complications.

Quitting smoking is difficult. While 68.8% of smokers want to quit, only 6.2% are successful (Centers for Disease Control and Prevention, 2011). Most smokers try to quit on their own, but there is a high rate of relapse. Using an evidence-based program can more than double a person's rate of success (CDC, 2011).

Concord Hospital is a 295-bed community hospital in New Hampshire that serves 137,884 people in the primary service area (Sg2, 2018). Over 40% of patients with vascular disease needing intervention in this service area were found to be current smokers (Vascular Quality Initiative, 2018). In 2017, it was discovered that smoking cessation resources for these communities were becoming scarce.

Concord Hospital and Concord Hospital Medical Group ambulatory practices needed to enhance smoking cessation resources available to improve the lives of people in the communities it serves.

Goals:

There were three main goals of enhancing smoking cessation resources:

1. Offer an accessible, in-person, evidence-based smoking cessation program.
2. Screen all patients and offering smoking cessation resources to those actively smoking.
3. Offer patients updated smoking cessation materials.

Improvement Strategies:

In 2018, Concord Hospital implemented the American Lung Association's Freedom From Smoking® program. Concord Hospital received grant funding to train facilitators for this small-group smoking cessation clinic. The Freedom From Smoking® course consists of eight 90-minute sessions over seven weeks and prepares participants for successful smoking cessation using a variety of techniques, including behavior modification and stress reduction methods.

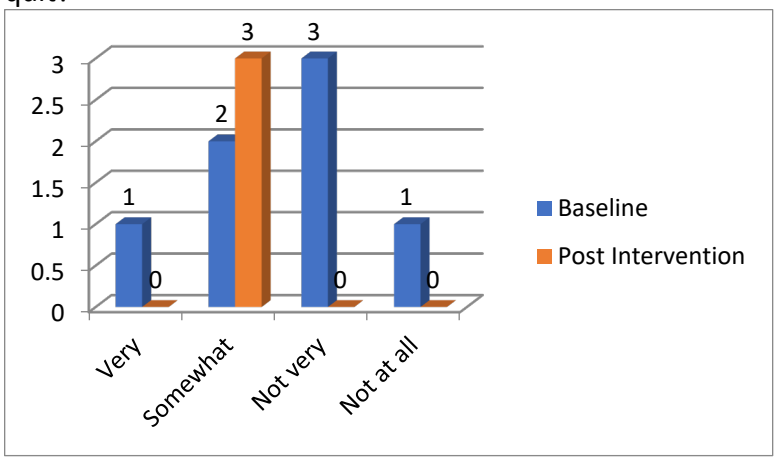
Concord Hospital redesigned "Quit Kits" that are offered to patients who actively smoke. The new Quit Kits now feature a free app to motivate those quitting, a free telephone-based cessation program, tips on affording smoking cessation medications, a stress stone, and a stick of gum.

Results:

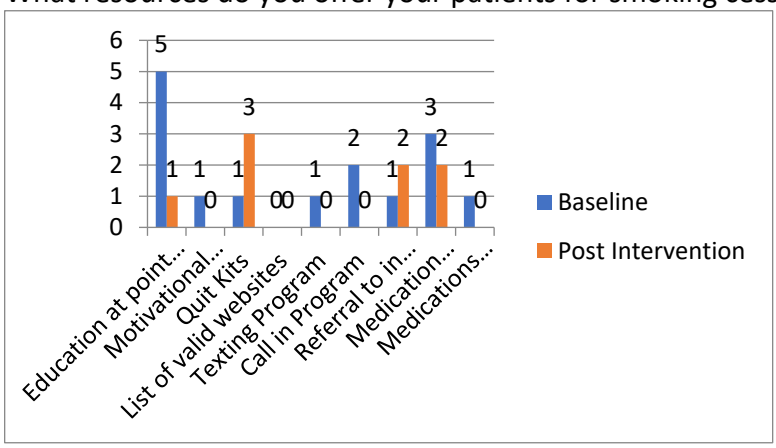
Our program is still in its infancy, but so far we have had two participant successfully quit tobacco. Three others joined the program, but ended up not completing it.

Clinician and Provider Qualitative Survey Results:

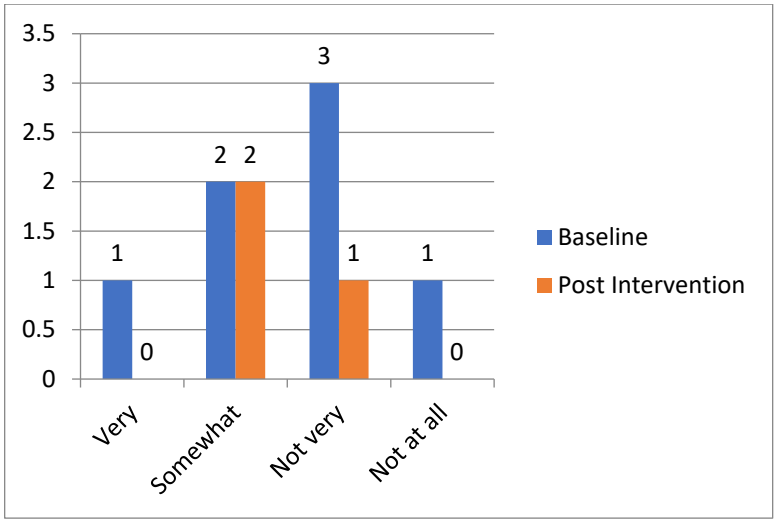
How well-equipped is our organization to meet the need of patients that smoke, in helping them quit?



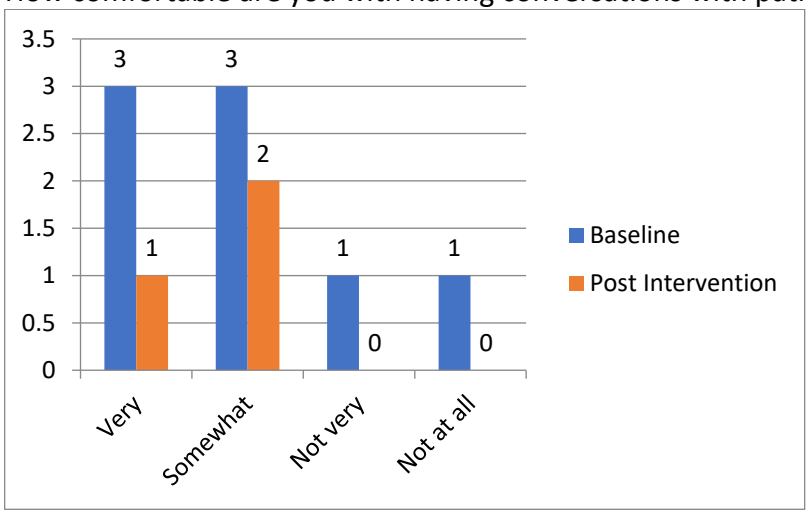
What resources do you offer your patients for smoking cessation?



How confident do you feel when you provide smoking cessation resources to patients?



How comfortable are you with having conversations with patients about smoking cessation?



Challenges/Lessons Learned:

- Recruitment of smoking cessation facilitators.
- Anti-kickback laws- cannot offer this program for free.
- Funding to market program.
- High rate of attrition.

Success Factors:

- Support from senior administration.
- Engaged staff to become facilitators of the smoking cessation program.
- Grant funding.
- A program coordinator.
- Affordable Care Act reimbursement.

4. Dartmouth Hitchcock - Anticoagulation and Antiplatelet Treatment Plan Communication and Documentation Improvement Project

Authors: J. Aaron Barnes, MD, Mark A. Eid, MD, Kayla O. Moore, MPH, Philip P. Goodney, MD, MS

Problem Statement:

Anticoagulant and antiplatelet medications are commonly utilized in the management of vascular diseases. Prior Vascular Quality Initiative studies have demonstrated significant variation in the use of these medications within vascular surgery. While the overall indications for these medications may be clear to vascular surgery practitioners, their role may be less clear to practitioners in other fields because of this variation. Given this, clear and effective documentation of anticoagulant or antiplatelet treatment plans are critical. A paucity of documentation prevents other members of the care team from being able to quickly ascertain the indication for, intended duration of, or ability to pause anticoagulant/antiplatelet agents.

Goals:

The goal of this project was to improve how vascular surgery, and eventually all services utilizing these medications, at Dartmouth-Hitchcock document and communicate anticoagulant/antiplatelet treatment plans.

Improvement Strategies:

1. Create and implement a standardized vascular surgery discharge summary template that clearly delineates antiplatelet/anticoagulant indication, duration, ability to be held, and contact information for further questions.
2. Build an electronic medical record (EMR) embedded SmartForm tool to streamline anticoagulation/antiplatelet treatment plan documentation. This SmartForm will extract information from the note writing process and store that information as discrete data points within the EMR. This data can then be directly pulled into future EMR documentation across service lines and encounters or larger reports for broader data extraction.

Results:

The vascular surgery discharge summary template was created in conjunction with an institutional campaign to standardize note templates. Following approval, the template was implemented in September 2019. Implementation monitoring was conducted alongside Plan-Do-Study-Act (PDSA) improvement cycles and results are shown in Figure 1.

The SmartForm EMR tool is actively being created in conjunction with an internal coder and EMR support staff. Approximately 50% of its features have been pilot tested in the “play EMR” environment.

Challenges/Lessons Learned:

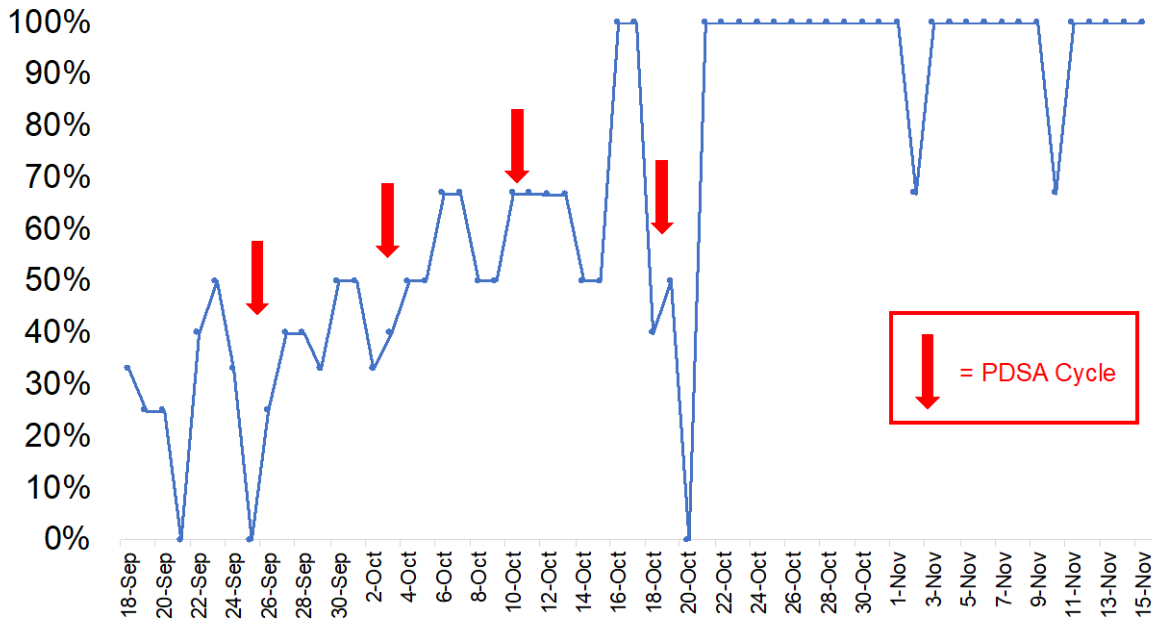
Turnover in the resident/trainee team on a monthly basis, along with vacation and leave, posed a challenge during the discharge summary template implementation. To remedy this, email instructions were sent to all new residents rotating onto the service. Associate providers provided greater continuity and led the implementation efforts.

The creation of the EMR tool posed numerous challenges. First, early tool designs were cumbersome and required numerous clicks to navigate. We made a concerted effort to ensure the final tool would not be burdensome or significantly alter workflows. To achieve this, several drafts of the tool were created before the final design was chosen. Second, stakeholders from other services participated in tool creation, but each brought differing needs or requests. To accommodate these differences, tool features were kept broad and generalized. Finally, the EMR is complex and accompanied with bureaucracy. Navigating this took time and the input from others who had successfully been through the process previously.

Success Factors:

1. Institutional support for standardized discharge summary templates was critical in expediting template approval.
2. Inpatient associate providers ensured that the discharge summary template was utilized and taught new trainees how to use it.
3. Patience and open communication with EMR coders have resulted in a positive relationship and sense of team.

Figure 1. Run chart demonstrating percent of all vascular surgery discharges using the standardized discharge summary template and intervening Plan-Do-Study-Act cycles.



5. Dartmouth Hitchcock - Increasing data entry rates for VQI variables using SmartText: a pilot approach

Authors: Camilo J. Martinez, BS (1), Aravind S. Ponukumati, BE (1), Regis Hila, BS (1), Mallory N. Perez, BS (1), Cassandra H. Brugger, MA (2), Allison J. Hawke, CCRP (2), Richard J. Powell, MD (2), Jennifer A. Stableford, MD (2), David H. Stone, MD (2), Bjoern D. Suckow, MD, MS (2), Philip P. Goodney, MD, MS (2)

1. Geisel School of Medicine at Dartmouth College
2. Dartmouth-Hitchcock Medical Center, Lebanon, NH

Problem Statement/Goals:

The Vascular Quality Initiative (VQI) has been instrumental in providing vascular surgeons necessary data to conduct clinical outcomes research to promote quality improvement. Data collection for each patient submitted to VQI includes variables specific to the perioperative period such as demographics, preoperative health status, and clinical factors for operative planning. VQI participants may be challenged with submitting complete and valid data given the large quantity and detail of variables required per procedure and lack of awareness around the deficiencies in source documentation for the data abstraction process.

This project set out to:
1) describe data completeness for three procedures at one participating VQI center
2) implement a 30-day pilot intervention to improve data capture for selected variables.

Improvement Strategies:

At one participating VQI center, a review was performed of all variables from the pre- and perioperative period in order to identify opportunities to improve data completeness and thereby strengthen data validity. Three procedures were selected to pilot this approach: carotid artery stenting (CAS), carotid endarterectomy (CEA), and endovascular aneurysm repair (EVAR). For each procedure, a de-identified dataset of cases performed between Q1 2016 to Q3 2019 was provided for analysis. Data elements for patient demographics, procedural variables, anatomic characteristics, and outcomes were stratified by their percent complete in the dataset. Clinical variables with less than 80% completion rates were the primary focus.

A process improvement strategy incorporating a SmartText template into operative reports for each of the selected procedures was developed using the variables of interest. Physicians were instructed to utilize the template in operative reports for all CAS, CEA, and EVAR cases for a 30-day pilot period between February to March 2020.

Intervention success will be measured by: 1) the percentage of total operative reports incorporating the SmartText template for CAS, CEA, and EVAR procedures, respectively; 2) surgeon-reported experience with implementation of the SmartText, adapted from the Net

Promoter Score, with a score of 7-10 indicating surgeons as likely/highly likely to recommend this intervention for future use; and 3) the difference in data entry rates for the variables of interest pre- and post-intervention.

Results:

Variables with less than 80% completion rates (%) were identified for intervention. Targeted variables for EVAR included: abdominal aortic aneurysm (AAA) Neck Diameter (69%), AAA Neck Length (70%), Aorta-Neck Angle (68%), and Neck-AAA Angle (69%).

The targeted variables will be incorporated within the SmartText tables for each corresponding procedure and final results will be available after the 30 day intervention.

Lessons Learned:

Proper documentation is important for data abstractors to have a more complete dataset for each procedure type. Future work will involve the inclusion of additional procedure types for implementation of SmartText.

6. Froedtert Hospital - Performance Improvement Project to Increase Antiplatelet and Statin Medications Prescribed at Discharge

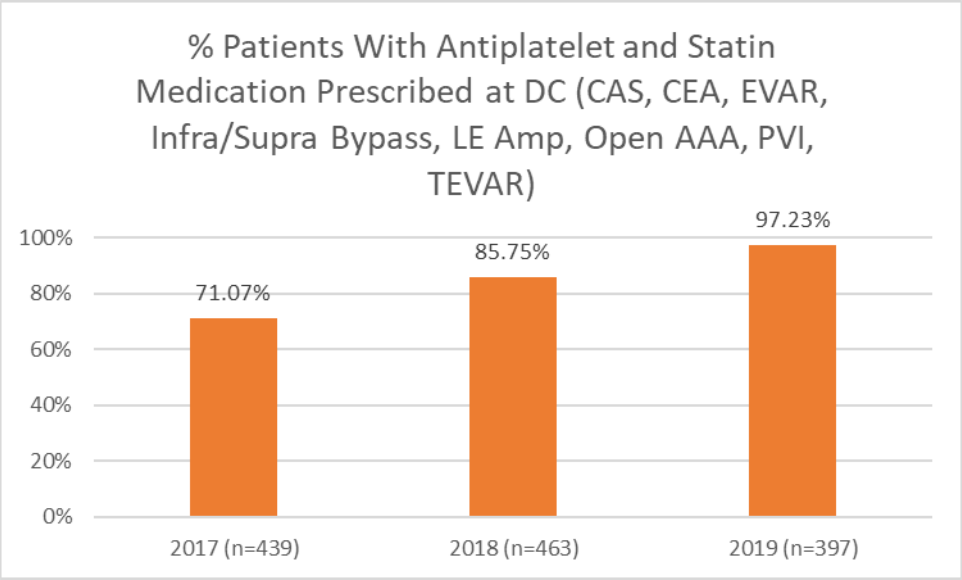
Problem Statement:
Compliance with antiplatelet and statin medications improves five year survival for patients having vascular procedures. The fall 2018 Vascular Quality Initiative (VQI) Regional Quality Report showed our hospital was below the VQI 25th percentile for antiplatelet and statin medications prescribed at discharge.

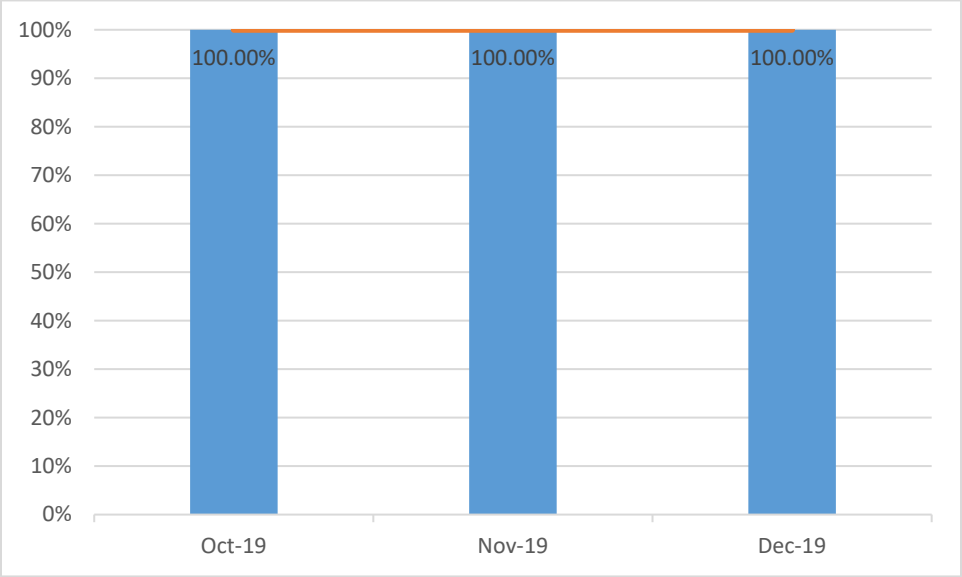
Goal:
We set a goal of 100% compliance for antiplatelet and stating medication prescribed at discharge for all patients undergoing a vascular procedure in the VQI registry at Froedtert Hospital.

Improvement Strategies:
The Vascular Performance and Program team met and collaborated on strategies to improve our compliance. The following plan was put into place in July of 2018.

- Collaboration with Pharmacy to develop process of reconciliation at discharge where provider will be contacted if antiplatelet and statin are not prescribed/addressed prior to discharge.
- Provider note template revision in electronic medical record to include a specific line for addressing antiplatelet and statin medication
- Development of workflow for elective procedures. This included review of the chart for antiplatelet and statin medications prior to the procedure, either by the interventional radiology (IR) nurse or the Vascular or IR Clinic nurse.
- Education to all providers and staff, inclusive of all specialties participating in VQI.
- Antiplatelet and statin medications added to discharge order set for outpatient peripheral vascular intervention.
- Monthly review of VQI registry data, with communication to providers, to address improvement opportunities with documentation of exclusions and ordering of medication if omitted.

Results:
A significant improvement was achieved from the fall of 2018 to the end of 2019. Our beginning percent of compliance in the fall of 2018 was 72.9% with current compliance of 97.23%. Compliance for the past three months, for all modules, has been 100%.





Challenges/Lessons Learned:

Education is not enough to hardwire the prescribed antiplatelet and statin medications at discharge. There is a definite need to add this to the discharge template in the electronic medical record. It was also necessary to include education to physicians, advanced practice providers, and nursing support staff in all areas prepping and discharging the patients. This was challenging in our institution due to lack of informatics support. Our electronic medical record was in the middle of entire system reboot. Once the education and templates were both implemented there was a significant increase in compliance.

Initially we focused our education on vascular surgery and interventional radiology. This improved our compliance rate significantly, but we continued to have fall outs in the data. We recognized that we needed to expand our educational efforts to the neurointerventional team. This was completed in December of 2019. We will work with their teams to also update their outpatient discharge templates.

Success Factors:

A clearly defined action plan, roles and responsibilities of each stakeholder.

Interdisciplinary collaborative team involvement in education of the importance of antiplatelet and statin medications at discharge.

Involvement of multiple departments and the engagement of the providers to update templates in the electronic medical record.

Ongoing education and monitoring for success.

7. Grey Nuns Community Hospital (Edmonton, AB, Canada) - Obtaining Closure: Utilizing VQI Data to Obtain Approval for Routine Usage of Perclose ProGlide Devices for EVAR

Adrian Fung[1], MD, Yaasin Abdulrehman[2], MD FRCSC ([1]Division of Vascular Surgery, University of British Columbia; [2]Division of Vascular Surgery, University of Alberta)

Problem Statement:

Advantages of vascular closure devices compared to cutdown access for endovascular aneurysm repair (EVAR) have been shown to include early ambulation, decreased OR time and length of hospital stay. Percutaneous EVAR (pEVAR) has been accepted as the new standard of care over cutdown EVARs (cEVAR) in properly selected patients. However, access to Perclose ProGlide (Perclose) vascular closure devices was limited at our centre due to perceived increased cost and required Operational Procurement Evaluations Committee's (OPEC) approval prior to routine use.

Goal:

To obtain OPEC approval for utilizing Perclose devices for EVAR at Grey Nuns Hospital using data collected for Vascular Quality Initiative (VQI).

Improvement Strategies:

After obtaining probationary approval for Perclose usage, we prospectively collected data on pEVARs and cEVARs from Oct 2017- Nov 2018 as per VQI data entry fields. We excluded all ruptured or symptomatic aneurysms from the analysis. The primary outcome of interest was length of hospital stay. We also examined secondary outcomes such as total OR time, complications, in hospital mortality and number of Perclose devices used. We planned to present our data to OPEC to obtain approval at the completion of the study.

Results:

After exclusion of ruptures, 130 patients underwent EVARs during the study period. The average age of the patients was 74.2 $\pm$ 8.2 years and 106 (82%) patients were male. 81 (62%) underwent pEVAR and the remaining 49 underwent cEVAR. Average of 4.5 Perclose devices were used per pEVAR, and 5 cases were converted to cutdown for device failure. The mean hospital stay was 1.6 $\pm$ 1.8 days for pEVAR and 3.8 $\pm$ 2.1 days for cEVAR ($p < 0.05$). The mean OR duration was 123.2 $\pm$ 15.9 minutes for pEVAR and 162.6 $\pm$ 18.3 minutes for cEVAR ($p < 0.05$). The post operative complication rate was not different between the two groups ($p= 0.26$). There was no mortality in both groups.

Challenges/Lessons Learned:

The process of procuring Perclose devices for EVAR was streamlined by presenting granular data provided by the VQI database at our centre. The results suggested that Perclose devices saved an average of $2064CAD per EVAR patient for the hospital secondary to length of stay alone, not to mention savings from the shorter OR time. The OPEC swiftly approved the Division of Vascular Surgery's request for routine use of Perclose for EVARs at the Grey Nuns Hospital.

Success Factors:

The collaborative efforts by all the vascular surgeons as well as anesthesiology colleagues were instrumental in providing all the necessary VQI data for each case. The dedicated vascular nursing team also ensured that all required data points were recorded for VQI submission.

8. University of Washington Regional Vascular Center at Harborview Medical Center, Seattle, WA - Best Practices for Complex Endovascular Procedures

Authors: Benjamin Starnes, MD, FACS; Amanda Sigala, RN, BSN, MPH, CPHQ

Problem Statement:
Efficiency in performing Complex Endovascular (EVAR) procedures has been shown to reduce patient morbidity and mortality. We benchmarked our institutional data against comparable peer groups in VQI to gain insight into performance on clinical processes of care and outcomes. We disseminated our best practices with peers regionally and nationally.

Goals:
Use data to understand baseline for clinical outcomes and processes of care. Promote best practices regionally and nationally with Vascular Surgery peers.

Population:
Complex EVAR procedures including Fenestrated Endovascular Aneurysm Repair (FEVAR) custom and modified graft procedures performed between Q4 2014 to Q4 2019 at 32 participating centers in the VQI Pacific Northwest (PNW) Regional Group in Washington, Oregon, and Alaska. The benchmarking group includes all centers participating in the VQI TEVAR/Complex EVAR VQI module nationwide. We reviewed custom and modified grafts as an aggregate group, and evaluated them separately.

Methodology:
Abstract baseline data on Complex EVAR metrics in M2S Pathways. Identify processes and metrics of interest in conjunction with Vascular faculty and clinical standards of care/evidence-based practice. Build custom queries in M2S Pathways Analytics to pull metrics of interest. Analyze data and identify areas of strength. Identify best practices associated with specific areas of strength. Metrics include Fluoroscopy Time, Contrast Usage, Percutaneous Femoral Access, Procedure Time, Estimated Blood Loss, Discharge Disposition, Re-Interventions, Post-Operative Complications, Length of Stay, and Post-Operative Length of Stay.

Improvement Strategies:
Review data on a local level and educate and promote best practices at our biannual PNW Regional Group Meetings. We also shared best practices in national publications and presentations, our Pacific Northwest Endovascular Conference (PNEC) Fellows Symposium, and the FEVAR symposium at the Western Vascular Society.

Results:

We identified the following clinical standards as important in order to achieve our excellent results: having a streamlined team, do not use fusion of CT scan to fluoroscopy image, do not

pre-cannulate target vessels, spend time prior to procedure in planning process, and use time-saving maneuvers to reduce procedure times in this largely elderly population. Using these standards of care can reduce post-op complications such as lower extremity ischemia and other complications, reduce length of stay, and reduce discharges to skilled nursing facilities.

Challenges/Lessons Learned:
We needed sufficient baseline data to begin benchmarking. There are less than three other centers in the PNW region participating in the Complex EVAR module, so there was less data available. A small "n" on a quarterly basis impacted rates if there were any outliers. The raw data lacked risk modeling for severity of illness and expected mortality.

Success Factors:
Our data and best practice recommendations were well received by the PNW Regional Group and national audiences. Sharing our best practices will increase knowledge among Vascular surgeons and elevate the national standard of care for patients undergoing Complex EVAR procedures.

Next Steps:
Correlate with VQI long-term follow-up or other long-term outcomes such as mortality or readmissions. Deeper dive into specific complications to look for opportunities for improvement.

9. Medical University South Carolina - EVAR LOS

Author: Thomas Brothers, MD

PROBLEM STATEMENT:
From June 2017 through May 2018 the proportion of patients at our institution with a postoperative length of stay (LOS) greater than two days after endovascular aneurysm repair (EVAR) significantly exceeded the Society for Vascular Surgery Vascular Quality Initiative (SVS-VQI) national and Carolinas Vascular Quality Group (CVQG) regional means (28% vs. 14% and 13%, respectively).

GOAL:
Our goal was to reduce the proportion of patients after EVAR (exclusive of fenestrated, snorkeled, or suprarenal cases) with postoperative LOS greater than two days to less than 10%.

IMPROVEMENT STRATEGIES:
After reviewed the records of all patients for the factors that contributed to increased length of stay over the prior year, the following strategies were adopted:

1. Avoid peri-procedure over- or under-hydration
2. Minimize use of intravenous contrast during the procedure
3. Hold Metformin 2 days and ACE-I 1 day prior to procedure
4. Preoperative discussion with patients regarding planned short length of stay
5. Minimize intraoperative use of Foley catheter

RESULTS:
From June 2018 through May 2019 the proportion of patients at our institution with a postoperative LOS greater than two days after EVAR was 3% compared with 12% for the SVS-VQI national and 10% CVQG regional means.

CHALLENGES/LESSONS LEARNED:
Recruitment of all attending and resident surgeons ensures compliance with protocols. Involvement of anesthesia and perioperative and ward nursing is essential to optimize hydration and maximize patient expectations and compliance, while bladder catheterization is not necessary during uncomplicated EVAR.

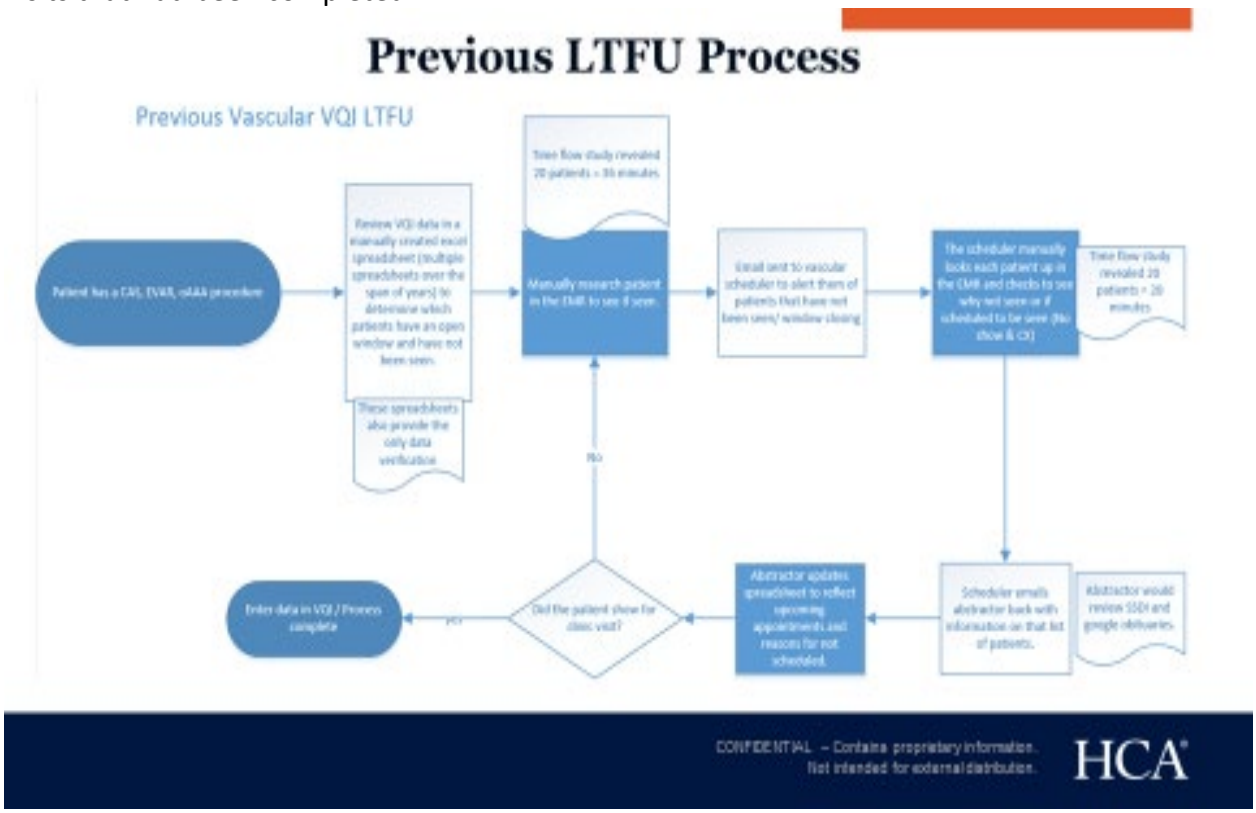
SUCCESS FACTORS:
Strong provider and institutional support for and belief in the SVS-VQI quality improve process facilitates success in attaining goals in improving vascular surgical patient care.

10. Mission Hospital - Long Term Follow up rates for visits that were completed between 9 & 21 months after 2017 procedures

Using our center's data from VQI we identified our combined long term follow up rate (defined by VQI as a follow up visit within 9-21 months of surgery) for procedures performed between 1/1/13 and 12/31/15 as 69%. For 2016 our follow up rate was 74%. This included all visits entered in VQI regardless of the visit type (phone call, face to face etc.). We established a goal of at least 80% of patients to have a face to face visit with a vascular provider within 9-21 months of their procedure.

Our team consisted of vascular surgeons, vascular advanced practitioners, the VQI abstractor, the patient scheduling supervisor, the practice manager, the VQI data manager, and the vascular practice operating officer.

Below is a flow chart of the process in place at the time of the charter. This process was used to identify patient appointments that had not been scheduled, patients who had visit windows closing soon, or had been scheduled in order to be within the "VQI visit window", as well as for visits that had been completed.



We identified the following potential barriers to follow up visits; the ability of patients to return for follow up appointments due to cost (regardless of insurance coverage), travel distance, physical ability to return and not understanding importance of vascular follow up.

Although there was agreement among providers with the time frame of the first post-operative visit, there was variability in the time frame for subsequent follow up visits. Due to this we were unable to establish a universal follow up schedule for each procedure or to schedule standard follow up visits at the time of surgery scheduling.

All providers and scheduling staff were educated regarding the follow up window of 9 to 21 months post procedure. We implemented a weekly email to team members with our current long term follow up rate so that everyone was aware and we reviewed the data quarterly at our VQI team meetings.

The outcome of this project resulted in an electronic dashboard that allowed the schedulers to see which patients needed to be scheduled.

Below is an example:

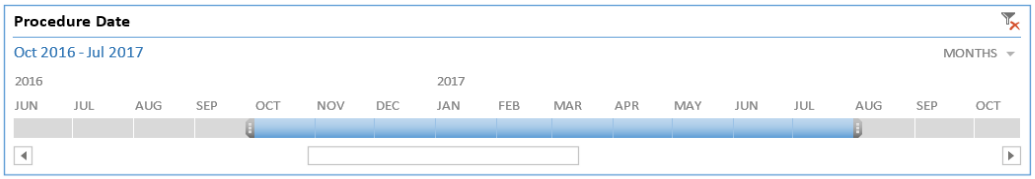
Months	Procedure Dat	Procedur
21	6/27/2017	CEA
20	7/31/2017	CEA
20	8/9/2017	CEA
20	8/16/2017	CEA
20	7/27/2017	CEA
19	9/21/2017	CEA
19	9/20/2017	EVAR
19	9/13/2017	CEA
19	9/5/2017	CEA
19	8/30/2017	CEA
18	9/29/2017	CEA
18	9/30/2017	EVAR
17	11/7/2017	CEA
17	11/3/2017	CEA
17	11/21/2017	EVAR
16	11/28/2017	CEA
16	12/19/2017	EVAR
15	1/11/2018	OPEN
15	1/5/2018	CEA
15	1/10/2018	EVAR
14	2/7/2018	CEA
13	3/7/2018	CEA
12	4/12/2018	OPEN
12	4/3/2018	CEA
12	4/20/2018	CEA
12	4/23/2018	CEA
11	5/22/2018	EVAR
11	5/9/2018	EVAR
11	5/7/2018	CEA
11	5/17/2018	CEA
11	4/27/2018	CEA
10	6/19/2018	EVAR
10	5/31/2018	EVAR

Red: visit window is greater than or equal to 18 to 21 months

Yellow: visit window is greater than or equal to 14 to 17 months

Green: visit window is greater than or equal to 9 to 13 months

This dashboard allows us to see in "real time" follow up percentages, which patients have an "open window", as well as where they are in the follow up period. This includes patients who will be out of their window soon so that they can be scheduled more urgently.



Procedure	Procedures	# Seen	% Seen	# CV Seen	% CV Seen	# Not Scheduled	# Scheduled Not Seen	# Patients deceased after 15mo
CEA	111	94	84.68%	103	92.79%	16	0	1
EVAR	55	44	80.00%	44	80.00%	8	0	3
OPEN	10	7	70.00%	8	80.00%	3	0	0
Grand Total	176	145	82.39%	155	88.07%	27	0	4

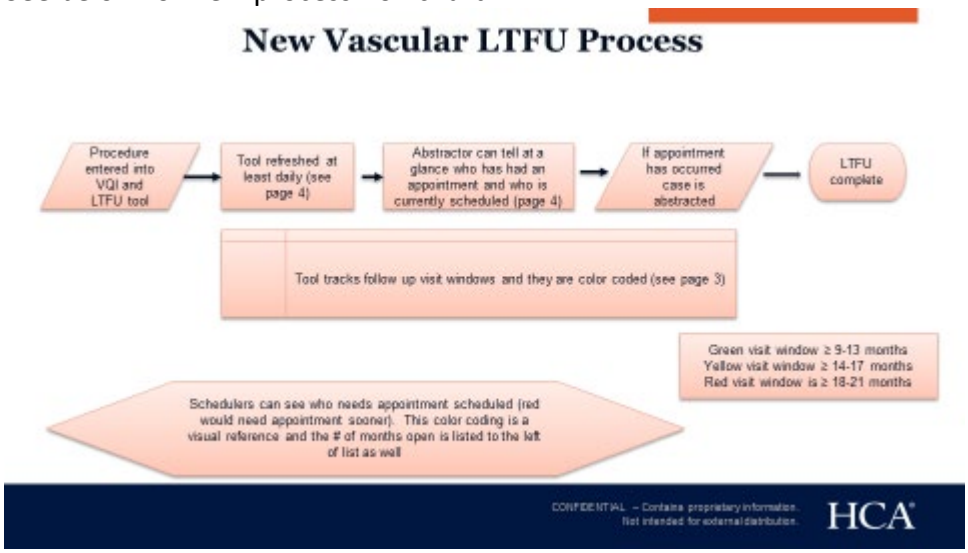
9 months back
7/24/2018

21 month back
7/24/2017

The Quality Improvement project also allows the abstractor to be aware of a patient visit once the visit has occurred. This results in data abstraction closer to the patient visit and reduces time spent searching for visits. Previously, follow up visits were identified by reviewing each patient's record manually which was very time consuming (see page 1 flowchart).

UPDATE								complete
Tami enters data in these columns			These columns are returned from the SQL query					Tami
Procedure	Procedure Date	Found MRN	Scheduled Date	Acknowledged Date	Appt Type	Appt Provider	Appt Comments	Entered in VQI
CEA	10/4/2017	YES		9/13/2018	CV Follow Up-30	Douglas MD, Michael G	6 mo f/u w/MD w/AAA/ABI	
CEA	10/13/2017	YES	5/6/2019	10/12/2018	CV Follow Up-30	Macmillan Jr MD, Douglas P	3 mo fu w/MD 9/18 no vm 9/19 line not in service	
EVAR	3/16/2018	YES	8/21/2019	2/6/2019	CV Follow Up-30	CVSC PA	6mo fu w/Kirby w/AAA & ABI	
CEA	4/4/2018	YES	7/5/2019	3/28/2019	CV Follow Up-30	CVSC PA	Referral for pain in left ft. with ABI's same day	
EVAR	3/7/2018	YES	9/13/2019	4/22/2019	CV Follow Up-30	CVSC PA	1 year follow up with AAA	
CEA	3/14/2018	YES	4/26/2019					
EVAR	5/23/2018	YES	5/2/2019					
EVAR	4/26/2018	YES	5/3/2019					
CEA	1/17/2018	YES	5/7/2019					
CEA	6/15/2018	YES	5/8/2019					
CEA	7/2/2018	YES	5/10/2019					
CEA	8/30/2017	YES	5/14/2019					

As a result of this performance improvement project we were able to achieve a long term follow rate of 85% for 2017 patients. Since this tool allows for multiple ways to filter the data, it used daily by schedulers, VQI staff and practice management. It also serves as a check and balance with VQI database entries and as a double check when reviewing reports. Managers can review follow up data efficiently when discussing scheduling of patients. The tool allows us to easily see where we are with appointment scheduling and allows schedulers to see where the priorities are for patient appointments. Office staff can identify patients who are unable to follow up for financial reasons. These patients can be referred to the "patient estimate line" to help determine their out of pocket costs and to the patient financial assistance department (as appropriate). Providers and nursing staff were also made aware of these resources. Finally, there is the possibility of transportation assistance through referral to a local network.
See below for new process flowchart



As part of our ongoing process, long term follow-up reports are sent to all team members monthly and follow up data is reviewed in our VQI meetings.

11. Nashville Vascular and Vein Institute - Using VQI and EMR chart alerts to increase compliance of statin and aspirin, a retrospective study.

Author: Jennifer Landis PA-C

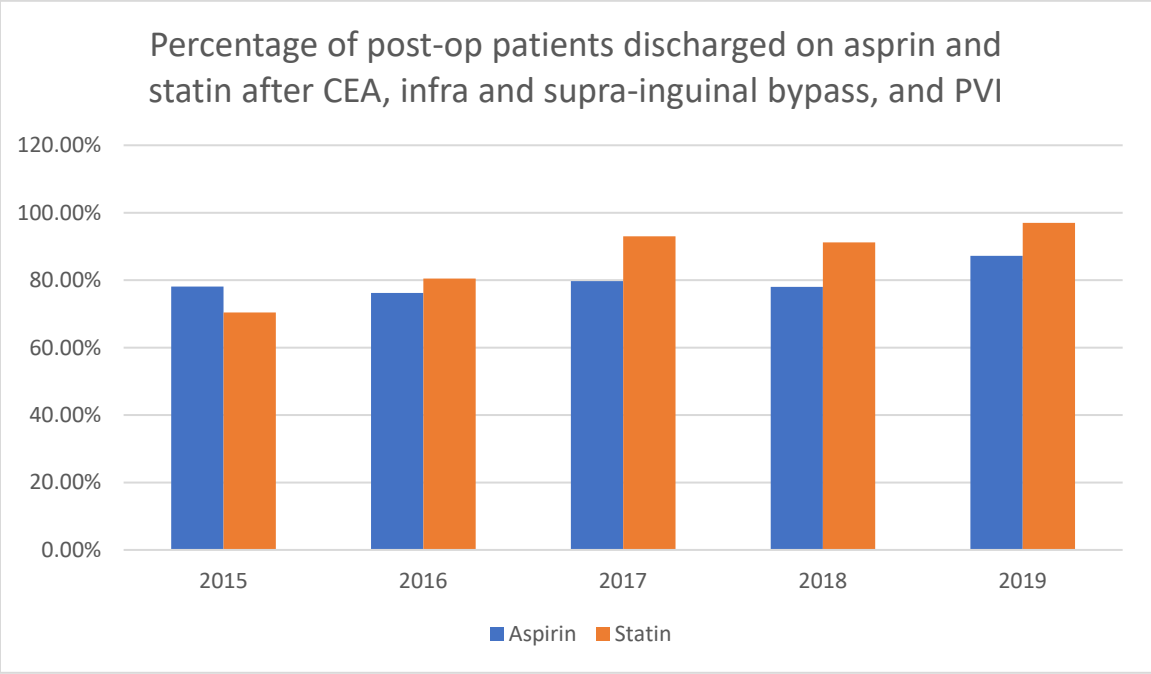
Problem statement:
The benefits of statin and anti-platelet therapy have proven beneficial through multiple studies, resulting in improved short and long-term outcomes of patients with PVD who are undergoing vascular intervention. This evidence is so compelling that it is now a recommendation from the Society for Vascular Surgery Patient Safety Organization that patients undergoing vascular surgery are prescribed a statin and anti-platelet agent. Although this is seemingly an easy change to make to improve the outcomes for patients, many patients are discharged without these medications and "slip through the cracks".

Goal:
Improvement to 80% compliance of patients prescribed statin and aspirin upon discharge after a vascular surgery intervention by using VQI reporting at discharge by provider and EMR chart alerts prompting letter/fax of medication change.

Improvement strategy:
Our office implemented a multi-faceted approach to ensure each patient is reviewed individually and ensure appropriate patients are started on a statin or aspirin. Initially a "recommend statin" letter prompt was built into our online EMR, Healthfusion. The provider can type in the "follow-up" section, "statin letter", which prompts the staff to mail a letter to the patient and fax a letter to their PCP encouraging them to start the patient on a statin and its benefits of reducing cardiac events and neurologic events/supportive literature. There was then an alert placed on the chart for the next visit by staff to follow up. There was additionally a "started statin" letter to patient and a faxed letter to the PCP communicating a statin was prescribed and request to have labs followed.

VQI reporting also facilitates the pursuit to ensure each patient was medically optimized by having all VQI data entered by trained staff and the physician during discharge prior to the patient leaving the hospital. This corrects outliers in real time by immediately catching patients that fell out. This was implemented in 2016 with improvements over the following 3 years.

Results:
We analyzed in a retrospective study the compliance of aspirin and statin in patients between 2015-2019 post-operative from carotid endarterectomy, infra-inguinal bypass, supra-inguinal bypass, and peripheral vascular intervention. Over the 5-year span of evaluation, with intervention taking place year 2, our interventions were able to improve post-op ASA compliance from 78.1% (N=169) in 2015 to 87.2% (N=164) in 2019. In addition, the statin compliance prior to intervention was 70.4% (N=169) in 2015 to 97% (N=164) in 2019.



Challenges/lessons:

Although a letter was sent to patient and faxed to the PCP, many were still not started on a statin, therefore an adjustment was made to use "started statin" letter, personally prescribe the medication, and ask to have appropriate lab follow-up from the PCP.

Success:

Having the provider who is discharging the patient complete the VQI in real-time allows any outliers to be identified immediately prior to hospital discharge to make adjustments to discharge medication if needed. The use of VQI reporting is a consistent prompt to medically optimize each patient prior to discharge that is providing a sustained positive impact. Sending a letter directly to the PCP facilitates closer communication with internal medicine physicians as well as providing additional education/literature on the benefits of statin and ASA therapy. Overall, significantly improved compliance over the 4 years of implementation.

12. Vascular Quality Initiative Startup in Singapore General Hospital

Authors: Ms Sum Lai Mei; Dr. Tang Tjun Tip; Dr. Ankur Patel; Dr. Chong Tze Tec

Background:

As one of the largest healthcare provider in Singapore, Singapore General Hospital (SGH) are committed in providing our patients with quality healthcare. Hence, we are the first hospital in Singapore and outside North America to embark on Vascular Quality Initiative (VQI) to benchmark and compare our performance against the Canada and United States counterparts.

In order to head start the initiation program, Department of Vascular Surgery (DVS) and Department of Vascular & Interventional Radiology (DVIR) have come together to collaborate and maximize care for the patients.

Problem Statement:

To improve and optimize patient care through this initiation.

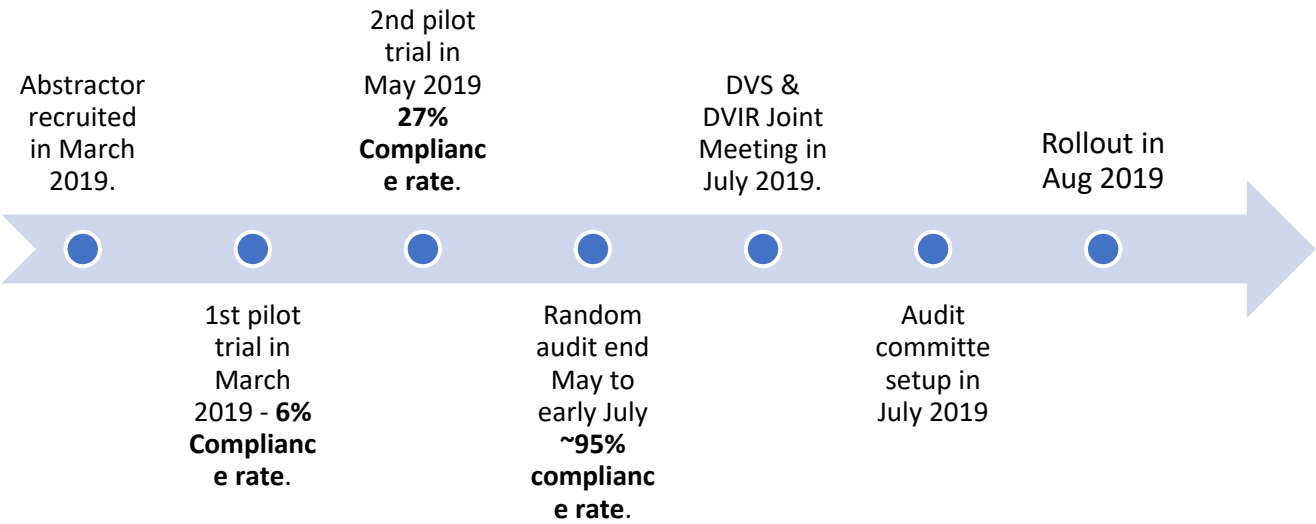
Goal:

Benchmarking SGH's Lower Extremity Angioplasty procedures against VQI for quality assurance purposes.

Improvement Strategy:

To standardize op notes reporting between both departments and fulfilling VQI's criteria in registry reporting.

Timeline:



To ensure the Standardize Op Notes template was being used. Abstractor had to look through ~40 cases from both DVS & DVIR for a two-week period and to highlight any non-compliance issues.

Thereafter, the abstractor will meet up with representatives from DVS & DVIR to discuss any issues/difficulties faced during data collection. Representatives will liaise with their departments on the findings.

1st pilot trial in March 2019, compliance rate was 6%. 2nd pilot trial in May 2019, compliance rate was 27%.

The process of auditing and meeting sessions went on from March to May 2019. Hence, decided to rollout Standardize Op Notes version 3 to include all relevant fields required for filling up the registry.

Random audit was conducted in end May to early July 2019 to check for any non-compliance for both departments. The compliance rate was ~95%.

Held a joint meeting (DVS & DVIR) in July 2019 to announce VQI startup in August 2019 and common documentation issues were highlighted in the meeting.

Announced the following:

a. setting up an Audit Committee - two representatives from DVS & DVIR, one administrator and one abstractor.
b. Abstractor to send out missing information emails to principal consultant in charge.
c. Monthly discussion between committee for updates and problem solving.
d. Standardize Op Notes version 4 is ready.

Results:
Standardize op notes reporting compliance rate was 100% for ~330 angioplasty cases treated in SGH from July to December 2019.

Challenges/Lessons Learned:
Non-compliance in using standardize procedure template during pilot period.

Success Factors:

Abstractor will give a 2 week notice email to principal consultant in charge for any missing information and when in doubt. Will send chaser when yet to receive any reply.

13. Stanford - Sustaining High Performance in Long Term Follow Up Care

Problem Statement:
Maintaining a high rate of patient clinical follow up can be challenging, the VQI database provides an opportunity to capture long-term follow up (LTFU) patients in the VQI registries.

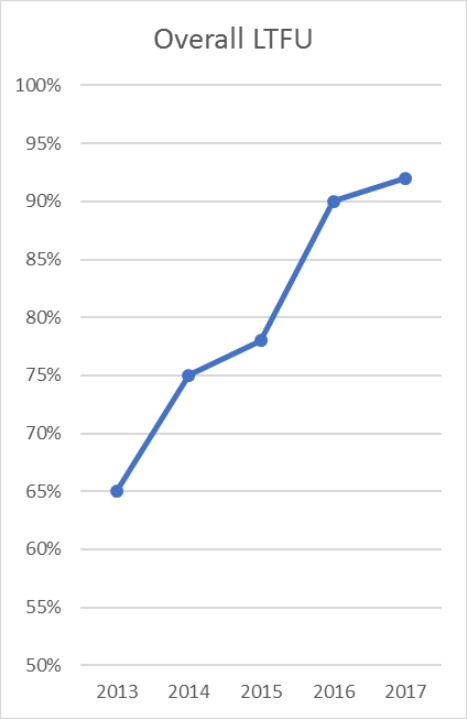
Goals:
One of the goals of VQI is to understand factors that contribute to successful long-term care of patients following vascular procedures. We presented our LTFU improvement for EVAR from 56% (2012) to 93% (2016) last year. Our goal is to expand the high LTFU to other categories and explore the necessary operational needs to sustain this.

Improvement Strategies:
We identified the biggest challenge as scheduling patients needing 9 to 21-month follow-up and obtaining missing data for patients unable to follow-up in person. We discovered that mixing VQI follow-up with regular clinic work caused patients to miss their window. In order to make sure that VQI scheduling complied with the required timeline, clinic work flow was revised to designate this responsibility to a single individual. Tasks for this coordinator included:

1. Performing patient-centered complex scheduling: coordination of follow up imaging and clinic visit preferably on the same day for patients travelling from long distances at the same time, allowing enough time to have images processed and available for provider at their subsequent clinic visit;
2. Obtaining images, report and clinical notes done locally for patients unavailable for in-person follow-up;
3. Using telephone follow-up to capture VQI data for patients unable to return for in-person follow-up;
4. Sending reminder letters and phone calls to ensure future schedule/follow-up adherence.

The entire clinic staff was trained regarding the importance of proper scheduling for the VQI patients. This together with consistent management support, including intervention and oversight from the Assistant Clinic Manager and Clinic Manager, helped optimize successful implementation of the new work flow.

Results:
The overall completed 2017 follow up rate for 300 VQI patients was 92% compared to 65% in 2013.



Challenges/Lessons Learned:

Sustaining continuum of care is not an easy task. Adjustment of many moving parts are involved in effectively implementing this type of quality measure. The main challenge that we faced was assigning VQI follow-up compliance to a single individual. Clinic personnel needs to balance responsibilities between tasks, such as optimizing Likelihood to Recommend (LTR) scores, for all patients and providers beyond VQI requirements alone. Thus, in order to steadily increase LTFU in 8 registries with an annual follow up of over 300 patients, securing the necessary resources to complete these tasks was essential.

Success Factors:

Continuum of an open communication, having a continuous learning environment with sufficient number of staff, and understanding the potential failure points associated with VQI LTFU will help sustain a high completion rate going forward.

14. Stony Brook Medicine, Stony Brook, NY - Development of a Successful Process to Enhance the Transition between Data Managers

Authors: Donna Albergo RN, Lisa Wilbert RN, Olympia Christoforatos RN, Kristan Probeck ANP, Apostolos Tassiopoulos MD

Problem Statement:

The transition of data managers is challenging for any institution. Whether taking over an established role, assuming a position that has been vacant for some time, or creating a new/expanded role in the institution, a workflow needs to be put into place to guarantee a smooth changeover. Being a novice in a fast paced, high volume center who participates in 10 modules, compounded by a 5 month hiatus between data managers, real-time data entry was significantly delayed.

An internal audit revealed 441 vascular procedures and 289 long term follow ups (LTFU) that were still outstanding.

Goals:

The goal for the onboarding data manager was to devise a strategic plan to capture and enter all the outstanding cases and long term follow ups into the VQI Registry concurrently with orientating to the new role.

Improvement Strategies:

1. Utilized several resources to gain knowledge on vascular procedures such as Departmental Information Guides, PowerPoint presentations and additional online resources.
2. Became familiar with M2S Pathways website, member guide, tutorials, inclusion/exclusion criteria, modules, and data definitions.
3. Consulted with key members within the institution who could assist in obtaining accurate technical information for the data elements required for the modules.
4. Assessed current state of registry work which was done by asking the billing department to run a report using CPT codes of vascular procedures that took place during a specific timeframe. This was the starting point to create processes to obtain charts/cases for review.
5. Ran long-term follow-up reports through VQI website to unveil patients that were outstanding.
6. Posed necessary registry questions to PathwaysSupport@M2S.com.
7. Participated in ongoing education through VQI, including annual meetings, bi-annual regional data manager meetings, and webinars.

Results:
All of the outstanding procedures and long term follow ups were entered into the VQI registry. LTFU rate increased from 20% to 80% over a three month time period.

Challenges/Lessons Learned:

- Physician champions are instrumental in clarifying technical questions in order to complete modules.
- Updated versions of Procedure and Follow-Up Paper Forms come out periodically so limit advanced printing and check website notifications for module changes.
- Develop/maintain daily patient list to track data entry. Run reports frequently to stay on top of LTFU and completion rates.
- Created post-op note templates to streamline documentation process, improve workflow and increase productivity of the data manager (awaiting roll out).

Success Factors:

- Utilizing and comparing billing reports and daily operating room schedules to capture cases each day assists in staying organized and minimizes missed cases.
- Collaborating with physicians to assist with technically complex portions of the modules.
- Created a resource binder including modules the institution participates in and their submission deadlines, questions and answers from Pathways Support, instructions on how to update user accounts, and how to run reports.
- All outstanding and LTFU cases were brought current.

15. Toronto - Iliac Re-interventions

Objectives:
Iliac limb occlusion, stenosis, kinking, and dislocation caused by narrow or stenotic iliac arteries, tortuous iliac vessels, or progressive aneurysmal degeneration are common complications of endovascular aneurysm repair (EVAR). This study is aimed to determine the frequency of these complications in a local population.

Methods:
Our local VQI follow up database was reviewed for iliac limb complications. Limb complications were defined as stenosis (narrowing equal or more than 50 percent of right or left or both graft limbs), occlusion, migration (movement of the endograft that requires treatment), and type Ib endoleak.

Results:
Twenty-four patients required re-intervention for limb complications. The average age was 76 years and the majority were men. The three most common causes for limb complications were identified as: type Ib endoleak in 10 limbs, equal on right and left sides, occlusion in 8 limbs, and stenosis in 6 limbs. One patient had to have re-intervention for bilateral type 1b endoleaks occurring remotely from each other. There were no cases of infection or migration.

Conclusions:
Limb complications rate have been reported to have an incidence of 3% to 5%. Our limb complication rates compare favorably with published series. Careful patient selection, preoperative identification of adverse anatomy, and adherence to stent graft manufacturer sizing guidelines are crucial first steps to ensure favorable outcomes.

16. University of Alabama in Birmingham (UAB, Birmingham, AL) - Implementation of a Long Term Follow Performance Improvement Project for the TEVAR and Complex EVAR Module

Background:

VQI long term follow up (LTF) completion is necessary to evaluate the health outcomes of patients across time. Currently the Vascular Surgery Division at UAB is formulating strategies and processes to improve the LTF completion rate across our participating modules. Before this project our center was experiencing a low TEVAR and complex EVAR LTF rate. Data abstraction for this module is essential because of the medical complexity of these cases and the need for routine life-long surveillance and imaging. Based on our center's recent regional report for 2019, the LTF rate for this module was 27%. This represented a significant discrepancy from the follow up rates experienced in our vascular clinic. In order to address this misalignment a quality improvement project was established. Additionally, lessons learned from improvement methods could easily be transferred to other VQI modules.

Methods:

To improve data abstraction we needed to assess the current submission status of completed procedures. Using our internal database and VQI resources we created a list of submitted status patients needing follow up within the VQI parameter of 9 to 21 months across 2017 and 2018. Those patients were segmented and retroactively entered in the registry. The VQI LTF drill down tool, EMR reports, and local obituaries were used to assess: a list of LTFs entered before the window start and expired VQI patients. To evaluate areas of strengths and weaknesses in our previous process, we used a failure modes and effects analysis in spreadsheet. This analysis allowed us to determine each way our follow up entry process was challenged.

Results:

Discovered barriers within our current process include the following: a percentage of patients refusing follow up, a relevant percentage of patients being scheduled slightly before the window, and a relevant percentage of patients being scheduled slightly after the window. For patients with in window follow ups, data abstraction was often hindered due to clinical notes missing pertinent VQI information such as aortic sac size despite imaging existing at the follow up date. While lines for open communication exist for retrieval of data, there is the potential for significant lag in communication or for needed information to be forgotten. These challenges suggested the need to introduce a VQI indicator into the EMR for the scheduling team and surgeons at different steps in the data collection process. Numerical results for this evaluation are pending.

Conclusions:

Strategically addressing gaps in performance for our center's VQI LTF processes is essential for improvement. TEVAR completion requires coordination between multiple project stakeholders. Furthermore, not addressing process issues allows for a continuation of missed opportunities for long term follow up. We believe the lessons learned from this project will allow us to standardize similar processes across our other participating modules.

17. UC Davis - Quality Improvement Project on the prescription of anti-platelet and statin upon discharge

PROBLEM STATEMENT:
Despite the evidence that perioperative treatment with antiplatelet and statin therapy reduces mortality after vascular surgery, current report for this facility shows only 71% of patients being discharged on both anti-platelets and statins.

GOALS/OBJECTIVE:
UC Davis Health established a goal to Increase the percentage of patients discharged on antiplatelet and statin therapy after vascular surgical procedures to 95% by the fall report 2020. TEVAR, EVAR and OAAA will be focused mainly because of low discharge medication prescription rate. Patients who expired during the hospital encounter were excluded from analysis. All patients not placed on dual medications for “not for medical reason” or contraindication were included in the analysis.

IMPROVEMENT STRATEGY:
The quality improvement team focused on educating and facilitating the vascular attending/residents on proper understanding of the importance of anti-platelets and statin prescription to the vascular patients. Then, the focus was drawn towards the EMR documentation on discharge summary where the smart phrase was created to accurately document whether the anti-platelets and statins were prescribed. There was also the necessity to mention the reason behind no anti-platelets and statins prescription which would clarify if the prescription were missed or its contra-indicated for some reason. Constant communication between discharge coordinator, quality improvement team and the physicians were critical to adhere to the workflow. Kept track of the discharge medication using the Pathways analytics engine and made appropriate correction needed if any data was missed during abstraction

RESULTS:
Increased the rate of anti-platelets and statin discharge medication prescription by 11% in just 4months according to the VQI QI report as of September 2019. We are hoping to reach our goal by the set timeline.

CHALLENGES/LESSONS LEARNED:
Initiating the project was little harder but with the constant reminder to the physicians about the proper documentation of discharge medication and the success we are achieving, the workflow became smooth with time. Discharge nursing co-ordination acted as a bridge on implementing the smart phrase into EMR. The inter-disciplinary teamwork is crucial to be successful.

SUCCESS FACTORS:

The consistence use of the new smart phrase in EMR has been a guideline for the physician documentation regarding anti-platelets and statin prescription. The continuous effort of the quality improvement team, discharge coordinator and the physician has made it possible to send patients home with the required discharge medication.

18. University of Rochester - VQI Checklist in the EMR: Impact on Statin and Antiplatelet Prescriptions at Discharge

Authors: Claire M. Motyl, BA, Mark D. Balceniuk, MD, MPH, J. Eli Robins, MD, Stacey Esposito, BSN, RN, Desiree Branson, DNP, RN, MS, FNP-C, Kathryn Kelleher, NP, Adam J. Doyle, MD, Michael C. Stoner, MD.

Problem Statement:

Antiplatelet and statin therapy after vascular surgery is correlated with a reduction in cardiovascular events and mortality. Despite high quality data demonstrating such, compliance to these guidelines remains heterogeneous. Previous Vascular Quality Initiative (VQI) research has demonstrated that utilization of the electronic medical record (EMR) in conjunction with team education can improve prescribing rates of antiplatelet and statin therapy at discharge from 61% to 77%. Ongoing review of institutional data is necessary to evaluate the impact of systematic changes on antiplatelet and statin prescribing at discharge.

Goal:

The objective of this project is to assess the effect that incorporating a standardized checklist of VQI best-practice medical therapy into patient discharge summaries in EMR had on prescribing of antiplatelet and statin therapy at discharge.

Improvement Strategy:

Increased use of antiplatelet and statin medications has been shown to reduce mortality following vascular surgery. Evaluating the impact of interventions implemented to improve prescribing of antiplatelet and statin medications at discharge allows for replication of highly effective efforts. This evaluation also highlights the need for further innovation where existing efforts have not demonstrated outstanding outcomes. We evaluated patient prescriptions for antiplatelet and statin medications at discharge at our institution using the VQI database, analyzing the percent change in patients discharged on statin and antiplatelet medications per year prior to and after the implementation of our change to the EMR.

Results:

We evaluated 1,640 cases over a 4-year period from January 12, 2015 to January 12, 2019. Exclusion criteria were missing data, medications not prescribed for medical reason, and noncompliant patients. There is a significant difference between the proportion of patients prescribed statin and antiplatelet medications at discharge before and after the addition of the VQI checklist into our discharge summary (Figure 1, $p<.001$).

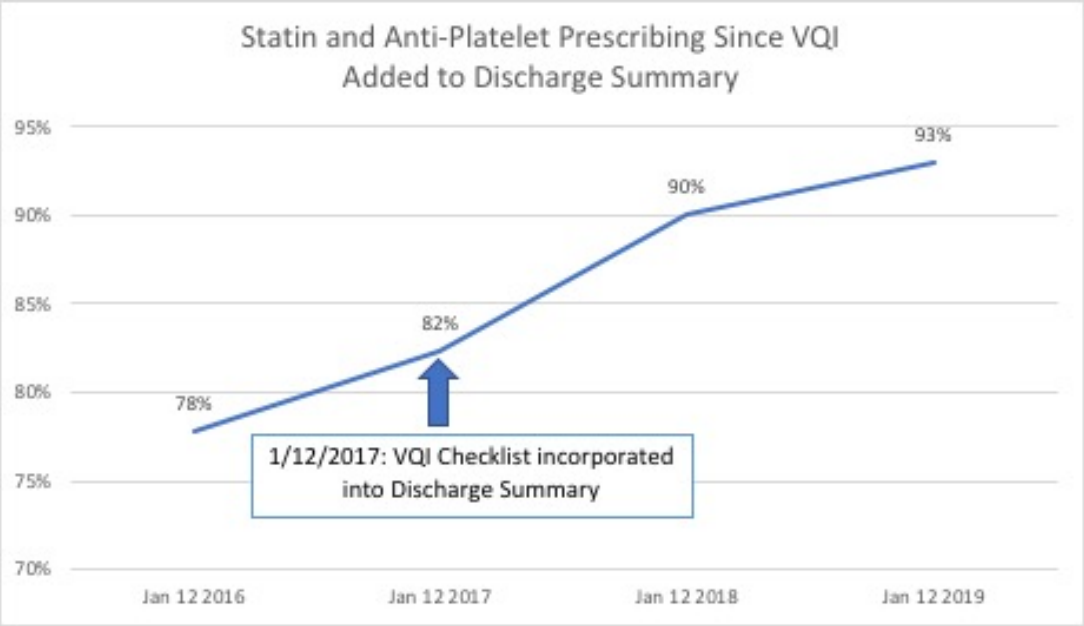
Lessons learned:

These data demonstrate that integration of a VQI checklist to patient discharge summaries in the EMR is associated with a significant increase in the proportion of patients discharged on both antiplatelet and statin therapies. Based on these results, we strongly recommend implementation of changes to the EMR that guide providers to maximize adherence to VQI guidelines on prescription of statin and antiplatelet medications.

Success Factors:

Successful implementation of standardized changes to the EMR designed to improve discharge prescribing requires understanding of the impact specific changes have had over a prolonged period. These data from a 4-year period demonstrate that the addition of a VQI checklist has created sustained improvement in patients discharged on statin and antiplatelet therapy. Sharing the impact of specific quality improvement efforts will aid in discussion and education initiatives to improve prescribing of antiplatelet and statin therapies at regional and national levels.

Figure 1.



19. University of Tennessee – Knoxville - Utilization of Vascular Quality Initiative Data to Improve Perioperative Blood Pressure Control and Hospital Length of Stay After Elective Carotid Endarterectomy

Authors: George Lodeiro, MD, Joseph Zakaria, Mary Duffy, MBA, Lynellen Gregory, MD, Andrew Hodge, MD , Joshua Arnold, Michael Buckley, MD, Oscar Grandas, MD, Scott Stevens, MD , Michael Freeman, MD, Michael McNally, MD.

Problem Statement:
Uncontrolled perioperative blood has been described as factor in increased morbidity and mortality after elective carotid endarterectomy. Specifically, postcarotid endarterectomy hypertension has been linked to increased length of hospital stay. Our current institutional VQI CEA data correlates with national trends of a 24% LOS>1day after elective CEA. In our institutional effort to reduce our hospital length of stay after elective CEA, we utilized our VQI CEA dataset to identify patients with a LOS>1 day compared to expected LOS<1 day in CEA patients. Our vascular division hypothesis was uncontrolled preoperative blood pressure was a significant cause for increased LOS>1 day and further investigation was necessary before requesting institution funding for monitoring at risk hypertensive patients 30 days prior to surgery.

Goals:
Our objective was to reduce LOS>1day after elective CEA by comparing institutional VQI CEA patients and identifying risk factors, specifically preoperative and perioperative blood pressure, in association with hospital length of stay. Secondary outcomes included morbidity and mortality.

Improvement Strategies:
Using a institutional VQI CEA dataset, we identified all patients undergoing elective CEA between 2016-2019. A retrospective review was performed comparing preoperative and perioperative blood pressure in addition to clinical outcomes. Results led to an abandonment of our original preoperative uncontrolled hypertension theory and the ongoing development of a post CEA antihypertension protocol.

Results:
VQI dataset at UTMCK identified 315 patients undergoing elective CEA between January 2016 and March 2019. Exclusion criteria were prior ipsilateral CEA, concomitant coronary artery bypass graft or concurrent proximal carotid artery stent placement. Patients were the stratified by LOS<1 day (n=238, 76%) and LOS>1day (n=77, 24%). There was no significant difference in demographics or comorbidities including HTN. There was no difference in mean preoperative

blood pressure between LOS groups however immediate postoperative blood pressure (within 4 hours postoperative CEA) showed a significant difference (127/52 +/- 22/13 LOS<1day vs 143/68 +/- 25/11 LOS>1day, p<0.001). Secondary outcomes resulting in LOS>1day showed 71% (n=55) required IV anti-HTN medication, 3 (3.9%) CVA/TIA events, 2 (2.6%) myocardial infarctions, 5 (6.5%) hematomas with return to OR and 18 (23%) uncontrolled headaches. Mean immediate postoperative blood pressure in the LOS>1 day group with these postoperative morbidities was significantly higher compared to LOS<1day group (127/52 LOS<1day vs 152/69 LOS>1day, p<0.001). There was no difference in 30 day mortality between groups.

Challenges/Lessons Learned:
Postcarotid endarterectomy hypertension is associated with increased length of stay >1 day and postoperative morbidity. Utilization of the VQI CEA data allowed for patient identification and stratification for investigation and clinical outcome association. While this is an ongoing project, progress has been made in the development of an institutional postoperative CEA antihypertensive protocol. The biggest project challenge to date was the lack of standardized postoperative CEA antihypertension protocols previously described in the literature.

Success Factors:
The initial project success stems from a dedicated VQI coordinator and large institutional dataset compiled over years to have enough data for statistical comparison. Final project success will depend on adherence and hospital education to the newly developed postoperative CEA antihypertension protocol.

20. WVU Medicine Morgantown, West Virginia - Implementation of an Interdisciplinary Work Group for IVC Filter Monitoring

Primary Authors: Stacy Giardina BSN, RN; Samantha Minc MD, MPH
Team Members: Heather McCue BSN, RN; Rachelle Sapp BSN, RN; Justin Browning PA; Luke Marone MD

Problem Statement:

When our hospital joined the VQI in Sept 2016 there was not a formal process in place for educating and tracking the removal of IVC filters from patients. In 2016 out of 91 filters placed only 12 received documented IVC filter education. The removal rate was at 19.14%. It has been found that inpatients are not receiving consistent education regarding filters placed and many are becoming lost to follow up. Additionally, IR and vascular have two different processes for managing IVC patients that we would like to merge. Many of our patients travel a long distance for their follow up appointments and other options need to be implemented to improve the care of these patients who cannot travel for appointments to insure that filters are removed when indicated.

Goal:

Create an interdisciplinary work group to standardize the education of patients and create a plan to track patients for removal of IVC filters hospital wide. This process will decrease the number of patients lost to follow up and increase the number of filters that are removed.

Improvement Strategies:

An interdisciplinary team was brought together that included two VQI data managers, a vascular surgeon, an interventional radiology PA and an IR nurse to standardize the education and tracking of IVC filters. Patient education was agreed upon by both services and this was placed in the EMR for all practitioners to use. The IVC Filter Retrieval report in Pathways was used to organize an excel spreadsheet of all of the current filter patients and the number of days since the procedure was noted. A shared drive was then set up so that the team could access the excel spreadsheet. The VQI data managers reviewed patient charts, entered upcoming appointments, and made notes regarding patients that had been lost to follow-up. This became the working list to track removals, filters that were to stay in, deceased patients and those that needed continued follow up. The team created two letters to use when all attempts to contact the patient have failed, one for the patient and one for the primary care physician. The team also utilized the Pathways IVC email notifications to help keep the shared spreadsheet up to date. Lastly, an algorithm was developed to determine the end-point of follow-up attempts that will be used to show due diligence with patients that are being noncompliant.

Results:

There is now a standardized process to track all patients that receive an IVC filter in our facility regardless of what service they are on. With the development and use of a shared drive, we can communicate via phone/email regarding patients that need follow-up. This will decrease the need to meet to discuss cases and provide a working list for all to use.

Challenges/Lessons Learned:

Meeting monthly was difficult due to all team members' busy schedules that slowed the forward progression of this project.

Success Factors:

WVU medicine now has a complete working list of all patients that have received IVC Filters from 2017 to present. We have standardized the patient education and placed it in our EMR. IR and vascular services are working as a team to follow all IVC patients. Our 2018 filter retrieval or attempt at removal is 57%.

21. Mass General - Development of a Consistency Check Tool for VQI Data Abstractors

Authors: Verna J. Curfman, BS, Sarah H. Bird, BA and Sunita D. Srivastava, MD.

Problem Statement:

Data Managers and surgeons, as data abstractors for VQI, are responsible for inputting the most accurate data to gather a correct picture of the quality of care that is delivered at their center. Additionally, accurate data provides the basis for VQI's quality improvement and research ability. Currently there are multiple points during data entry where mistakes can occur due to abstractor error. These potential errors include points inside registries where similar data values are entered multiple times, types of data that can be input incorrectly due to typing or selection errors for lab or study values, and clinical impossibilities that can arise from selecting the wrong combination of variables. Data abstractors, as the first line of defense of data quality, need tools to assess their own work and to help maintain consistency of data collection.

Goals:

Our goal was to develop a tool that can identify possible problems in data abstraction. By identifying these areas of potential inconsistencies, we hope to help better manage data quality at a data abstractor level instead of relying on VQI level audits. We would like to make this tool available for other data abstractors to use at individual hospital sites.

Improvement Strategies:

First, we developed a list of potential data entry errors. To develop this list our abstractor carefully evaluated the data entry screens and definitions for each registry to find scenarios where conflicting data could be input. The abstractor focused on areas where one or more variables might be related, numeric data that could be entered inaccurately, and definitions that might shift from one registry to another. Due to the individual nature of each procedure type, each registry was assessed separately. The variables were then identified in the data download for each procedure. The downloaded data was imported into Microsoft Access where we created queries that would catch the potential errors.

Results:

We identified 86 potential data entry errors that we could check for in the eight registries Massachusetts General Hospital participates in. The types of statements range from out of range variables, to unlikely variable combinations that would warrant review by the data manager.

Table 1. Examples of problem statements used to flag data points in need of additional review.

Registry	Type of Check	Check Phrase
ALL	Demographics Variable Check	Smoking Status "prior"; quit smoking date < 30 days from Procedure Date
ALL	Post-op Variable Check	Pre-admit Living "Nursing home"; Discharge status "Nursing Home"
CAS	Procedure Variable Check	Approach "femoral"; Flow Reversal Type "Silkroad Enroute"
CEA	History Variable Check	Prior CEA/CAS (Demographics Tab) "yes"; Prior R or L CEA or CAS (History Tab) all "no"

By having the tool available to evaluate our data we have adapted our workflow to review any possible errors on a scheduled basis. We believe that this will ensure that our data is correct and could have a positive effect on the time required to answer future audits by catching errors prior to large scale review.

Challenges/Lessons Learned:

One of the challenges that we faced during the development of the list of potential errors and writing the queries were the different variable definitions and the differences in the separate forms of the registry for similar variables. While these are clinically required differences, additional attention and care was required to maintain each set of definitions. As a result, we developed different sets of queries for each of the procedure types.

Success Factors:

Our success is due to the collaborative effort between data manager, data analyst and quality director. By working together, we have been able to bring extensive clinical knowledge together with technical knowledge of VQI and database management tools. Continued support from the Department of Vascular Surgery and the Codman Center of Clinical Effectiveness in Surgery to pursue improvement in the quality of our data has also been critical for our success.

22. Yale – New Haven - Road to Recovery for Patients Undergoing Vascular Procedures at the Heart and Vascular Center, Yale New Haven Hospital

Authors: Sandy Fillion MSN, RN-BC; Sarah Elliston MSN, RN; Sherline Italien MD, MHA; Pauline Acorda RN, BSN; Rhonda Johnson, RN, BSN; Corey Champeau MBA, MHS, PA-C; Jeptha Curtis MD; Raul J. Guzman MD; Francine LoRusso MHA, RN; Keith Churchwell MD; Cassius Iyad Ochoa Chaar MD, MS

Problem Statement:

In 2015 we identified a problem with inadequate follow-up among patients who had undergone vascular procedures at the Heart and Vascular Center (HVC), Yale New Haven Hospital (YNHH). Completion rate for long term follow-up (LTFU) is defined by VQI as number of patients who had a vascularization procedure with a one year follow up during a 9 – 21 month window. In 2015, the LTFU completion rate at our institution was 61% (451/745). In 2016, we experienced improvement and reached an 82% follow up rate overall (720/877). Although we demonstrated progress in our rate of compliance for 2016 LTFU care, there continues to be an opportunity for improvement in providing optimal vascular follow-up care, as apparent through our 157 patients lost to LTFU.

The Society for Vascular Surgery identifies clinical practice guidelines for follow-up post vascular surgery arterial procedures for optimal patient outcomes. (*J Vasc Surg 2018; 68:1*)

Goal:

Improve the percentage of 2017 vascularized patient cases with one year follow- up to >90%, by September 30, 2019.

Improvement Strategies:

In 2017, key stakeholders from the interdisciplinary Vascular Registry Performance Improvement (PI) Team identified barriers and performed a gap analysis, including missed case review, to identify strategies for improvement. The Vascular Registry PI Team employed the following interventions using the Plan, Do, Study, Act (PDSA) methodology:

- Standardized vascular procedure documentation templates
- Developed a comprehensive report combining the M2S LTFU case list and the electronic medical records (EMR) appointments for 1 year follow-up. Report includes compliance with follow-up visits with appropriate vascular provider.
- Vascular providers champion ongoing discussions with other providers to address barriers & capture follow-up
- Ongoing collaboration, evaluation, and revision of plan to drive performance and sustainability
- Engage in a current charter focusing on PAD loss reported for 2016 (455/557)

Results:

The Vascular Registry PI Team has been successful in meeting SMART Aim, by achieving an overall 92% compliance with one-year LTFU visits for 2017 vascularized patients while sustaining performance in a positive trajectory since 2015.

1 Year LTFU for YNHH Vascularized Patients

1/1/2015- 12/31/2015		1/1/2016- 12/31/2016		1/1/2017- 12/31/2017	
Procedure Type	Completion Rate	Procedure Type	Completion Rate	Procedure Type	Completion Rate
Carotid Artery Stent	51% (33/65)	Carotid Artery Stent	85% (46/54)	Carotid Artery Stent	90% (60/67)
Carotid Endarterectomy	59% (58/99)	Carotid Endarterectomy	82% (83/101)	Carotid Endarterectomy	88% (66/75)
Endo AAA Repair	78% (49/63)	Endo AAA Repair	83% (43/52)	Endo AAA Repair	89% (34/38)
Infra-inguinal Bypass	68% (28/41)	Infra-inguinal Bypass	84% (66/79)	Infra-inguinal Bypass	97% (57/59)
Open AAA Repair	33% (1/3)	Open AAA Repair	86% (6/7)	Open AAA Repair	80% (8/10)
Peripheral Vascular Intervention	60% (273/452)	Peripheral Vascular Intervention	82% (455/557)	Peripheral Vascular Intervention	93% (469/506)
Supra-inguinal Bypass	41% (9/22)	Supra-inguinal Bypass	78% (21/27)	Supra-inguinal Bypass	84% (21/25)
Overall	61% (451/745)	Overall	82% (720/877)	Overall	92% (715/780)
*Denominator only includes submitted records.		*Denominator only includes submitted records.		*Denominator only includes submitted records.	

Challenges/Lessons Learned:

Challenges have been identified in both logistics and resource sustainability. YNHH is a large quaternary referral hospital with a large volume of vascular procedures each year. Geographic location of these patients often includes remote areas where patients have received follow-up care by a provider outside of the Yale New Haven Health System, using an alternative EMR.

Success Factors:

Our success factors for performance and sustainability include the following key drivers:

- Monthly interdisciplinary approach to prioritizing effective interventions and ongoing evaluation of the plan to recover cases LTFU
- Optimized Vascular Registry Dashboard to monitor data trends and potential outliers
- Vascular specialists and nursing coordinator run reports and call patients eliciting follow-up with their corresponding providers
- Business plan for vascular nursing coordinator position(s) is being developed to support the patient volume

23. Jobst Promedica Toledo - Review of 30-day Follow up & Readmissions to Optimize Post-Operative Care

Authors: Acino R, Mason J, Wolff E, Lurie F

Problem Statement:

A significant proportion of hospital readmissions after vascular interventions is due to post-operative complications and aggravation of pre-existed comorbidities. Most of such conditions can be managed in outpatient settings if diagnosed early. Individual surgeons' practices vary significantly in the time of the first post-intervention follow-up. However, current VQI schedule of 30-day voluntary follow up visit introduces an opportunity to identify the optimal follow up time in order to early diagnose and manage conditions that can lead to hospital re-admission.

Goal:

Use the 30 day follow up form to identify patients who had been readmitted within 30 days of their procedure and determine an optimal window for post-operative visits to reduce readmission rates.

Improvement Strategies:

As part of the process of completing the 30 day follow up in VQI, we began to collect details related to post-operative appointments and readmissions. Data provided the opportunity to look at variations in physician practice patterns, scheduling gaps, and reasons for patient non-compliance.

Results:

773 patients from our primary vascular practice were entered into VQI in 2019. Of those, 92(11.9%) were readmitted within 30 days. In most cases, follow up appointments are typically scheduled anywhere from 2-4 weeks, depending on the surgeon. 23 patients did not return for a post- operative appointment, 7 due to readmission at the time of their follow up clinic visit. The range of days to readmission was from 1 to 28 days, with an average days to readmission of 11.8 days.

Challenges/Lessons Learned:

Challenges resulting from this project was developing a strategy to minimize patients who are lost to follow up, following cancellation, readmission or failure to schedule. As a result, surgery schedulers began to schedule outpatient visits prior to surgery and inpatient rounding staff were tasked with confirming patient appointments were scheduled for after discharge.

Success Factors:

This data has shown that perhaps a standardized post-operative visit should be scheduled on all patients within a 7-10 day window. This change may optimize patient outcomes by identifying issues and avoiding readmissions.

24. Jobst Promedica Toledo - Collaboration between Health System and Hemodialysis Center to Capture Follow Up Data

Authors: Mason J, Acino R, Seiwert A, Wolff E, Hanus K, Lurie F

Problem Statement:

Fractionated care for hemodialysis patients hampers reliable and consistent data acquisition for the VQI dialysis module. While baseline data is accessible from the hospitals EMR where the dialysis access is created, the follow-up data requires communication with dialysis centers, where issues pertaining to access are identified, and institutions other than primary hospital to which patients may be referred for managing such issues. Jobst Vascular Institute initial experience has confirmed this challenge. Dialysis center staff directly referred patients for follow up surveillance, fistulagrams, and interventions without sharing this information with VQI coordinators. Re-interventions were sometimes performed in the other than ProMedica facilities, frequently resulted in incomplete information in the EMR. Thus, important follow up variables such as index access use, thrombosis, steal syndrome, etc. were difficult to obtain.

Goal:

To develop a collaboration between Jobst Vascular Institute and local hemodialysis centers to share data and improve the ability to capture accurate long-term follow up data.

Improvement Strategies:

Jobst Vascular Institute met with dialysis center personnel and created a partnership with the Vascular Access Manager at each dialysis center. The data manager tracked each patient's dialysis center at time of creation. The VQI follow up form was sent to the dialysis center 3 months and 9 months following, to obtain data. The dialysis centers would respond by fax, allowing complete data collection. We worked with Jobst Certified Nurse Practitioners who round in dialysis centers to assist with non-responsive units. These efforts, including communications with the Vascular Access Manager at each facility, promoted a relationship of sharing pertinent information to improve patient care.

Results:

95 patients had procedures from January to June 2019 that required a follow up entry into the VQI. 14 (15%) had data captured via records available in EMR. Of the remaining patients, dialysis facilities were contacted to obtain data for 81 patients, with a response provided for 56 (59%) patients. 25 (26%) patients we were unable to complete early follow up. Of the patient population where data was requested from the dialysis center, a response was provided for 69%.

Challenges/Lessons Learned:

Lessons learned through the process included the involvement of a champion vascular surgeon, who communicates the importance of the VQI and the focus of improving patient outcomes to the dialysis centers staff and participating nephrologists. We used a detailed letter sent by our data manager and incorporated a data dictionary on the fax coversheet to assist with accurate data capture. The challenges included facilities that chose not to respond and the inability to obtain treatment details from independent facilities and some nephrology offices.

Success Factors:

The collaboration between hemodialysis centers and our institution was crucial in bridging the data gap and allowed for a reliable source of follow up data. It was in each institution's best interest to form positive relationships to provide the best quality of care to our mutual patients.

25. USC - Perioperative blood transfusion in moderately anemic patients undergoing infrainguinal bypass – a single center experience

Authors: Miguel Francisco Manzur, MD, Cali E Johnson, MD EdD, Albert Ortega, BS, Vincent L Rowe, MD, Fred A Weaver, MD MMM, Gregory A Magee, MD MSc

Problem Statement:

Our 2018 institutional rates of transfusion and post-operative congestive heart failure (CHF) for patients undergoing infra-inguinal bypass were noted to be 61.1% and 25%, respectively, significantly higher than that of the overall Society for Vascular Surgery Vascular Quality Initiative (VQI), 26.3% and 1.5%. This necessitated review of responsible pre-operative and intra- operative factors.

Goals:

We sought to evaluate if the incidence of blood transfusion contributed to major adverse cardiac events (MACE), including myocardial infarction, dysrhythmia, stroke, CHF, and mortality perioperatively and at follow-up.

Improvement Strategies:

The infra-inguinal bypass registry of the VQI from 2016-2019 was queried for our institution and identified a total of 114 patients. Follow-up data was available for 88 patients (77.2%). Univariate and multivariate regression analyses were performed to assess the impact of patient and procedural variables, including blood transfusion on MACE. We sought to evaluate the impact of blood transfusion by stratifying according to hemoglobin nadir.

Results:

Of the 114 patients reviewed for analysis, 52 patients (46.5%) received a blood transfusion. The mean number of units transfused was 3 ± 2 units of blood. Patients who received a blood transfusion had a mean nadir hemoglobin of 8.3 ± 1.0 g/dL compared to 9.48 ± 2.5 g/dL for those without a blood transfusion. The overall incidence of MACE was 24.6% (28 of 114 patients). Univariate analysis (Table I) demonstrated that MACE was associated with lower pre-operative Hgb (P= .002), lower Hgb nadir (P=.023), prior CHF (P= .0003), prior carotid stenosis surgery (P=.01), surgical indication of acute limb ischemia (P=.01), concomitant supra-inguinal bypass (P= .012), and massive blood transfusion (P=.026). Multivariate analysis demonstrated that prior CHF (OR 7.28, P= .009) and lower pre-operative Hgb (OR 0.671; P=.031) were the only variables associated with MACE (Table II).

There was no statistically significant difference for MACE when stratified by nadir Hgb and transfusion, P= .16 (Figure 1). In a subgroup analysis of patients with nadir Hgb 7-10 g/dL (Figure 2), the rate of transfusion was 60.5% (46/76), with an incidence of MACE of 30.2% (23/76). Although not statistically significant, the rate of MACE was higher for patients with nadir Hgb between 7 and 8 who did not receive a transfusion (50% vs 20%; P=.136), and higher for nadir Hgb between 8 and 9 who did receive a transfusion (42% vs 14%; P=.08).

Challenges/Lessons Learned:

Review of VQI data identified outlying practice patterns at our institution regarding transfusion of blood products.

Conclusions/Success Factors:

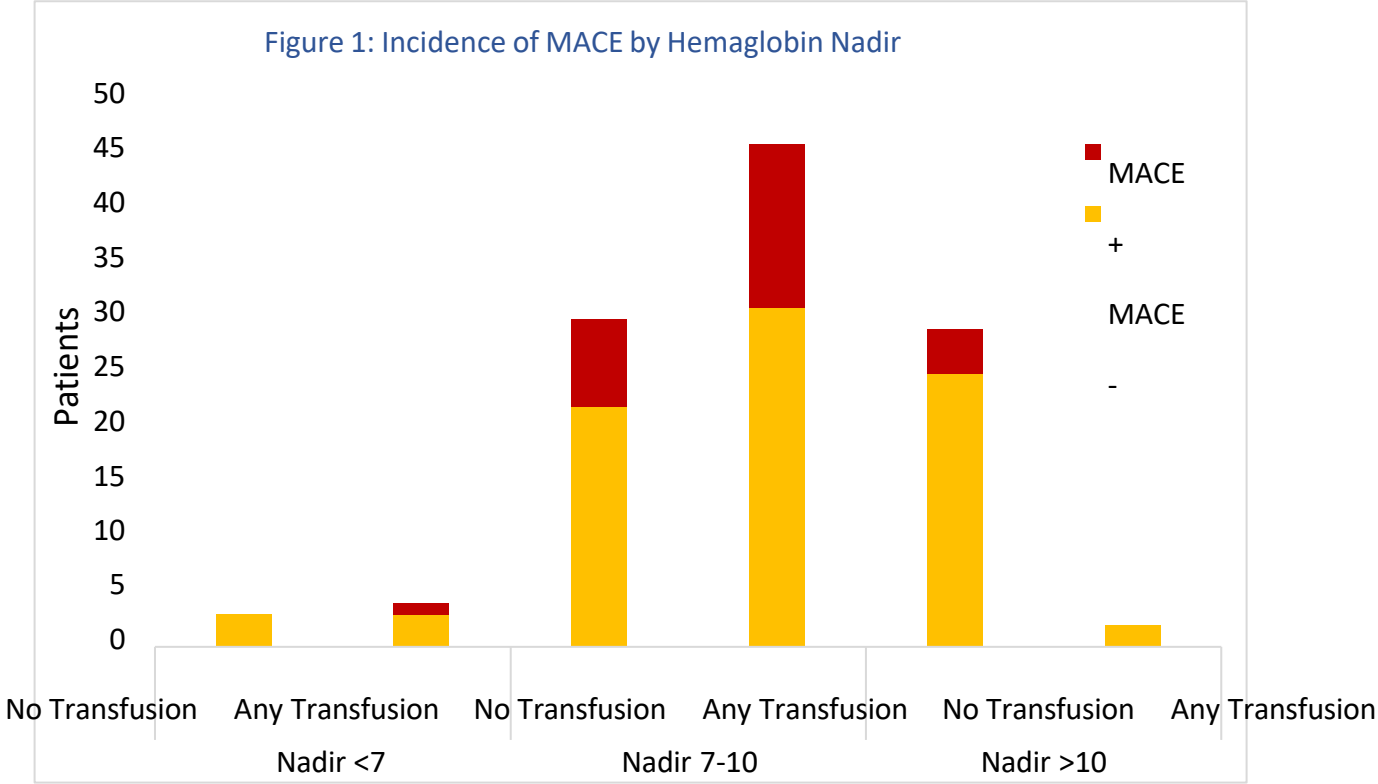
Success will be determined by the decreased usage of blood products perioperatively in those undergoing infra-inguinal bypass surgery, and ultimately in the reduction of MACE. Next steps will include attempting to identify the optimal Hgb threshold for transfusion in order to reduce MACE for patients undergoing infra-inguinal bypass.

Table I. Univariate Analysis

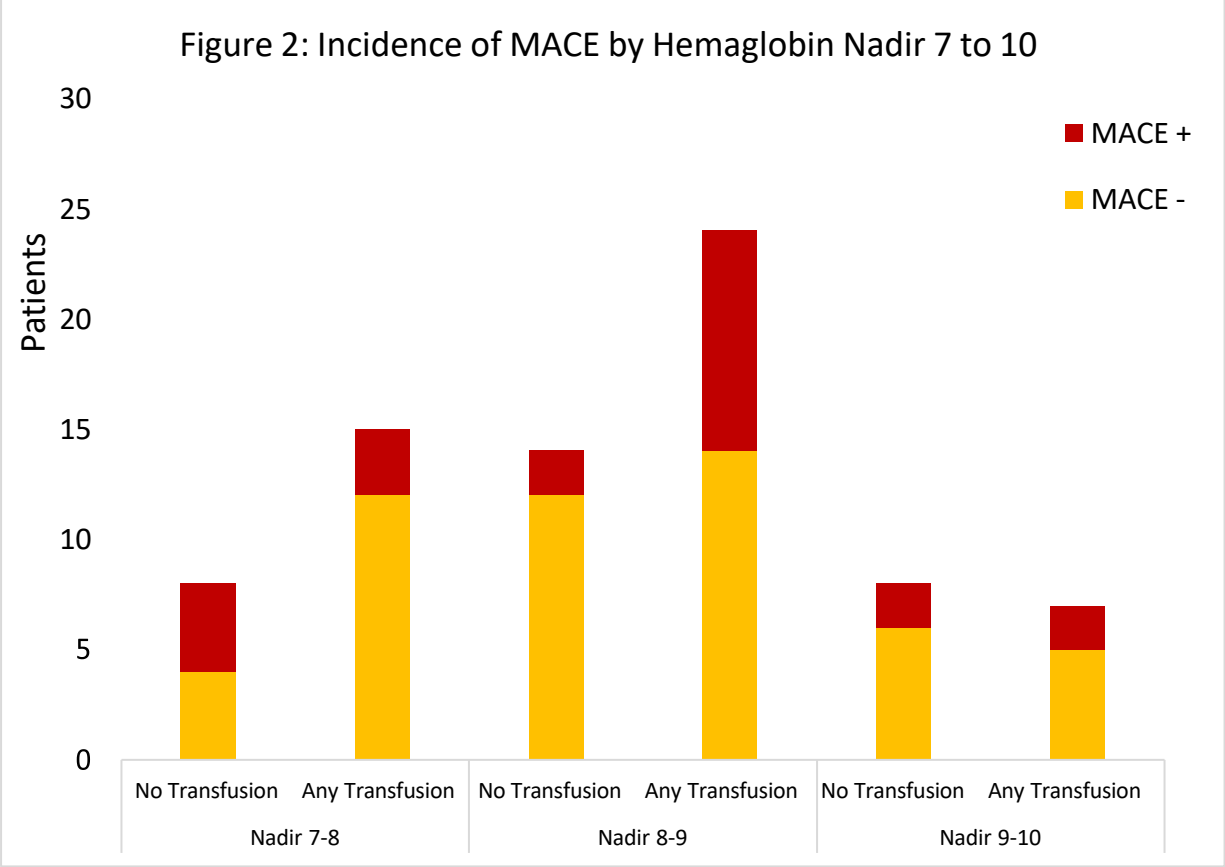
	MACE + (n=28)	MACE – (n=86)	P-value
Demographics			
Pre-op Hemoglobin g/dl	10.7±1.9	12.2±2.2	0.002
Hgb Nadir	8.6±1.2	9.3±1.7	0.023
Prior CHF	8 (28.6%)	4 (4.7%)	0.0003
Prior CEA/CAS	5 (17.9%)	3 (3.5%)	0.01
Supra-inguinal Bypass	2 (7.1%)	0 (0%)	0.012
Indication			
Claudication	2 (7.1%)	22 (25.6%)	0.01
Rest Pain or Tissue Loss	22 (78.6%)	62 (72.1%)	
Acute Limb Ischemia	4 (14.3%)	2 (2.3%)	
Transfusion			
None	12 (42.9%)	50 (58.1%)	0.026
1-2units	7 (25%)	22 (25.6%)	
3-5units	5 (17.9%)	13 (15.1%)	
6+units	4 (14.3%)	1 (1.2%)	

Table II. Multivariate Analysis of MACE

	OR	P-value	95% C.I.
Prior CHF	7.281	0.009	(1.65-32.2)
Pre-op Hgb g/dl	0.671	0.031	(0.467-0.964)
Nadir Hgb g/dl	1.228	0.355	(0.795-1.90)
Transfusion	0.788	0.682	(0.252-2.47)
Indication: Acute Limb	1.937	0.338	(0.501-7.48)
Prior CEA/CAS	1.626	0.609	(0.252-10.5)
Supra-inguinal Bypass		0.999	



% Transfused	57.1%		60.5%		6.5%	
MACE +	0	1	8	15	4	0
MACE -	3	3	22	31	25	2
MACE %	0%	25%	27%	33%	14%	0%
p-value	0.350		0.582		0.574	



% Transfused	65.2%		63.2%		46.7%	
MACE +	4	3	2	10	2	2
MACE -	4	12	12	14	6	5
MACE %	50.0%	20.0%	14.3%	41.7%	25.0%	28.6%
p-value	0.136		0.08		0.876	

26. AAA Size Appropriateness Quality Project - The Cleveland Clinic, Cleveland, OH

Authors: Donna Fleming, RN, MSN and Christopher Smolock, MD

Problem Statement:

The 2019 VQI Report indicates that 86% of elective EVARs performed at The Cleveland Clinic met the SVS Guideline indications regarding aneurysm diameter (≥5.5cm for Men; ≥5 cm for Women). It is important to identify patients undergoing intervention without meeting SVS guidelines for repair, which take into consideration size alone. We maintain there are indications other than size that are appropriate for aortic aneurysm repair, e.g., occlusive disease, rapid growth, infection.

Goals:

Increase compliance with SVS guidelines for size criteria for elective EVAR to 100% once mitigating factors are taken into account.

Improvement Strategies:

These strategies were implemented to identify and document SVS guidelines for diameter indication as well as appropriate indications for repair when guidelines are not met:
Since 2012, the department of Vascular Surgery has implemented an Internal Quality Dashboard to monitor complications and appropriateness. Over time, these Dashboards have undergone expansion and modification to include criteria noted above.
Abstractor will enter AAA diameter as documented by the Primary Surgeon. Patients not meeting size criteria will be noted after accounting for mitigating factors.
A film reader, under the supervision of our imaging core laboratory will review all EVAR patients. Measurement discrepancies, specifically those not meeting threshold for SVS guidelines for repair, will be sent to the Vascular Surgery Quality Officer for review.
Upon review by the Quality Officer, patients not meeting SVS guidelines for repair nor the accepted exemptions will be noted on the Vascular Surgery Internal Quality Dashboard and communicated to the Department Chairman. Feedback will be given to the Primary Surgeon and education provided if necessary.

Results:

All elective EVARS were included in analysis. Cases not meeting size threshold, yet met at least one of the following criteria were noted as appropriate: Dissection, Iliac Aneurysm, Rapid Progression, Saccular, Failed EVAR, Connective Tissue Disorder, Occlusive Disease, Infection, and Requirement Prior to Other Surgery.
Once mitigating factors were accounted for, we found that 94.8% of Elective EVAR met SVS guidelines for repair. Those that did not meet threshold for repair were brought to the

attention of operating surgeon, Quality Officer, and Department Chair for discussion and education.

Challenges/Lessons Learned:

Despite marked improvement in SVS guideline compliance, there remains a small percentage of cases that did not meet appropriateness criteria. There remains a variance in inter-operator measurement and reliability as well as image reading technique and experience.

Success Factors:

A similar process has been applied to all of our carotid and aorta procedures to identify appropriateness compliance. These are reported quarterly to all staff across the main campus and regional hospitals.

The VQI Quality Charter outlining this process has generated interest amongst many other VQI participants resulting in a Multi-Regional project. Additional data identifying reasons for repair outside of SVS guidelines will be entered by participating centers. This data will be analyzed in 2021.

27. Decreasing Post-Operative Length of Stay after Lower Extremity Bypass

Author: Tracy Campin

Problem Statement:
Throughout calendar year 2016-2017, VQI data showed patients at Nebraska Medicine who underwent lower extremity bypass (LEB) procedures had a mean post-op LOS of 7.7 days, an approximate two-day longer hospital stay compared to the mean regional post-op LOS of 5.7 days. Similarly, this performance was also higher than the national post-op LOS of 6.2 days.

Goals:
Develop and implement standard practice guidelines and order sets for LEB patients, identify those with poor nutrition pre and post-operatively, and improve patient and staff education. Nebraska Medicine's desired outcome of these initiatives included a reduction in post-op LOS in by 1-2 days in order to meet or exceed regional and national VQI benchmarks.

Results:
Since implementation of the project on 1/27/20, Nebraska Medicine LEB patients have experienced a decrease in post-op LOS by approximately 2 days, with a mean LOS throughout calendar year 2020 of 6.1 days.

Improvement Strategies:
Standardize care for all elective and non-elective lower extremity bypass patients. We sought to accomplish this through development and implementation of a clinical pathway, defined discharge criteria, comprehensive patient education, improved staff education, pre and post-operative systemic pain control, pre and post-operative nutritional care, and early mobility. Because our strategies aligned so closely with an existing organization pilot, enhanced recovery after surgery, the vascular team aligned with this program to launch many of these initiatives in a standardized way for LEB patients. Data metrics were compiled manually and utilizing Vizient quality data.

Challenges/Lessons Learned:
Our biggest challenges were indirectly related to Covid-19. Due to restrictions in elective procedures, volumes were reduced. Patients were shuffled on varying units with different staff, making it difficult to educate and maintain consistency. With a no visitor policy in place for a majority of the year, we could not engage family support in educating and motivating our patients.

Success Factors: Team engagement and support, improved communication to staff via well-defined orders, and a decrease in post-op length of stay.

28. Implementation of an Infection Prevention Bundle for Patients Undergoing Vascular Lower Extremity Bypass Surgical Procedures at Dartmouth-Hitchcock Medical Center: A Quality Improvement Project to Reduce Surgical Site Infections

Authors: Mark Abel, MD; Mark Eid, MD; Colleen Kershaw, MD; Antonia Altomare, DO, MPH; Philip Goodney, MD, MS; Katherine Shea, MD, MPH, Jocelyn M. Beach

Background:
Surgical site infections (SSIs) are associated with increased health care costs and poorer patient outcomes. The use of infection prevention bundles has been shown to reduce SSI rates. The vascular surgery department at Dartmouth-Hitchcock Medical Center (DHMC), a rural academic medical center in New Hampshire, aimed to improve healthcare value by implementing an infection prevention bundle to reduce rates of SSIs in patients undergoing vascular lower extremity (LE) bypass surgeries.

Methods:
The Vascular Quality Initiative (VQI) database was queried to determine baseline SSI rates over a three-year period from April 2017 to April 2020. A literature review was conducted to identify the evidence for various interventions aimed at reducing SSIs. These interventions were presented to stakeholders from the vascular clinic, pre-operative same day surgery, and operative staff and consensus was obtained on elements to include in the bundle. In conjunction with the hospital infection prevention and antimicrobial stewardship teams, antibiotic prophylaxis recommendations were updated based on review of SSI culture results and the hospital antibiogram. Updated operative note templates and EMR order sets were designed to facilitate use and tracking of the bundle.

Results:
On average each month, 23% of vascular LE bypass surgeries at DHMC were complicated by infection over the three-year period. The DHMC vascular surgery infection bundle includes the following evidence-based interventions: at-home chlorhexidine gluconate (CHG) bathing for patients prior to surgery, CHG bathing in pre-operative same day surgery, universal pre-operative glucose checks, anti-septic skin prep, signs on operating room doors to limit traffic during surgery, and updated evidence-based recommendations for antibiotic prophylaxis. This bundle will be implemented in its entirety beginning January 2021.

Conclusions:
By implementing an infection prevention bundle, we aim to reduce surgical site infections at our institution for patients undergoing LE vascular bypass surgery.

29. EVAR Long-Term Follow-Up at UW Medicine

Problem Statement:

Long-term surveillance after endovascular procedures is critical for early identification and treatment of potential complications. The logistics of long-term follow up can be difficult in a tertiary referral center where many patients live out of area. Local clinical and imaging follow up can be difficult due to lack of access to specialized imaging center such as ICAVL lab for vascular duplex exam as well as specialists such as vascular surgeons. We compared VQI Endovascular Aneurysm Repair (EVAR) long-term follow-up national data versus PNW regional data and noted that PNW regional follow up rate of 46% was lower than the VQI national rate of 60%. To investigate further our own center performance metrics, we collect data on our EVAR procedures. Our hypotheses were: 1) Routine follow-up post EVAR at a tertiary facility occur per SVS (Society of Vascular Surgery) guidelines, 2) Follow ups are the same for elective versus emergent cases, and 3) Distance and geographic barriers do not affect follow up.

Goals:

Our goals are to understand limitations associated with long term follow up compliance in a tertiary center and to implement systemic protocols to improve follow up compliance and care quality at our center.

Improvement Strategies:

We analyzed follow up clinic and imaging data on all elective and urgent/emergent EVAR's performed at three practice sites in our hospital system, using data from EPIC Clarity and the Amalga data warehouse. Appropriate follow-up consisted of a clinic visit within the first 30 days post-procedure, EVAR duplex evaluation, and CTA/CT non contrast at prescribed interval per SVS guidelines.

Results:

Overall, 67% of EVAR patients completed follow-up. Among elective EVAR patients, 69% completed follow-up, while urgent/emergent EVAR patients had 43% completed follow-up. CTA imaging modality was more frequent than ultrasound. For those who did not complete follow-up, distant geographic location and emergent case status were more highly represented.

Challenges/Lessons Learned:

Patients' follow up after EVAR in a tertiary referral center is variable and not consistent. Geographical distances and emergent cases are predictive of worse follow-up as compared to elective cases. We were unable to determine if patients who did not follow up at our facilities had follow-up locally or if they received the appropriate follow up imaging modality locally.

Success Factors:

UW Medicine EPIC EMR go-live in 2021 will potentially offer new options to track patients as well as their needed laboratory and imaging appointments. As the next phase of the project, we wish to design a reliable, systematic, and automated method to ensure and track follow-up. Long-term goals include using a robust EMR system and large database repository to use AI for data acquisition, tracking, and analysis, and to automate the entire follow-up process. We propose to start at a single center and expand to the entire UW Medicine System, and across the PNW region, through collaboration with other centers within the PNW VQI region.

30. Multi-center implementation of the Clinical Frailty Scale within the vascular surgery clinic workflow for VQI hashtag data collection - University of Utah

Authors: Julie Beckstrom, RN, MSN; Benjamin S. Brooke, MD, PhD; Larry Kraiss, MD;

Problem Statement:
Frailty is a multidimensional syndrome of loss of reserves (energy, physical ability, cognition, health) that gives rise to vulnerability to adverse events (Rockwood et al, CMAJ, 2005). Frailty-based instruments such as the Clinical Frailty Scale (CFS) may be useful for predicting long-term clinical and functional outcomes after vascular surgery. Implementation of the CFS into the vascular surgery clinic workflow is necessary in order to accurately capture patient's frailty status before and after surgery.

Goal:
To implement the CFS into vascular surgery clinic workflow for VQI hashtag data collection at the pre-operative and long-term follow up time points.

Improvement Strategies:
Beginning September 13, 2019, vascular surgery providers at the University of Utah, and three other Rocky Mountain Region VQI Centers, assigned the CFS to clinic patients at the pre-operative time point who were undergoing VQI-eligible procedures. VQI data managers documented the provider-assigned CFS in hashtag format within corresponding VQI patient case forms. The project team presented education and training at the Fall 2019, Spring 2020, & Fall 2020 Rocky Mountain Region VQI Meetings to discuss project barriers and facilitators and reinforce end-goals. The University of Utah Vascular Surgery team developed a CFS documentation flowsheet within the Epic Electronic Medical Record (EMR) to improve the efficiency of assigning and documenting the CFS. One year after project onset, the CFS hashtags were centrally 'pulled' and aggregated.

Results:
From September 13, 2019 through September 15, 2020, vascular surgery providers at four VQI centers assigned the CFS to 566 unique patients undergoing VQI-eligible procedures. Following CFS assessment, 30% of patients underwent HD Access, 26% PVI, 21% CEA, 8% Endo AAA, 7% Infra-bypass, 3% Open AAA, 2% TEVAR, and 2% Supra-Bypass. Among the four VQI centers, 23% of CFS assignments were from the University of Utah, 47% from Site 45, 20% from Site 175, and 10% from Site 119. As the project has been ongoing for over 1 year, patients assigned a CFS at the pre-operative time point are now being seen for long-term follow up, wherein the CFS can be assigned and documented in hashtag format within the VQI long-term follow up case form.

Challenges/Lessons Learned:

Due to the COVID-19 pandemic, vascular surgery clinic visits largely transitioned from face-to-face to telephone and/or video platforms. Providers were unable to accurately assign the CFS when a physical examination was not performed.

Success Factors

VQI provider champions across regional centers are effective in promoting the adoption of the CFS within the vascular surgery clinic workflow. Documentation of the CFS in VQI will aid future research to assess the relationship between pre-operative frailty assessment and long-term outcomes following vascular surgery.

31. VQI Summary Report Tool in EPIC (Baylor Scott & White Health System)

Authors: Priya Padmanabhan, MHA; Rosha Nodine, BAAS; Steve Teal, MS; Rachel R. Escontrias, RRT, MHA

Problem Statement:

There are numerous challenges that come with transitioning from one EHR (electronic health record) system to another. Although the adoption of a new system can increase efficiency, the implementation process itself may produce inefficiencies in all or certain workflows. Between September 2019 and July 2020, four hospitals in the Baylor Scott & White system transitioned from Allscripts to EPIC - Baylor Heart and Vascular Hospital Dallas, Baylor All Saints Medical Center – Fort Worth, The Heart Hospital Plano and The Heart Hospital Denton. Immediately following implementation, VQI abstractors at these facilities experienced losses in productivity, which led to increased average data abstraction times by about 60%.

Goal:

Our objective was to minimize the impacts of a new EHR implementation by leveraging tools built in EPIC and provide necessary process updates for data abstraction. The overall expectation was that the improvements would achieve or exceed pre-EPIC data abstraction times. We hypothesized that developing a standard data collection tool would facilitate our objective.

Improvement Strategies:

We performed a current state workflow analysis and identified key drivers to improve data abstraction times. Our analysis showed that the primary time consuming activity was locating where each data element existed in the medical record. Even for data with known locations, multiple steps were required to navigate to the information. To address these challenges and with the awareness of EPIC's robust reporting functionalities, we collaborated with IS Application Analysts to determine how to consolidate key registry data elements from multiple sources into a single summary report. After registry criteria were defined and sources of information established, IS Application Analysts compiled "print groups" containing the required information for testing. After vetting the layout, end users were provided access to review and assess the drafted VQI Summary Report in a test environment with real patient data. Quality checks were performed to validate data/process accuracy and provide feedback to EPIC analysts. Once final review and approval was complete, the registry Summary Report was moved to production.

Results:
Creating a standardized VQI Summary Report in EPIC provided quick accessibility to relevant patient information and exceeded our initial abstraction time goals. Additionally, we were also able to improve efficiency and reduce complexity leading to greater staff satisfaction. This process improvement initiative served as the blueprint to provide the same functionalities across several national registries, as well as now allows all facilities in the Baylor Scott & White system access to the VQI Summary Report.

Challenges/Lessons Learned:
Given the complexities of EPIC, determining a reliable source of truth for each data element was challenging. Framing data definitions and nuances to the EPIC technical team was crucial in developing a comprehensive report. Designing a solution while still learning a new EHR system created additional challenges for the data abstraction team.

Success Factors:
Proper coordination, a willing and able technical team, as well as a structured roll out plan ensured the creation of a robust reporting tool. With constantly evolving registry needs, we will continue o collaborate with the EPIC team to sustain improvement efforts.

32. Leveraging technologies to improve VQI Long term follow up compliance and data documentation: a centralized metadata approach. (Indiana University Health)

Author: Lillian Camino, Megan Brown; Affiliations: Indiana University Health

Summary Statement:

The implementation of centralized VQI abstraction and data analysis, along with the development of Resource Variation Tool (RVT Tool) and Reports, and Long Term Follow Up Autotext templates provided a foundation toward improving patient care and ensuring accurate registry data collection for improved outcomes in vascular patient populations.

Background:

In 2017, Indiana University Health (IUH) desired to improve the quality of care provided to vascular patient populations. To this end, a process improvement goal to improve Long Term Follow Up (LTFU) visit compliance and documentation was established. Given the multiple hospitals, specialties and operation areas involved in vascular procedures captured by the VQI registry, IUH sought to develop a process to minimize physician documentation burden while improving LTFU compliance and data documentation.

Improvement Strategies:

Minimizing physician documentation burden and improving and sustaining LTFU follow up compliance required an approach from multiple points of view:

A. **Centralized IUH VQI abstraction** into the Quality Reporting and Analytics Department.
B. Created **VQI LTFU AutoText templates** for each participating VQI modules (Carotid Stent, Peripheral Vascular Interventions, Endovascular AAA Repair and TEVAR and complex EVAR) that captures required VQI LTFU data elements for physicians to utilize during the patient's follow up clinical visit.
C. Registry Coordinators provided feedback to physicians on LTFU rate of

compliance in monthly multidisciplinary **"Integrated Vascular Process Improvement meetings"**. Information was also shared bi-monthly during a system-wide multidisciplinary **"Clinical Effectiveness Vascular Council meeting"** and included feedback on outcomes and LTFU compliance across all IUH facilities.

D. Created multiple **VQI-reports** to identify three categories of patients: patients lost to follow up, patients with future appointment scheduled, and patient's date of visit if follow up already occurred (see figure 1).

Process:

By centralizing VQI IUH abstraction into the Quality Reporting and Analytics Department, Registry Coordinators were able to provide consistent data in multidisciplinary meetings system wide. Registry Coordinators collaborated with the System Clinical Data Analytics Team to create a tool (RVT Tool) using Microsoft Power Bi software that merged data from an Azure Data Warehouse containing Cerner electronic medical record (Cerner-EMR), hospital facility billing and supply chain data with data from all VQI modules that IUH participates (Excel import into Power Bi through PowerQuery/Transform for index procedure and long term follow up visits) (see figure 2). The patient's index procedure data was matched with corresponding long term follow up data. Then, the tool narrowed the cases without a LTFU in VQI, and excluded known deceased patients based on VQI data and Cerner-EMR data.

Once an initial list was generated, IUH separated the patients into three reports. The reports (A, B, and C explained below) are set up to generate automatically and are sent to liaisons of each physician group along with VQI Registry Coordinators to use and distribute

Report A: "VQI: Needs an Appointment Report" – the purpose of this report is to identify cases lost to follow up to ensure an appointment for follow up is scheduled. This report provides a list of cases that do not have a follow up encounter scheduled in Cerner EMR within the timeframe (9-21m) required by VQI. It also provides a suggested start date and end date for the physician scheduler to contact the patient to schedule a follow up appointment within VQI LTFU 9-21-month range. If a scheduler finds a patient who has expired, a separate deceased notification form is filled out and scanned into Cerner-EMR and the patient is excluded in future lists (utilizing "IUH Deceased Notification Form").

Report B: "VQI: Future Appointment for VQI Templates Report" – the purpose of this report is to identify which cases have an upcoming visit for follow up. Physicians are then alerted for the need to utilize the **LTFU Auto-text template** during the patient encounter to ensure all required follow up data elements are captured.

Report C: "VQI: Completed Appointment Report" – the purpose of this report is to improve VQI Registry Coordinators efficiency in long term follow up abstraction. By knowing the exact date the encounter happened, coordinators no longer have to spend time looking through multiple encounters for follow up information.

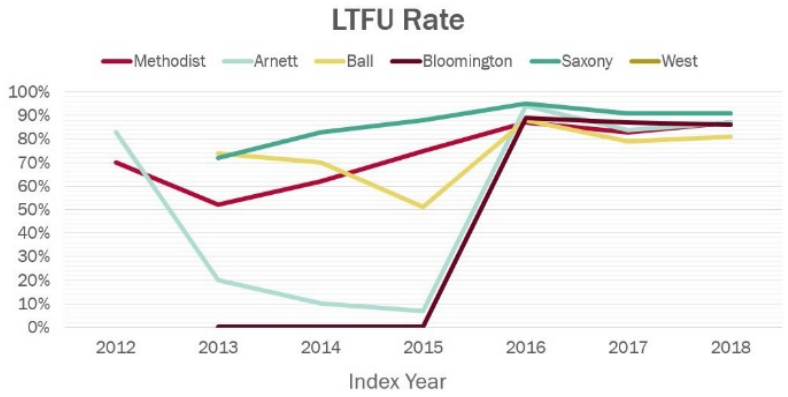
These reports are intuitive having rules set to them to apply on the next run of reports (report runs once a week):

- Once a patient visit is scheduled in Cerner-EMR, the report will drop the patient from the "Needs an Appointment Report" and will load in the "Future Appointment Report".
- If the patient cancels the appointment, the report will remove the patient from "Future Appointment Report" and load it back into the "Needs an Appointment Report".
- If the patient is found to be deceased, the report will drop the patient out of future reports.
- Once the patient is abstracted into VQI, the patient is removed from all reports. This helps ensure the VQI Registry Coordinators are not reviewing encounters multiple times.

The **LTFU Auto-Text templates** for each VQI participating module (Carotid Stent, Peripheral Vascular Interventions, Endovascular AAA Repair and TEVAR and complex EVAR modules) were created with commonly missed data points for physician to utilize for 1 year follow up visits. The template ensures that VQI registry required data elements are collected and reduces physician addendum requests. "**Report B: "VQI: Future Appointment for VQI Templates Report"** (discussed above) assists physician to determine when to use the templates.

Results:

By utilizing a centralized multisystem approach of analysis, tools and reports, IUH have improved and sustained our LTFU compliance across all facilities. Physicians and staff among all facilities appreciated receiving updates on LTFU compliance and outcomes during meetings. The RVT VQI Reports and Autotext templates were well received and reportedly user friendly. Since initiation of this project, there has been a sustained improvement in LTFU, with an increase in the amount of data that is entered into the VQI databases, as well as a decrease in the amount of physician addendum requests.



CONCLUSIONS:

The multiyear effort explained above has efficiently improved and sustained our long term follow up compliance and data documentation. The final gap in missed opportunities will be addressed by continuous of use of tools and reports across all systems as IUH continues its commitment in transforming healthcare though quality, innovation and education.

APPENDIX:

Figure 1: Approach for Reports (below)

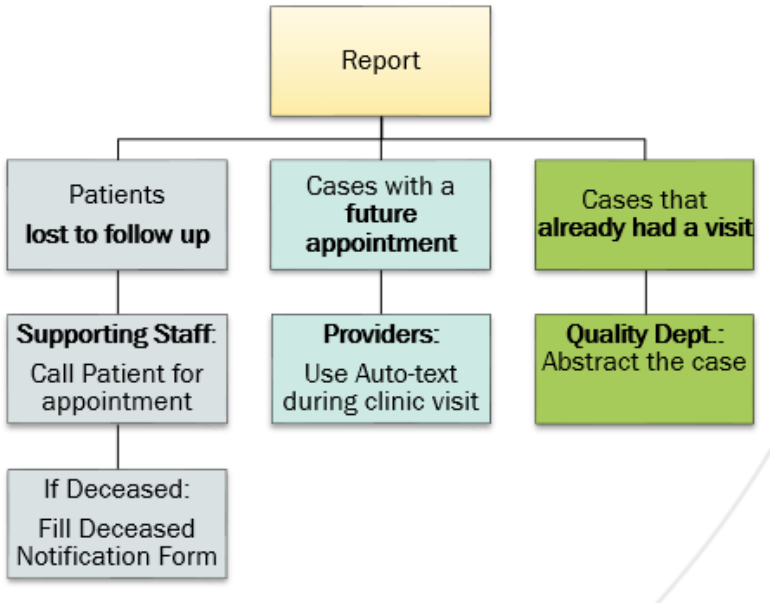
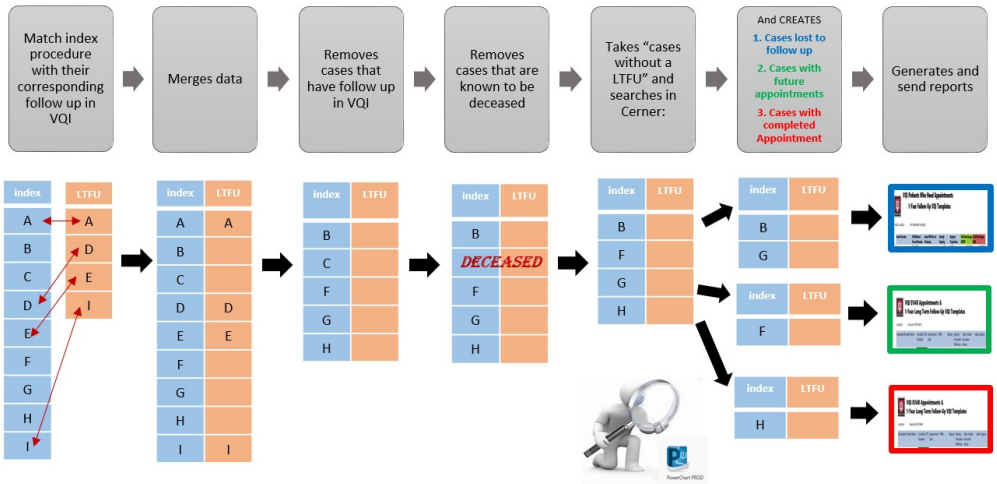


Figure 2 Construction Methodology (below)



33. Impact of preoperative anemia in patients undergoing peripheral vascular intervention

Authors Abdul Kader Natour, MD, Alexander Shepard, MD, Timothy Nypaver, MD, Ali Rteil, MD, Paul Corcoran, MD, Amy Tang, PhD, Loay Kabbani, MD.

Introduction:

The Vascular Quality Initiative (VQI)® data base was analyzed to determine whether pre-operative anemia was associated with postoperative death, length of stay (LOS), and overall survival in patients undergoing peripheral vascular intervention (PVI).

Methods:

The national VQI dataset was queried for all PVIs performed between 2010 and 2019 and outcomes correlated with the presence of anemia. Anemia was classified into mild (10-13 g/dl for men and 10-12 g/dl for women), moderate (8-9.9 g/dl) and severe (<8 g/dl) based on the World Health Organization definition of anemia. Analysis of variance or Kruskal–Wallis test were used for continuous variables and Chi square test was used for categorical variables. Multivariate logistic regression, generalized linear, and proportional cox models were used to evaluate the association between preoperative anemia and postoperative 30-day mortality, total LOS and overall survival time. Kaplan Meier curve was used to compare the survival time based on anemia severity.

Results:

A total of 86,726 patients met the inclusion criteria. Demographics collected were age (mean 68 years), gender (males 59%), and race (whites 80%). Anemia was documented in 41,627 patients (48%); mild 71% (N=29,687) moderate 25% (N=10,500), and severe 4% (N=1,440). Demographics (age, gender, and race), and comorbidities (Smoking, BMI, HTN, COPD, CHF, and Dialysis) were associated with the degree of pre-operative anemia (**Table I**). The median follow-up was 4 years (1.25-5.78). On univariate analysis, 30-day mortality, total LOS and overall survival were significantly associated with the level of pre-operative anemia (**Table II**). These associations persisted on multivariate models (**Table II**). Kaplan-Meier survival was associated with the degree of anemia (P<0.001) (**Fig 1**).

Conclusions:

The presence and degree of preoperative anemia are independently associated with 30-day death, total LOS and overall survival in patients undergoing PVI. The presence and degree of anemia should be important components of preoperative risk stratification for patients undergoing PVIs. Anemia should be a listed variable in all reports detailing outcomes of PVI.

Variables	Normal Hgb	Mild Anemia	Moderate Anemia	Severe Anemia	P-value
Age, years, mean (SD)	66.47 (11.06)	70.01 (11.32)	69.55 (11.92)	67.50 (12.26)	<0.001
BMI, mean (SD)	28.09 (6.05)	27.74 (6.36)	27.60 (6.78)	27.63 (7.32)	<0.001
Female, n (%)	18962 (42.0)	10890 (36.7)	4969 (47.3)	664 (46.1)	<0.001
Race, n (%)					<0.001
African American	4831 (10.7)	5273 (17.8)	2461 (23.4)	402 (27.9)	
White	38546 (85.5)	22625 (76.2)	7316 (69.7)	928 (64.6)	
ASA class, n (%)	858 (1.9)	358 (1.2)	96 (0.9)	26 (1.8)	<0.001
1	11297 (25.0)	5146 (17.3)	1292 (12.3)	127 (8.8)	
2	30126 (66.8)	20303 (68.4)	6878 (65.5)	893 (62.0)	
3	2818 (6.2)	3880 (13.1)	2234 (21.3)	394 (27.4)	
4,5					
Hx of CAD, n (%)					<0.001
None	32613 (72.3)	20033 (67.5)			
Hx of MI but no Sx	8488 (18.8)	6519 (22.0)	6890 (65.6)	977 (67.8)	
Stable angina	3200 (7.1)	2328 (7.8)	2407 (22.9)	284 (19.7)	
UA or MI <6months	798 (1.8)	807 (2.7)	767 (7.3)	95 (6.6)	
			436 (4.2)	84 (5.8)	
Hx of CHF, n (%)	39862 (88.4)	22683 (76.4)			<0.001
None	3107 (6.9)	4000 (13.5)	7132 (67.9)	986 (68.5)	
Asymptomatic	1337 (3.0)	1720 (5.8)	1767 (16.8)	245 (17.0)	
Mild	793 (1.8)	1284 (4.3)	842 (8.0)	122 (8.5)	
Moderate/Severe			759 (7.2)	87 (6.0)	
Hx of COPD, n (%)	33673 (74.7)	22230 (74.9)			<0.001
None	3223 (7.1)	1929 (6.5)	7729 (73.6)	1071 (74.4)	
Not treated	7308 (16.2)	4644 (15.6)	636 (6.1)	97 (6.7)	
On Medications	895 (2.0)	884 (3.0)	1721 (16.4)	210 (14.6)	
On Home O2			414 (3.9)	62 (4.3)	
Hx of DM, n (%)					<0.001
None	26639 (59.1)	11857 (39.9)	3420 (32.6)	486 (33.8)	
Diet controlled	1697 (3.8)	1330 (4.5)	543 (5.2)	76 (5.3)	
Non-insulin dependent	7439 (16.5)	5545 (18.7)	1653 (15.7)	227 (15.8)	
Insulin dependent	9324 (20.7)	10955 (36.9)	4884 (46.5)	651 (45.2)	
Hx of HTN, n (%)	38527 (85.4)	27134 (91.4)	9704 (92.4)	1308 (90.8)	<0.001

On Dialysis, n (%)					<0.001
No	44071 (97.7)	26068 (87.8)	8042 (76.6)	1037 (72.0)	
Functional transplant	282 (0.6)	382 (1.3)	168 (1.6)	24 (1.7)	
Yes	746 (1.7)	3237 (10.9)	2290 (21.8)	379 (26.3)	
Smoking, n (%)					<0.001
Never	6854 (15.2)	7619 (25.7)	3304 (31.5)	459 (31.9)	
Prior	17936 (39.8)	14146 (47.7)	4755 (45.3)	644 (44.7)	
Current	20309 (45.0)	7922 (26.7)	2441 (23.2)	337 (23.4)	

Table I: Baseline demographics and comorbidities relative to the anemia level. *SD: Standard deviation, Hx: History, Sx: Symptoms, CAD: Coronary artery disease, MI: Myocardial infraction, UA: Unstable Angina, CHF: Congestive heart failure, COPD: Chronic obstructive pulmonary disease, DM: Diabetes Mellitus, HTN: Hypertension.*

	Overall Survival (Univariate)			**Overall Survival (Multivariate)**		
Predictors	***HR***	***CI***	***p***	***HR***	***CI***	***p***
Normal Hgb	*1*			1		
Mild Anemia	2.23	2.16 – 2.31	**<0.001**	1.59	1.54 – 1.65	**<0.001**
Moderate Anemia	3.53	3.39 – 3.67	**<0.001**	2.09	2.01 – 2.18	**<0.001**
Severe Anemia	3.50	3.21 – 3.82	**<0.001**	2.14	1.96 – 2.34	**<0.001**
	30-Day Death (Univariate)			**30-Day Death (Multivariate)**		
Predictors	***OR***	***CI***	***p***	***OR***	***CI***	***p***
Normal Hgb	1			1		
Mild Anemia	3.08	2.71 – 3.51	**<0.001**	2.02	1.76 – 2.31	**<0.001**
Moderate Anemia	6.79	5.93 – 7.79	**<0.001**	3.39	2.92 – 3.94	**<0.001**
Severe Anemia	8.20	6.41 – 10.38	**<0.001**	3.94	3.03 – 5.06	**<0.001**
	Total LOS (Univariate)			**Total LOS (Multivariate)**		
Predictors	***IRR***	***CI***	***p***	***IRR***	***CI***	***p***
Normal Hgb	1			1		
Mild Anemia	2.01	1.96 – 2.06	**<0.001**	1.75	1.71 – 1.80	**<0.001**
Moderate Anemia	4.33	4.18 – 4.48	**<0.001**	3.34	3.22 – 3.47	**<0.001**
Severe Anemia	5.97	5.48 – 6.51	**<0.001**	4.62	4.24 – 5.03	**<0.001**

Table II: Univariate and multivariate analyses for the overall survival, 30-day death and total length of hospital stay (LOS). *HR: Hazard Ratio; OR: Odds Ratio; IRR: Incidence Rate Ratio; CI: Confidence interval*.

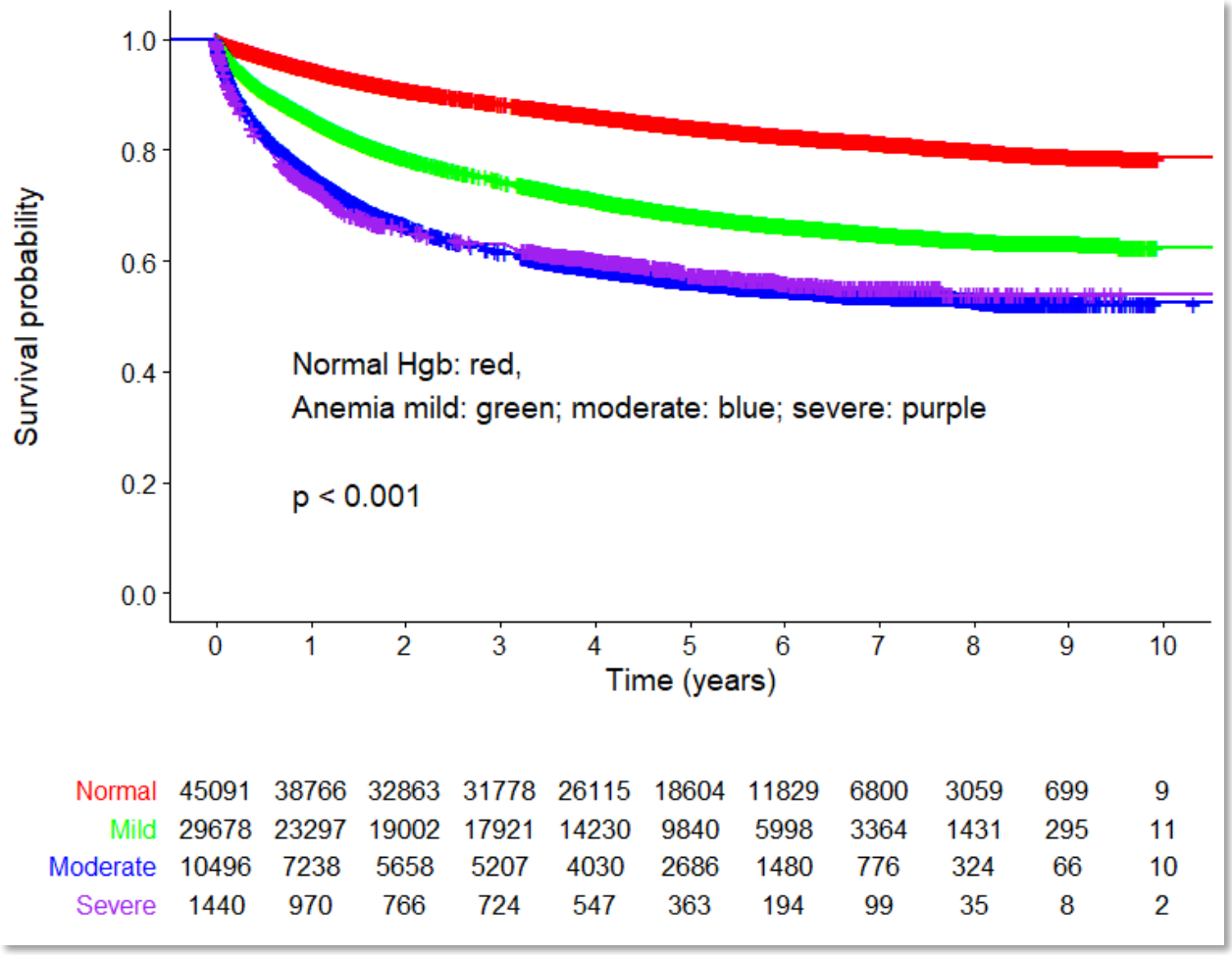


Figure 1: Kaplan Meier curves comparing the survival time based on anemia severity.

34. Utilizing Vascular Quality Initiative (VQI) data to assess for fluctuations in placement of inferior vena cava filters (IVCFs) during the COVID-19 pandemic

Authors:
Kristan Probeck, MS, RN, ANP-C
Doreen Elitharp, MS, ANP-C

Problem Statement:
The COVID-19 virus contributes to alarmingly high rates of venous thromboembolism (VTE). At our university medical center, an anticoagulation policy was instituted for all COVID-19 positive patients placing them on therapeutic or prophylactic anticoagulation, based on D-Dimer levels. However, a subset of patients had an absolute contraindication to anticoagulation and remained at high risk for pulmonary emboli (PE).

Goals:
To utilize the VQI IVCF database to determine the incidence of IVCF placement before and during the pandemic to determine if there was an increase in placement in those highly coagulable patients.

Improvement Strategies:
Assessment of all VTEs in the 695-bed hospital reviewed in real time for appropriate treatment upon diagnosis of a VTE, or VTEs that are present on admission.
Careful review and follow up of all IVCF placed at the university medical center and outpatient vascular center.

Results:
Comparison of the total number of IVCFs placed between 1/1/2017 to 12/31/2020 to the total number of nosocomial VTE showed no increase in placements during the COVID-19 pandemic, even though the number of VTEs increased.
Review of all IVCFs placed between March 13, 2020 (when the World Health Organization declared a pandemic) and December 31, 2020, revealed 3 patients were COVID-19+.
The institution of the anticoagulation policy for COVID-19 patients may have lowered the overall VTE rate for that population, but it was still higher when compared to 2017 and 2018.
Diagnosis of VTE in many patients may have been missed in 2020 due to high acuity and/or infectious isolation policies hindering transport of COVID-19+ patients throughout the hospital, limited bedside duplex ultrasound testing and the scarcity of PPE.

Challenges/Lessons Learned:

Due to the highly infectious manner of COVID-19, patients did not have access to clinics for follow up. IVCF retrievals are considered an elective procedure and prolonged the dwell time for the temporary filters. A follow up study on COVID-19+ patients that had a filter placed to determine if filter thrombosis was present would be of interest.

COVID-19 should be considered a risk factor in the VTE risk assessment tools we currently use. After a literature review in PubMed, there are no articles that address the use of IVCF in COVID-19+ patients. This is another area of VTE management in COVID-19 patients that should be explored.

Success Factors:

An aggressive anticoagulation strategy afforded patients protection from developing VTE, and in turn lowered the number of IVCF placements required.

A decrease in IVCF placement in comparison with the overall higher volume of diagnosed VTEs was discovered. Further investigation shall be done as to why this is.

