

Quality Improvement Abstracts

VQI Annual Meeting 2019

June 11th & June 12th, 2019

Gaylord National Resort & Convention Center, National Harbor, MD



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1. Baylor, Scott & White – The Heart and Vascular Hospital (Dallas, TX) How Many Data Managers Does It Take To...

Authors: Rosha Nodine, BAAS; Kristi Verschelden, BSN, RN; Tiffany Reyna, RHIA

PROBLEM STATEMENT: In the past, abstraction turnaround time data has not been available to new facilities joining the Vascular Quality Initiative (VQI) registry to help with Full Time Equivalent (FTE) calculations. Likewise, existing data managers need assistance in the stratification of requesting more FTEs when volumes are increasing at their facilities. Data managers have also requested national benchmarks to better understand how their abstraction times compare to their peers.

GOALS (OUTCOME MEASURES): Survey national VQI data managers in order to get an overall picture of average abstraction times per registry as well as data manager backgrounds and role responsibilities. Provide VQI data managers with a way to calculate how many FTEs their facility needs in order to abstract cases based on volumes and number of registries. In addition, establish registry specific national benchmarks of abstraction turnaround times to allow data managers the ability to measure their performance amongst their peers. Lastly, see if there are any trends in higher turnaround times with specific data manager backgrounds.

IMPROVEMENT STRATEGIES: Created and sent a national survey to VQI data managers and received an overall picture of average turnaround times for each registry. A formula was created taking into account registry volume, registry participation level, employee downtime and average abstraction time per case. Using the average abstraction time eliminated outliers and gave a better middle ground in calculating a start up to mid-range level data manager. In addition, the relationship between registry abstraction times and data manager experience, roles and responsibilities were analyzed.

RESULTS: A 14% (130/942) participation rate in the survey provided a national average abstraction time for each registry. A formula was created to calculate the number of FTEs needed at a facility based on volumes and number of registries.

	Data Manager Responses					Total number of people surveyed	Average Time per Case	People not Participating in Registry
	<30 Min	30 Min - <1 Hr	1-2 Hrs	2-4 Hrs	>4 Hrs			
TEVAR/Complex EVAR	5	23	15	14	1	58	91.29	66
EVAR	11	34	35	3	0	83	66.87	40
CEA	27	50	23	1	0	101	52.57	23
CAS	14	45	32	5	1	96	67.34	26
Infra-Inguinal Bypass	14	31	28	1	0	74	61.01	50
Supra-Inguinal Bypass	13	26	28	1	0	68	62.65	55
PVI	7	33	27	3	0	70	66.64	53
Varicose Vein	4	4	0	0	0	8	37.50	113
Hemodialysis Access	13	10	3	0	0	26	42.69	98
Open AAA	11	25	25	6	0	67	71.42	55
IVC Filter	6	5	1	0	0	12	41.25	112
Lower Extremity Ampu	6	9	2	0	0	17	45.00	106
	Median Times of Each Range in the Survey for Calculations							
	30	45	90	180	240			

CHALLENGES / LESSON LEARNED: Since there is a variation in VQI registry participation across facilities, it was difficult to show any correlation between the relationship of abstraction times and data manager roles. Per the survey, the experience was spread evenly throughout all registries. However, this doesn't exactly mean the data manager has the same level of experience across all registries. This survey would have been more accurate if the background questions were asked specific to each registry. In order to take into account the varied experience levels amongst data managers in conjunction with the complexity of cases across facilities, we considered both the range and average abstraction times when creating the formula for facility FTE needs.

SUCCESS FACTORS: A 14% participation rate in the national survey resulted in the creation of a tool to calculate the number of FTEs needed. Data managers now have access to national benchmarks for abstraction times specific to each VQI registry.

2. Baylor, Scott & White - The Heart & Vascular Hospital (Dallas, TX)

Improving Follow-up Imaging Compliance After Endovascular Aortic Repairs

Authors: Priya Padmanabhan, MHA; John Eidt, MD; Ashley Moore, APRN, AGACNP-BC; Trent Witt, BSN, RN, CPHQ

BACKGROUND: Life-long postoperative surveillance following an endovascular abdominal aortic aneurysm repair (EVAR) is recommended to optimize long-term outcomes. A key performance measure of the Vascular Quality Initiative (VQI) Registry is the rate of compliance with long-term follow-up (LTFU) imaging at one year (9 to 21 months) after the index procedure. Despite the recommendations, only 53% of patients in our region (Southern Vascular Outcomes Network) had LTFU imaging in 2015, which is similar to the VQI national average of 55%. In our center, only 44% of patients had annual follow-up imaging.

OBJECTIVE: In order to improve adherence to recommended surveillance guidelines, Baylor Scott & White Heart and Vascular Hospital in Dallas developed an improvement strategy to increase follow-up imaging compliance. We hypothesized that a structured follow-up strategy would improve LTFU after EVAR.

METHODS: We examined the VQI data set of patients who underwent EVAR at our center in 2016. A root-cause analysis was performed to identify barriers to compliance with recommended long-term follow-up. Based on the identified barriers to compliance, we developed a strategy to reduce the rate of non-compliance and improve LTFU imaging. A multi-disciplinary team, which included a physician champion analyzed barriers and developed an intervention targeting the root causes. A PDCA (Plan-Do-Check-Act) cycle evaluated the impact of our initiative.

RESULTS: We examined the VQI data set of patients who underwent EVAR at our center in 2016. A root-cause analysis was performed to identify barriers to compliance with recommended long-term follow-up. Based on the identified barriers to compliance, we developed a strategy to reduce the rate of non-compliance and improve LTFU imaging. A multi-disciplinary team, which included a physician champion analyzed barriers and developed an intervention targeting the root causes. A PDCA (Plan-Do-Check-Act) cycle evaluated the impact of our initiative.

CONCLUSION: Implementing a standardized process of timely and consistent communication between the VQI coordinator and physicians' office led to tracking and scheduling appointments that may have otherwise been lost to follow-up. Ongoing patient education and awareness around strict adherence to postoperative surveillance protocols continue to impact the rate of LTFU imaging. This ongoing quality initiative requires awareness, transparency and cross-departmental collaboration to sustain improvement efforts. Physician and staff engagement remains crucial to the successful implementation of this new process.

3. Beth Israel Deaconess (Boston, MA)

Sex Differences in Perioperative and Long-Term Outcomes after Endovascular Repair for Complex Abdominal Aortic Aneurysms

Author: Livia E.V.M De Guerre, MD; Nicholas J. Swerdlow, MD; Thomas F.X. O'Donnell, MD; Rens R.B. Varkevisser, BS; Ruby Lo, MD; Virendra I. Patel, MD; Joost A. van Herwaarden, MD; Marc L. Schermerhorn, MD

PROBLEM STATEMENT: Previous studies have shown higher perioperative morbidity and mortality in female patients compared to male patients after endovascular abdominal aneurysm repair (EVAR). However, the sex differences in long-term outcomes after complex aneurysm EVAR and their cause are unclear.

GOAL: We aimed to determine the association of sex with perioperative and long-term outcomes after endovascular complex AAA repair.

IMPROVEMENT STRATEGIES: We identified all patients undergoing elective complex EVAR in the Vascular Quality Initiative from 2014 to 2018. Complex EVAR was defined as endovascular repair of an aneurysm with proximal extent between the top of the celiac artery and the lowest renal artery and included repairs with fenestrated EVAR (FEVAR), chimney repairs and physician-modified endografts (PMEG). The primary outcome of our study was long-term mortality and secondary outcomes were in-hospital mortality and postoperative complications. We used multivariable logistic regression to compare the independent association between sex and perioperative outcomes and assessed long-term survival using multivariable Cox regression.

RESULTS: 1,304 patients underwent complex EVAR, of which 22% were female. Female patients were older (75 vs. 73 years, $P=.001$), had smaller median aneurysm diameters (56 vs. 58mm, $P<.001$), and more often underwent chimney repairs (20.6% vs. 15.1%, $P=.028$). However, no difference was found in proximal aneurysm extent rates ($P=.632$). Female patients had higher in-hospital mortality with 5.2% vs. 2.7% in male patients ($P=.029$) and had higher rates of complications (33.4% vs. 27.2%, $P=.040$). After adjustment, including adjustment for repair modality and proximal extent, female sex remained significantly associated with in-hospital mortality (OR, 2.3; 95% CI: 1.2-4.4; $P=.017$). However, no difference was seen in three-year survival analysis between female and male patients (85.6% vs. 88%).

CHALLENGES/LESSONS LEARNED: Female sex is associated with higher in-hospital mortality but not with long-term mortality after complex EVAR. Improvement of patient selection is essential to reduce these sex discrepancies.

SUCCESS FACTORS: The large sample size and clinical granularity of the VQI database were essential success factors for this study.

4. Concord Hospital (Concord, NH)

Implementing a Smoking Cessation Program

Author: 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.

GOAL: 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.

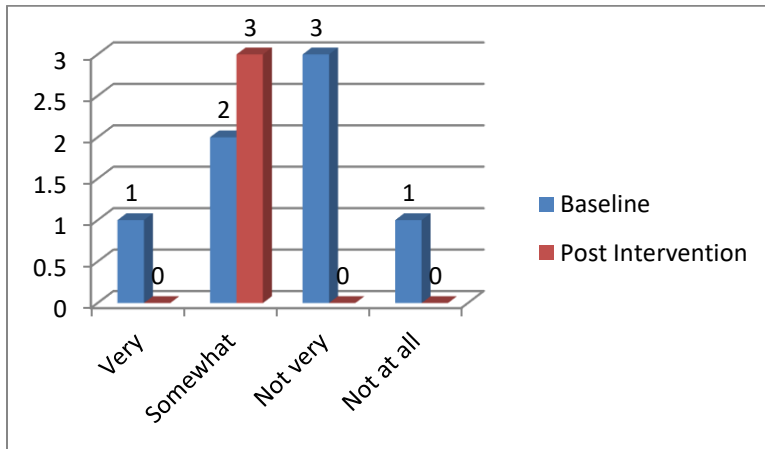
Concord Hospital redesigned “Quit Kits” that are offered to patients who actively smoke. The new Quit Kits now feature a free app to motivate those quitting, a free telephone-based cessation program, tips on affording smoking cessation medications, a stress stone, and a stick of gum.

RESULTS:

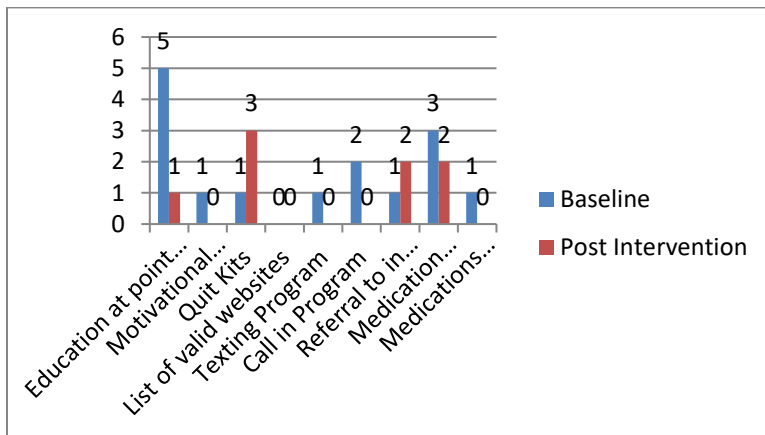
mortality but not with long-term mortality after complex EVAR. Improvement Our program is still in its infancy, but so far, we have had two participants successfully quit tobacco. Three others joined the program but ended up not completing it.

Clinician and Provider Qualitative Survey Results:

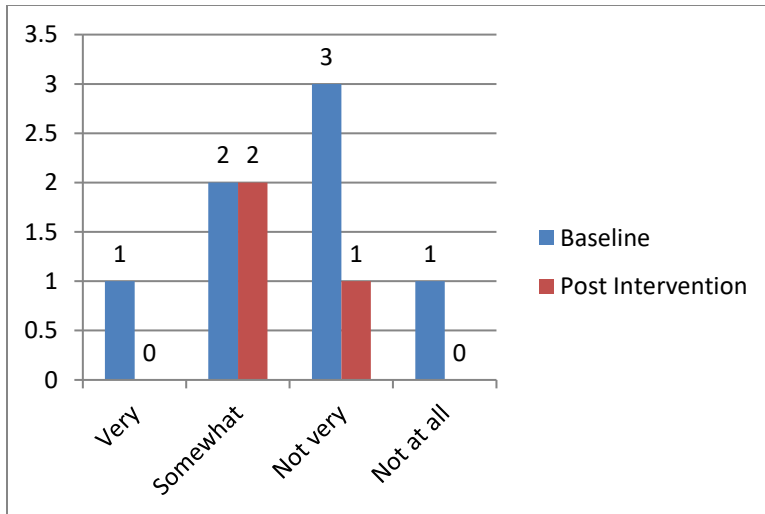
How well-equipped is our organization to meet the need of patients that smoke, in helping them quit?



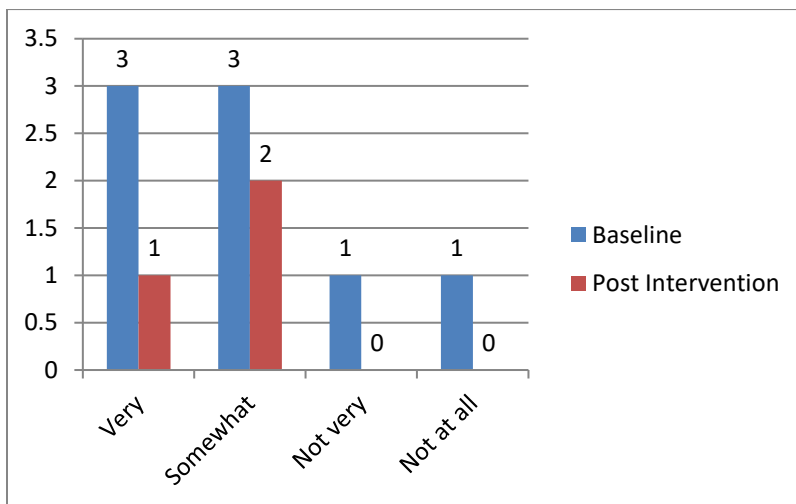
What resources do you offer your patients for smoking cessation?



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.

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

Peripheral Vascular Intervention (PVI) Device Utilization and Patient Outcomes

Authors: Lillian Camino, RPVI, RVT; Melissa Easterday, BS; Gary Lemmon, MD

SUMMARY STATEMENT: Peripheral Arterial Disease (PAD) is a very prevalent disease in the population. Peripheral Vascular Intervention (PVI) is a catheter-based intervention commonly used for arterial atherosclerotic disease in the aorta and lower extremity circulation. In 2018, ACC/AHA/SCAI/SIR/SVM released a publication regarding appropriate use criteria for Peripheral Artery Intervention. Indiana University Health (IUH) Methodist Hospital (MH) sought to understand procedural treatment strategies and the impact to patient outcomes outside of hospitalization.

GOALS / OBJECTIVES: IUH desired to analyze the amount and type of device used in femoral-popliteal disease treatment. This includes the immediate and long-term outcomes of the procedures with intention to determine efficacy of treatment at follow-up timeframes.

IMPROVEMENT STRATEGIES: The MH interprofessional and interdisciplinary process improvement team utilized Vascular Quality Improvement (VQI) PVI Registry data, including the type and number of PVI devices and patient outcomes to understand how internal treatment strategies affects outcomes for the patients. This was a retrospective analysis for procedures reported in the VQI database during the timeframe of 2012-2018. Limitations in the results are due to the data review including patients lost to long-term follow up (LTFU) and reporting capability for procedural devices and lesions. For the purposes of this analysis, noncritical limb ischemia (NCLI) was defined as asymptomatic and claudicant cases; and critical limb ischemia was defined as rest pain, ulcers, non-healing amputations, and acute ischemia. Target lesion revascularization (TLR) included percutaneous PVI and or open bypass graft (related to the area initially treated). Major amputations were defined as above the knee (AKA) or below the knee (BKA) amputation. Outcomes were defined as improvement in patients presenting symptoms such as change from critical limb ischemia to non-critical limb ischemia or resolution/no change in symptoms. Outcomes were defined as worsened when reintervention, amputation or progression of symptoms developed.

RESULTS: A total of 1108 vessels were treated during the study period in 1012 patients. LTFU information was available for 620 vessels. When a single device was used (27% of the cases 303/1108), percutaneous transluminal angioplasty (PTA) alone was utilized in 81% (245/303) of the interventions. When analyzing the type of device used during the 2012-2018 timeframe, 77% involved percutaneous transluminal angioplasty (PTA) alone or with concomitant devices: 31% with stents, 15% with atherectomy, 15% with specialty balloon, and 9% with stentgraft. This data shows a shift of PTA usage from its highest 86% (2014) to a 61% (2018) with an increase in utilization of specialty balloons from 2% (2014) to 41% (2018). For the purpose of this review, specialty balloons included the following devices: drug coated balloons, cryoplasty, and cutting balloons. With the release of the expanded PVI Registry (V1.44), the rate of cases with three or more devices used was 41%, utilization of two devices 27%, and procedures with one device used was 31% (2017-2018 data). When only one device was used, the preferred method was PTA (81%) followed by specialty balloons (12%), stentgraft (2%), atherectomy (1%) and stents (1%). A failure to wire was observed in 3% of the procedures, with no failed wire placement since 2016.

Procedural success rate was observed in 95% of cases with $\leq 30\%$ residual stenosis, 1% of cases with a $>30\%$ or 10mm gradient and in 3% of cases classified as failure to treat and/or abort. In 2018, the success rate increased to 98% for lesion stenosis rates of $\leq 30\%$ residual stenosis.

Analyses of outcomes at follow up, regardless of type of device used and quantity of device used, demonstrated 60% of cases did not require target lesion revascularization (TLR) or amputation. A total of 75 new TLR, and a total of 43 major amputations were performed for disease progression or failure of TLR at time of LTFU (N = 620 vessels). TLR alone with no amputation was demonstrated in 10% of cases, incidence of TLR plus amputation was demonstrated in 2% of cases, and amputation without TLR occurred in 4% of cases

When analyzing LTFU outcomes by device, cases had better outcome in vessels treated with specialty balloons 66% (38/58), atherectomies 65% (67/104), stents 54% (94/173), or stentgrafts 49% (29/59), respectively. The incidence of worsening outcomes, as defined above, was found 26% (45/173) of cases treated with stents, 22% (13/59) of cases treated with stentgrafts, 20% (13/59) of cases treated with specialty balloon and in 15% (15/104) of cases treated with atherectomy. Reintervention rates were higher for vessels treated with stentgrafts 17% (10/59) and stents 16% (28/173) compared to specialty balloons 10% (6/58) and atherectomies 9% (9/104). Major amputation rates were 9% (15/173) in cases treated with stents, 7% (4/58) in cases treated with specialty balloons, 3% (2/59) of cases treated with stentgrafts and 1% (1/104) of cases treated with atherectomy.

CHALLENGES/LESSONS LEARNED: The robust interprofessional team with representation from Cardiology, Interventional Radiology, and Vascular Surgery was beneficial to this project. The three subspecialties brought unique perspectives to the project. Preconceived notions of individual and institutional bias of device performance could not be reproduced in our analyses as all devices performed well when compared to each other. Increased frequency of specialty balloon use was noticed over time. Project limitations previously highlighted in regard to the data collection capabilities, incomplete/missing data, and patients lost to long-term follow up were challenges that occurred. Despite an underestimated time needed to complete this review, a deep dive analysis was possible using VQI raw data available within the PVI module. Other limitations included inability to collect more than 3 devices per vessel treated and single center data. For continued monitoring, insights from the initial review will guide continued tracking.

3 SUCCESS FACTORS: The MH interprofessional and interdisciplinary process improvement team found value in analysis of VQI data to review internal treatment strategies and patient outcomes. The intensive review supports the adoption of current practices to align with the recently published PVI guidelines.

CITATIONS: Journal of the American College of Cardiology Dec 2018, 25614; DOI: 10.1016/j.jacc.2018.10.002

6. Indiana University Health Methodist Hospital (Indianapolis, IN)

Indiana University Health Improvement in Medication Compliance

Author: Melissa Easterday, BS; Lillian Camino, RPVI, RVT; Gary Lemmon, MD

SUMMARY STATEMENT: Vascular Quality Initiative (VQI) best practice has shown patients with arterial disease benefit from being placed on an aspirin/antiplatelet and a statin. Indiana University Health (IUH) sought to ensure all eligible vascular patients included in the VQI registry modules of interest were prescribed an aspirin/antiplatelet and a statin at discharge.

GOALS / OBJECTIVES: IUH Methodist Hospital established a goal in 2016 that 90% of eligible Peripheral Vascular Intervention (PVI) patients would be discharged on recommended dual medication therapy. As a result of the success seen with the PVI procedures, IUH Methodist aspired to build off of the PVI focus to include other VQI modules. In 2018, IUH Methodist participated in a quality improvement charter including the following modules: Carotid Stent (CAS), Peripheral Vascular Intervention (PVI), Endovascular AAA Repair (EVAR), and Thoracic and Complex EVAR (TEVAR). The target compliance rate for discharge medications was set at 95%. 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 STRATEGIES: The IUH VQI Data Coordinators along with the Integrated Vascular Process Improvement Team continually worked to develop strategies to ensure the recommended discharge medications were prescribed.

☐ The first strategy for improvement was to revise and standardize current order sets utilized by physicians. The VQI Data Coordinators collaborated with multiple stakeholders (physicians, pharmacy, and information systems) in the standardization process. IUH VQI Data Coordinators consistently stressed the importance of utilizing this tool to aid in medication documentation. Continual emphasis was placed on the importance of documenting “not for medical reason” when there were contraindications to prescribing the medications at discharge.

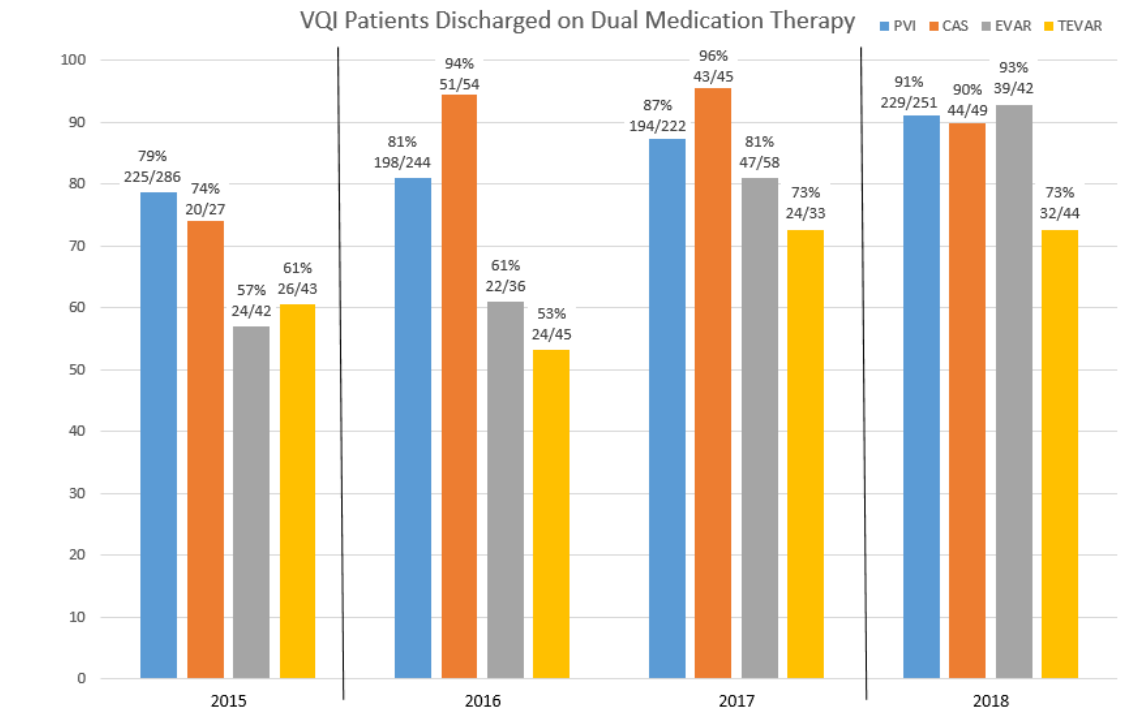
☐ The second strategy was to individually provide feedback to physicians of any VQI eligible patient not discharged with appropriate dual medications. Individual physicians were notified by email monthly to bring awareness to misses. The physicians then had the opportunity to review whether a “true miss” occurred, a contraindication needed to be documented, or if there was an oversight in the initial data abstraction of the case.

The improvement efforts occurred during the monthly process improvement meetings. All sub-specialties that perform VQI eligible procedures were included in the monthly meetings. Representatives from pharmacy, information systems, anesthesiology, and physical therapy were invited on an ad hoc basis.

RESULTS: As shown in table 1, IUH initiated efforts to make improvements in medication compliance in 2016. The following two years reflected positive outcomes. Once the additional VQI modules of interest were added in 2018, the proposed VQI quality improvement charter helped IUH either achieve the goal set and/or make consistent improvements. IUH Data Coordinators have observed positive trends continuing for year to date performance in 2019.

CONCLUSIONS: The participation in the quality charter and the continual focus placed on the VQI discharge medications has assisted IUH Methodist on a path of improvement. Through the efforts and the support of all sub-specialty physicians and multiple stakeholders IUH was able to send a total of 122 more patients home on dual medication therapy over the course of three years across all VQI modules IUH participates. The consistent usage of the new standardized order sets and appropriate verbiage utilized in physician documentation will further efforts in improving discharge medication compliance and improve quality of care.

Table 1. VQI Patients Discharged on Dual Medication Therapy



7. Inova Fairfax Medical Campus (Falls Church, VA)

Is Transcarotid artery revascularization (TCAR) best under local (LA) or general anesthesia (GA)? Results from the SVS-VQI TCAR Surveillance Project

Authors: Dipankar Mukherjee, MD, FACS, Devon T. Collins, MPH, CPH, CHES, Erica Emery, MSc, Chang Liu, PhD, MD, Jeffery Jim, MD, MSPH

PROBLEM STATEMENT: The current literature has reported conflicting claims of superiority with carotid endarterectomy (CEA) done under LA versus GA. (TCAR) is a similar and newer approach to treat the same patient population but may have better patient outcomes than CEA for patients that are considered higher-risk. At the present time, a consensus opinion in the field on best practices has not yet been reached.

GOALS: The objective of this project was to examine if there was a difference in patient outcomes between TCAR done under LA compared to GA utilizing a large national database. The findings of this analysis could help improve patient care and help guide best practices in the field.

IMPROVEMENT STRATEGIES: TCAR has shown comparable results to CEA in previous trials. A database analysis was conducted to measure the outcomes of 2,609 patients who underwent TCAR with LA or GA from the SVS-VQI TCAR Surveillance Project between the years 2016 and 2018. The primary endpoint was a composite outcome consisted of the following measures; transient ischemic attack (TIA), stroke, myocardial infarction (MI), and/or death. Secondary outcomes include flow reversal time, radiation dose, contrast, total procedure time, and length of stay. A Fisher's exact test was used to compare the unadjusted outcomes and multivariate logistic and linear regression models were applied to adjust for possible confounding variables.

RESULTS: 2,146 (82.3%) patients underwent TCAR with GA and 463 (17.7%) with LA. No significant differences in demographics or patient comorbidities were noted. The LA group had higher proportions of congestive heart failure and semi-urgent interventions. Approximately 60% of all cases were for asymptomatic and approximately 40% for symptomatic disease. Primary composite outcome was reported in 3.2% of patients in the GA group versus 2.8% in the LA group ($p=0.808$). Postoperatively, the secondary composite outcome of TIA, stroke, and death occurred in 2.5% of GA versus 2.4% LA ($p=0.998$). No significant differences were seen for flow reversal time, in-hospital mortality, or postoperative complications (MI, cranial nerve deficit, hematoma, blood pressure changes, length of stay, or 30-day mortality) between GA vs. LA. Sub-group analyses by ASA class, known CAD (including MI <6 months prior to intervention), or symptomatic status showed no differences between groups (Table 1). Multivariate linear regression models demonstrated significantly less need for contrast with procedures done under GA ($\beta:3.14$; $p=0.039$).

CHALLENGES/LESSONS LEARNED: Excellent patient and clinical outcomes paired with low complication rates were observed in TCAR performed with both GA and LA. The current practice reflects that a majority of TCAR procedures are completed used GA, which could be a limitation of the present analysis because 82.3% of the entire sample analyzed consisted of those who underwent TCAR with GA. The present results further suggest that vascular surgeons should perform the TCAR procedure with the anesthetic technique they are the most comfortable with utilizing. Future analyses and prospective based studies should additionally be conducting in order to further assess and confirm practices.

SUCCESS FACTORS: A benefit of conducting analyses on a large dataset is having the sample size large enough to conduct statistical analyses at an inferential level versus basic descriptive analyses. Analyses of this size are vital to assessing and confirming practices in not only the vascular surgery field but is a great tool for all other fields, as data is generally adequate and readily available for a large amount of records allowing for a more accurate and representative evaluation.

8. Jobst Vascular Institute Promedica (Toledo, OH)

Lessons Learned Following the Pathways Claims Validation

Authors: Acino R, Mason J, Lurie F, Oriowo B

PROBLEM STATEMENT: The 2017 Claims Validation audit identified 12.2% of VQI cases submitted for payment had coding miss-match impacting the Diagnosis Related Group (DRG). Some cases entered in VQI as open Carotid Endarterectomy (CEA) were billed as percutaneous, internal carotid arteries were not included in CEA codes, vessels for bypass cases were inaccurate and standard endograft procedures did not match VQI data.

GOAL: Use the results of the 2017 audit to investigate the accuracy of coding and to develop an action plan and quality improvement project (QI) to reduce billing and coding errors.

IMPROVEMENT STRATEGIES: Vascular surgery staff provided an education session to over 40 HIM staff reviewing vascular anatomy and common procedures. Coding staff was assigned American Health Information Management Association (AHIMA) webinars pertaining to AAA, bypass, and femoral percutaneous transluminal coronary angioplasty (PTCA) and stent coding education. Documentation templates are being developed and implemented into the EMR to capture procedure variables to assist with correct coding and billing. 100% SMART review of Carotid Endarterectomy and AAA procedures is being conducted for all 2019 cases.

RESULTS: Charge codes pertaining 2017 cases were updated and rebilled resulting in \$17,661 rebilled at loss, \$12,131 rebilled at a gain, and \$23,151 to old to rebill. Discussions between Vascular and HIM identified opportunities to improve education amongst the Health Information Coding (HIM) coding staff and improve documentation by providers.

CHALLENGES/LESSONS LEARNED: The accuracy of VQI data was confirmed, and the miss-match of coding was due to the coding errors. HIM staff identified difficulty with vascular coding due to the complexity of anatomy, procedures and devices. With the recent transition to EPIC EMR, templates and smart tools were low priority for IT due to the backlog of requests and other priority projects.

SUCCESS FACTORS: Although the audit identified a relatively small financial impact, the importance of doing things correct resulted in a unique collaboration between HIM and vascular teams. The focus on education and development of tools to reduce errors and maximize reimbursement will result in a much greater impact in the future.

9. Jobst Vascular Institute Promedica (Toledo, OH)

VQI's role in re-establishing patient care following a transition to a new EMR

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

PROBLEM STATEMENT: Following conversion from paper-based charting and Athena scheduling to EPIC Electronic Medical Record (EMR), a trend emerged of decreased volume in our vascular laboratory and vascular practice. Upon further investigation, it was discovered that data containing patient recall lists did not transfer from Athena to EPIC, resulting in the loss of patient data for scheduling routine annual surveillance.

GOAL: Utilize data from VQI to perform a Quality Improvement (QI) project improving the rate of long-term follow up (greater than 24 months) after surgery. Key goals of the project were to use data records from procedures in 2013 through 2015 to review and identify patients lost to follow up resulting from EPIC implementation in 2016. Once patients were identified, outreach would take place to re-engage annual vascular care.

IMPROVEMENT STRATEGIES: Using the VQI database, downloads were completed and a retrospective review of patients was conducted. All in-person vascular encounters, regardless of date, were abstracted and added to patient follow-up records. Analysis was conducted and descriptive statistics were presented regarding outcomes of long-term follow up, with a focus on those lost after EPIC implementation in 2016. Patients identified without a vascular clinical visit in greater than 18 months were contacted to schedule a clinical office visit and any appropriate vascular laboratory testing.

RESULTS: A total of 550 ProMedica Jobst Vascular Institute patients were reviewed from Carotid Endarterectomy (CEA) and Endovascular AAA Repair (EVAR) procedures completed in 2013 – 2015. Patients now deceased were excluded from analysis, resulting in 358 CEA and 74 EVAR patients. For the CEA group, 220 patients were found to have either had no follow up following surgery (N=137) or had been lost to follow up following the transition to the EPIC EMR (n=83). Among the EVAR patients, 46 patients were identified with either no follow up (n=4) or lost to follow up after EPIC transition (N=42). Following identification of these patients, efforts were made by clinical office staff to outreach to the patient and re-engage them for an annual vascular exam and vascular surveillance testing. As a result, 28.2% (n=62) of the CEA patients were successfully contacted and seen in the vascular clinical office. One patient was identified as having re-stenosis and required angioplasty and stenting. Of the EVAR patients, 65.2% (N=30) have been successfully re-engaged and seen in the office with three patients identified as having new endoleaks, two of which required intervention.

CHALLENGES/LESSONS LEARNED: While progress has been made, the efforts still continue. Re-establishing patient contact has been challenging with many patients failing to respond to outreach efforts. Additional measures are underway to contact the patients' primary care provider to encourage the continuation of surveillance testing and vascular exams.

SUCCESS FACTORS: The ability to download data provided us the opportunity to identify patients and complete a QI project to re-engage patients into routine annual care. Commitment and efforts of the leadership of clinical staff including vascular surgeons, quality team members and clinical office staff were key to this project's success and ongoing efforts.

10. Keck Medical Center of USC (Los Angeles, CA)

The Use of Vascular Quality Initiative Strategies to Decrease Length of Stay After Elective Carotid Endarterectomy

Authors: Joyce Peralta, DNP, ACNP-BC, Fred Weaver MD, and Sung Wan Ham, MD

PROBLEM STATEMENT: Our facility observed rate of length of stay (LOS)>1 day following elective carotid endarterectomy (CEA) has consistently far exceeded our region and Vascular Quality Initiative (VQI) overall since 2011 and has been high as 56% compared to the region (25%) and VQI overall (25%). Our institution specific VQI Center Opportunity for Improvement (COPI) report identified a high rate of use of intravenous (IV) medications for hypertension following CEA as a significant risk factor associated with a LOS>1. The percentage of patients requiring intravenous medications for hypertension following CEA was 45.5% compared to our region at 19.3% and VQI overall at 25.6%. Furthermore, patients that require intravenous medications for hypertension require ICU utilization due to the unavailability of a step-down unit at our institution, further contributing to LOS>1 day.

GOALS: Our facility aimed to reduce LOS>1 day after elective CEA by decreasing use of intravenous antihypertensive medications and implementing other LOS improvement strategies.

IMPROVEMENT STRATEGIES: To address the high frequency of intravenous medications following CEA, we standardized the post CEA order set for all surgeons by liberalizing our goal post-operative systolic blood pressure (SBP) parameters from <140mmHg to <160mmHg before initiating IV antihypertensive infusion. Furthermore, our facility LOS improvement strategies included timely resumption of all oral blood pressure medications post-operative day 0 to minimize use of intravenous hypertension medication, and implementation of a four-hour recovery stay for all CEA patients in the post-anesthesia care unit unless meeting direct ICU admission criteria to optimize post-op blood pressure management. In addition, we implemented pre-operative hypertension medication assessment and early identification of mobility deficits in the pre-operative area. These strategies ensured accurate hypertensive medication reconciliation, identify patients who are on multiple oral hypertensive medication, whether doses were missed and not taken pre-operatively in order to minimize hypertension in the post-operative period. For patient's requiring overnight ICU stay for blood pressure control, a streamlined protocol to wean off IV antihypertensives and ICU nurse coordination to discharge directly from the ICU was implemented.

RESULTS: The percentage of patients with LOS >1 for elective CEA decreased from 56% in 2011 to 27% in 2018, which was comparable to the region (27%) and VQI overall (25%). The percentage of patients requiring intravenous medications for hypertension following CEA decreased from 45.5% to 33%. Although IV medication for hypertension was above regional and national VQI averages, median length of stay following elective CEA remained 1 day.

CHALLENGES/ LESSONS LEARNED: Our facility challenges included standardization of post-operative goal SBP from previously <140 to our current post-op SBP protocol <160 for all surgeons despite their individual preferences. The unavailability of a step-down unit with subsequent ICU utilization made it particularly challenging to have ICU nursing adopt direct discharge home from the ICU on POD 1. Resident engagement to perform accurate pre-operative oral hypertension medication reconciliation for a timely discharge is an ongoing challenge.

11. Lifespan (Providence, RI)

Automating Data Retrieval for the VQI Database

Authors: Louisa Jones, Valliammai Veerappan, Alice Roher, Paula Duffy, RN, Ellen Cerullo, RN, Thomas N. Carruthers, MD

PROBLEM STATEMENT: The lack of a single, automated workflow makes gathering data and reporting qualified cases an expensive, labor-intensive, and inefficient process.

Lifespan participates in the Vascular Quality Initiative (VQI) and other quality reporting registries that require manual data abstraction of hundreds of data elements from the Epic electronic health record. Information is entered in various ways by different users and peppered throughout the medical record. Numerous rules surround which location or source should be used first when abstracting data to report qualified cases. Reports on qualified cases are manually generated.

GOALS: Starting with the Peripheral Vascular Intervention (PVI) registry, develop interfaces and tools that use discreet fields, Smart Data Elements, the Abstraction Assistant, a potential Epic registry, and Epic Quality dashboards to:

- Reduce abstraction expense
- Improve reporting capabilities
- Create a standardized workflow across care team roles
- Prepare for external interface to quality registries

After successful implementation of the first model, build out Epic tools to support additional registries.

IMPROVEMENT STRATEGIES:

- Standardize workflow for defined roles
- Use technology to reduce unnecessary navigation through the chart
- Increase data stored in discreet data elements vs. free text
- Reduce ambiguity in the documentation
- Use electronic abstraction and reporting tools to manage the case load more effectively

RESULTS: A live pilot in two hospitals for Peripheral Vascular Intervention has resulted in:

- Active tracking and reporting of PVI cases to M2S. (Reporting is still manual)
- Elimination of the need for surgeons to abstract surgeries themselves into M2S
- Reduced reliance on external abstraction services

CHALLENGES/LESSONS LEARNED:

- New workflows need periodic reinforcement with surgeons after the initial implementation
- Education for residents on the correct completion of the new template
- Changes in downstream systems require ongoing maintenance
- Buy-in from key stakeholders improves adoption success (recommend focus groups)
- Standardization in data capture reveals variances in documentation practice
- Not all data can be captured discreetly. For example, histories are typically documented in an external EHR at the surgeon's office, so an external EHR must be referenced for History & Physical
- Lack of readiness for M2S to receive a full case transaction interface

SUCCESS FACTORS:

- IS Applications Support
- Experienced abstractors
- Committed, effective surgeon champion
- Senior leadership support

12. Massachusetts General Hospital (Boston, MA)

Quality Center Management of VQI Database

Authors: Verna J. Curfman, BS and Sunita D. Srivastava, MD

PROBLEM STATEMENT: Clinical registry database management and the use of registry data for quality improvement is challenging in this information filled age. In the history of Massachusetts General Hospital (MGH) Vascular Quality Initiative (VQI) data abstraction, there has not been a consistent data abstraction work flow process or method for collecting eligible cases using CPT codes. In 2018, with new leadership in Vascular Surgery, MGH began managing VQI data through the direction of the Codman Center for Clinical Effectiveness in Surgery, a center which manages many clinical registries and uses the data to drive quality improvement in surgery. How as a center do we maintain consistent data abstraction, guarantee that we are collecting all eligible cases, and drive quality improvement?

GOALS: We set out to create a work flow for case identification, data abstraction and surgeon queries. A more efficient work flow and utilization of the data will then provide timely, actionable data to support quality improvement projects.

IMPROVEMENT STRATEGIES: To create a work flow, our center moved case identification to surgeon billing codes (CPT Codes) being pulled once per quarter, compared to relying on administrative assistants adding patients to the database as they presented for procedures. Next, our model changed to a sole data abstractor, with primary responsibility being data management of the registry, with no other clinical or administrative duties. This includes data abstraction, management of audits and clinical trial participation. Another important role of the data manager is to alert surgeons to any favorable and unfavorable trends. After the initial data collection, surgeons were queried once per quarter about variables that required additional documentation. Surgeons are asked to respond to the query within one month. After query response, the data manager submits complete forms.

RESULTS: With the implementation of the new work flow collection rates for 2018 have greatly improved. Compared to the 60.23% of CPT-eligible cases collected in 2016 and the 49.18% of cases collected in 2017, 96.92% of cases were collected in 2018.

In addition to new case management, long-term follow-ups were better managed by collecting all eligible cases and identifying patients who had not been seen in the office within the follow-up window. Surgeons and their schedulers were alerted that patients had not been seen. This process is being developed with the assurance that care is being covered by an outside provider or in our facilities.

Several quality projects have been initiated, including an EPIC templated note project to decrease the number of surgeon queries and developing Tableau dashboards for Vascular Quality Champion to better utilize VQI data.

CHALLENGES/LESSONS LEARNED: While we have decreased the amount of time asked of surgeons by removing their direct entry of data into the registry, timely surgeon query response remains a challenge. We continue to work with Vascular Surgery leadership to encourage surgeon participation, as well as develop tools for the surgeons to add the variable details when doing their original charting instead of being queried in the months following. The process of developing an efficient workflow has shown the importance of the data manager role that is dedicated to the accurate and timely completion of VQI data. This role is critical to providing actionable data to drive improvement.

SUCCESS FACTORS: Our success is due to the dedication of vascular surgeons Dr. Sunita Srivastava, Quality Director and Dr. Matthew Eagleton, Chief of Vascular Surgery, to the Vascular Quality Initiative through investment of their time and prioritizing VQI quality. In addition, the expertise of the Codman Center in clinical registry data base management has been invaluable while bringing VQI under their care.

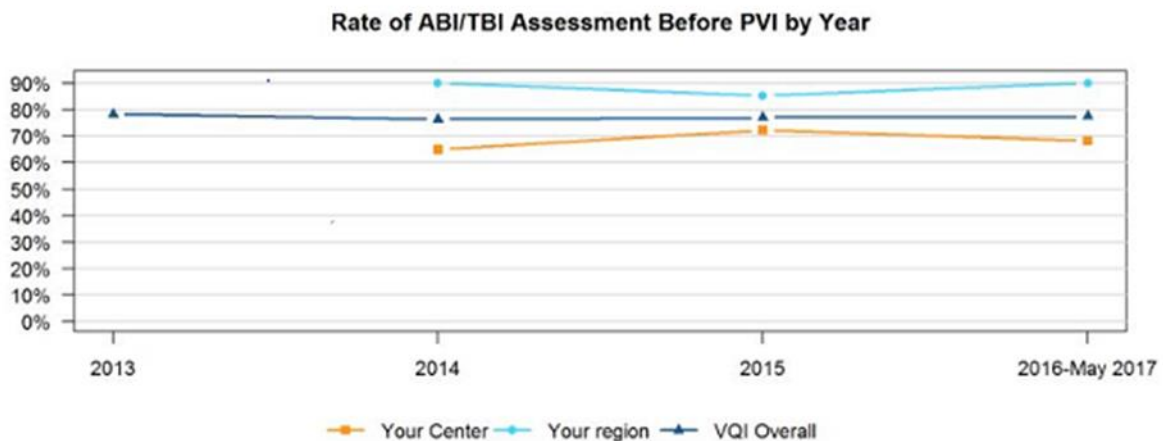
13. Ohio State University Hospital (Columbus, OH)

Increasing Compliance of Pre-procedure ABIs

Authors: Megan Pepin, RN- Program Manager, Michelle Farneman, Sr. Quality Manager, Shelby Hamilton, RN, BSN, Dr. Jean Starr, and Dr. Cindy Baker

PROBLEM STATEMENT: According to SVS/AHA/ACC guidelines, an Ankle Brachial Index should be conducted on patients presenting with risk factors for PAD so that therapeutic interventions known to diminish their increased risk of myocardial infarction (MI), stroke, and death may be offered. The acquisition of ABI studies prior to peripheral vascular interventions were below expected benchmarks for OSUMC services lines performing these interventions. The OSUWMC ABI rates have been lower than national SVS rates since 2014. The 2016-17 rate was 68% with the VQI regional rate comparison at 90% and VQI national rate at 78%.

	Your center	Your Region	VQI Overall
Number of PVI procedures with indication of claudication	135	1096	14336
Percentage with ABI/TBI recorded before procedure	68%	90%	78%



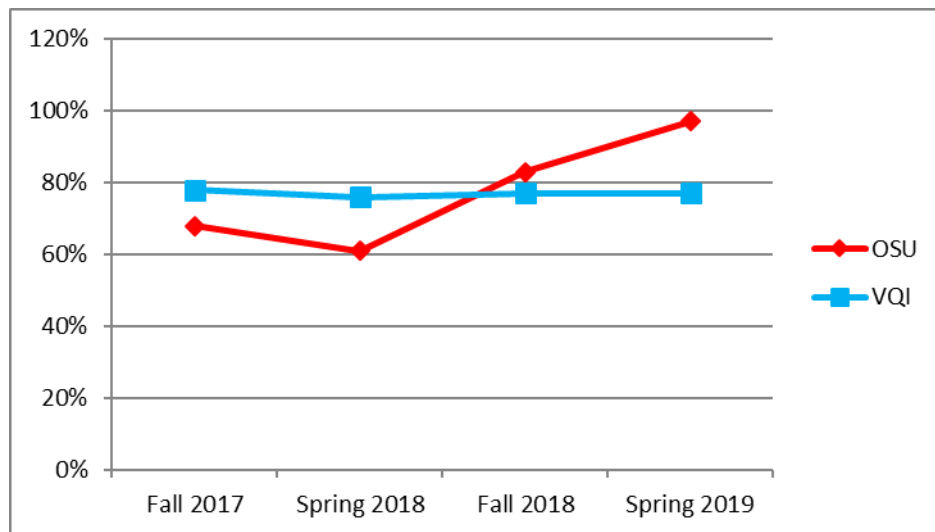
GOALS: OSUMC will improve rate of pre-procedural ABI testing to 78% by December 31, 2018.

IMPROVEMENT STRATEGIES: Using DMAIC methodology, a process improvement team with project leads and process owners was assembled. A retrospective analysis of 2016—17 cases that did not have a pre-procedure ABI was completed.

Improvement plan included:

1. Provide education to Interventional Cardiology and Vascular Surgery regarding importance of ABI studies and potential associated mortality/morbidity, review of current performance and establish target benchmarks.
2. Align clinical practices' pre-procedural testing guidelines within all disciplines.
3. Established monthly reporting process to providers with cases listed as ABI not measured.
4. Follow up phone calls to physician offices to obtain pre-procedure testing not found in the EMR.
5. Quarterly compliance reports distributed for 1 year and audit of PVI cases to evaluate effectiveness of education, identify challenges and need for potential changes.

RESULTS: Using our 2016-2017 VQI ABI rates as a baseline, there was an overall 29% improvement in acquisition of ABIs. The VQI Spring 2019 summary reported a 97% compliance rate, well above the national average. (See graph)



CHALLENGES/LESSONS LEARNED: There was a variation between Vascular Surgery and Interventional Cardiology criteria that dictated whether pre-procedure ABIs were completed within the appropriate timeframe. One service captured pre-procedure ABIs within the registry approved timeframe, whereas, the other did not always if the patient had previous abnormal ABIs and presented with worsening symptoms. Limitations on outside hospital transfer patients' records being scanned into the system. Finally, patients that were seen at offsite offices did not always have ABI testing available in the EHR. Office staff was educated on scanning/importing offsite records and physicians were asked to dictate results in their charting.

SUCCESS FACTORS: The success of this project is attributed to engaging the participating services and physicians, providing education and standardizing practices to ensure the guidelines were followed. A continual monthly report outlining current performance and opportunities for improvement ensured the team was kept up to date of the improvement observed as the project progressed. Also, a patient database was created to track those patients with pre-procedure ABIs captured as "not measured" so chart could be audited and testing requested if applicable; this is a database that will be used going forward to help maintain our results.

14. OSF St. Francis (Peoria, IL)

Effects of Body Mass Index on Fluoroscopy Time in Peripheral Vascular Interventions for Arterial Occlusive Disease Using Regional Vascular Quality Initiative Data

Authors: R. Nicholas Nolte, MD, Ravishankar Hasanadka, MD. OSF St. Francis Medical Center, Peoria, IL; Southern Illinois University, Springfield, IL

PROBLEM STATEMENT: The increasing frequency of peripheral vascular interventions (PVI) necessitates the identification of factors influencing radiation exposure and prolonged case length for vascular interventionalists and patients.

GOALS: We sought to evaluate how body mass index (BMI) impacts fluoroscopy time (FT) and dose area product (DAP) in PVI for arterial occlusive disease.

IMPROVEMENT STRATEGIES: The PVI registry of the Mid-America Vascular Study Group of the Society for Vascular Surgery Vascular Quality Initiative (VQI) from 2012-2018 included 9,638 patients. Procedures were excluded that involved more than one vessel treated, that had indications other than occlusive disease, and that had missing relevant data points, leaving 1,436 patients for analysis. Univariate and multivariate linear regression analyses were performed to assess the effect of patient and procedural variables on FT and DAP.

Table 1. Summary of Multiple Linear Regression Model: Effects of Covariates on Fluoroscopy Times.

	Estimate	Std. Error	t-value (p-value)	Confidence Interval (95%)
Intercept	4.327	0.177	24.406(0.000)***	3.979 / 4.674
Covariates				
Age	0.006	0.003	2.290(0.022)*	0.001 / 0.011
Race (White)	-0.165	0.071	-2.313(0.021)*	-0.306 / -0.025
BMI	0.019	0.007	2.567(0.010)*	0.005 / 0.034
Smoking (Current/Former)	-0.171	0.079	-2.159(0.031)*	-0.326 / -0.016
CHF (Yes)	0.407	0.128	3.178(0.002)**	0.156 / 0.658
Diabetes (None)	-0.091	0.053	-1.710(0.087)	-0.195 / 0.013
Diabetes (No Meds)	0.083	0.089	0.933(0.351)	-0.092 / 0.258
Diabetes (Meds)	0.008	0.053	0.144(0.885)	-0.096 / 0.111
Aortoiliac Procedure Site	-0.684	0.071	-9.663(0.000)***	-0.823 / -0.545
Previously Treated Site (Yes)	-0.150	0.058	-2.608(0.009)**	-0.263 / -0.037
Calcification (Low)	-0.442	0.054	-8.121(0.000)***	-0.549 / -0.335
Access Type (Femoral)	0.038	0.148	0.253(0.800)	-0.253 / 0.329
TASC Classification (A/B)	-0.306	0.057	-5.342(0.000)***	-0.418 / -0.194
Number Access Sites (2)	0.620	0.098	6.338(0.000)***	0.428 / 0.812
Number Devices (2)	0.042	0.032	1.316(0.188)	-0.020 / 0.104
Number Devices (3)	0.186	0.020	9.181(0.000)***	0.146 / 0.226
Interaction Terms				
BMI * Access (Femoral)	0.055	0.024	2.269(0.023)*	0.007 / 0.102
BMI * TASC (Low)	-0.028	0.009	-2.976(0.003)**	-0.046 / -0.009

RESULTS: BMI did not significantly affect FT in univariate analysis ($p=0.56$). Multivariate analysis identified higher FT with increasing age ($p<0.02$), non-white identification ($p=0.02$), no smoking history ($p=0.03$), history of congestive heart failure

(CHF) ($p=0.002$), with more than one access site ($p<0.001$), and with increased number of implanted devices ($p<0.001$). FT was significantly lower in treatment of aortoiliac disease ($p<0.001$), TASC A or B lesions ($p<0.001$), less calcified lesions ($p<0.001$), and in previously treated arterial segments ($p=0.009$). In subgroup analysis of patients with TASC C or D lesions, FT was significantly higher with increasing BMI ($p=0.003$). Additionally, higher FT was noted with femoral access versus alternative access with increasing BMI ($p=0.02$).

CHALLENGES/LESSONS LEARNED: Unfortunately, assessment of the DAP data was found to have multiple inconsistencies in the regional data set thought to be due to variable units of measurement which prevented meaningful use of the data.

CONCLUSIONS/SUCCESS FACTORS: Prevention of excess exposure to radiation is paramount for vascular interventionalist and patients in the performance of PVI. Increasing BMI significantly increases FT when treating TASC C/D lesions or in those with femoral access. This study highlights an opportunity for a quality improvement project within the regional VQI to refine DAP data entry for future analysis.

15. Stanford Health Care Heart and Vascular Center (Stanford, CA)

Adherence to EVAR LTFU Imaging Practice Recommendations Results in Significant Improvement in LTFU National Quality Indicator

Author: Rouchelyn Fallorina

PROBLEM STATEMENT. Our follow-up rate for Vascular Quality Initiative (VQI) patients undergoing endovascular aortic repair (EVAR) was 56% in 2012, necessitating improvement in patient communication and follow-up care.

GOALS/ OBJECTIVES. A goal of the VQI is to provide quality long-term care for patients following vascular procedures. Follow-up is essential to improve outcomes and reduce risk of AAA-related deaths in the years following EVAR.

IMPROVEMENT STRATEGY. At the 9 to 21-month period following surgery, we examined and modified our standard workflow within our clinic to obtain necessary follow-up information and confirmed completion of follow-up imaging. Our team utilized the VQI database and collaborated closely with the quality analyst at our institution to monitor patient compliance and prevent loss to follow-up. Re-assigning staff and prioritizing the VQI activities were critical in improving follow-up. For the three targeted areas, we set forth the following approach: (1) to bridge the gap in communication, we sent reminder letters to patients; (2) for patients receiving care in their local areas we extended a call to the patient's local PCP, cardiologist, and/or vascular surgeon to ensure follow-up care; and (3) if the patient's insurance did not cover future visits, we informed the patient and took necessary steps to assist the patient in receiving care with their local PCP.

RESULTS. We improved our follow-up rate to 93% in 2016.

CHALLENGES/LESSONS LEARNED. Gathering information for follow-up was difficult and the three areas of challenges identified were: (1) inability and difficulty in contacting patients including those unwilling to return to clinic for follow-up; (2) patients unable to return for follow-up due to transportation issues; and (3) health insurance restrictions that did not allow follow-up at our institution and re-directing them elsewhere.

CONCLUSIONS/SUCCESS FACTORS. Proper coordination, effective implementation of standard work, and re-assigning a designated staff to continuously monitor the database proved to be the key elements in achieving a higher EVAR follow-up percentage. 16. Toronto General Hospital (Toronto, ON, CA)

16. Preoperative Anemia has Gender Based Differences in Immediate Postoperative Mortality

Authors: Raju Sneha, Eisenberg Naomi, Montbriand Janice, Roche-Nagle Graham

GOALS/OBJECTIVES: The objective of the present study was to assess hemoglobin thresholds to prevent short-term mortality, adverse cardiac events, and immediate post-operative complications.

PROCESS: Data was extracted from the Vascular Quality Initiatives Database (VQI) at our institution from January 2010 to December 2017. After testing for differences in key baseline demographics, logistic regression analyses were running with hemoglobin and necessary covariates predicting outcomes. Anemia was defined as <135 g/L (<13.5 g/dL) in men, and <120 g/L (< 12.0 g/dL) in women. Predictive probabilities were saved from these models to create ROC curves. When appropriate, cut-offs were created for the ROC curves using Youden's index.

RESULTS: There were 1682 patients, with 1274 (76%) males and 408 (24%) females. There were 249 carotid endarterectomies, 498 EVARs, 308 infrainguinal repairs, 213 open AAA repairs, 233 suprainguinal repairs, and 181 TEVARs. 38% (n=639) of the study population was anemic (Hb<135 in M, 120 in F). The average preoperative hemoglobin was 133 g/L. Preoperative hemoglobin was associated with in-hospital mortality (F p < 0.0001; M p < .0001), adverse cardiac events (M p < 0.0001; F p < .02) and post-operative complications (M p < 0.001; F p = 0.008). COPD played an important role in predicting in-hospital mortality (F p = 0.008; M p = .01), with a higher expected mortality in those with COPD. Predicted hemoglobin cutoffs were 130 g/L with COPD and 116 g/L without COPD in females and 127 g/L with COPD and 148g/L without COPD in males.

CONCLUSIONS, CHALLENGES, LESSONS LEARNED: Preoperative anemia is a powerful predictor of immediate mortality, adverse cardiac events and postoperative complications. There are important gender differences in risk of adverse events and preoperative anemia should be aggressively treated in vascular surgery patients.

17. Toronto General Hospital (Toronto, ON, CA)

Leveraging Vascular Quality Initiative Data to Improve Hospital Length of Stay for EVAR Patients

Authors: Naomi Eisenberg, PT, MEd, CCRP; Graham Roche-Nagle, MD, MBA, MMed, FRCSI, EBSQ-VASC; Thomas F. Lindsay, MDCM, MSc, FRCSC; George Oreopoulos, MD, MSc, FRCSC

BACKGROUND: The Vascular Quality Initiative (VQI) is a quality database providing insights into standards of care and highlighting opportunities for quality improvement by benchmarking institutional data against local, regional and national trends. Endovascular aneurysm repair (EVAR) is a frequently performed vascular operation. Postoperative length of stay (LOS) varies between institutions. We reviewed morbidity, mortality, and the financial impact of increased LOS of EVAR patients at our institution. In addition, we sought to identify modifiable factors associated with prolonged hospital LOS.

METHODS: We identified all patients under-going elective EVAR between January 1, 2011, and December 31st, 2014. Preoperative patient characteristics, intraoperative details, postoperative factors, long-term (1-year) outcomes, and cost data were reviewed. Univariate analysis was used to determine statistical differences between patients with LOS ≤ 2 days and > 2 days. Interventions were implemented to modify factors identified as having a negative impact on EVAR LOS.

RESULTS: Identified factors negatively impacting on EVAR LOS included social, neurological, cardiovascular and renal issues. Following interventions, LOS after EVAR decreased from an average of 3.8 to 3 days ($p < 0.05$). Logistic regression identified cardiovascular issues as the most significant predictor of LOS greater than 2 days. Patient expectations and social issues need to be managed effectively. Reducing LOS was associated with the additional benefit of 6.6 percent cost savings (adjusted).

CONCLUSIONS: Leveraging VQI data reduced hospital LOS after EVAR by identifying modifiable factors and instituting focused interventions. Hospital LOS was reduced and this was associated with a cost saving to the hospital.

Table 1:

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

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

18. Toronto General Hospital (Toronto, ON, CA)

Endovascular Repair of Abdominal Aortic Aneurysm (EVAR) in Octogenarians: Report on Clinical Outcomes and Complications

Authors: Sneha Raju MD, Naomi Eisenberg MEd PT, Janice Montbriand PhD, Graham Roche-Nagle MD

GOALS/OBJECTIVES: To investigate outcomes and predictors of EVAR complications in octogenarians.

METHODS: A retrospective chart review of consecutive patients ≥ 80 years of age who received an EVAR between August 2010 to January 2017 was conducted. After appropriate univariate comparisons, logistic regression was completed to determine predictors of complications, and Kaplan Meir was used to explore survival times.

RESULTS: One hundred and fifty-four octogenarians underwent an EVAR during this period for an infrarenal aneurysm with an average size of 63.77 mm (SD= 12.73). The average age was 84.1 and the majority were males (81%). Eighteen patients presented as ruptured AAA. Ninety-five (62%) patients sustained either an intraoperative or a postoperative complication. Intraoperative endoleak was documented in 64 (42%) cases with Type II lumbar being the most common (n=38). On follow-up, there were 12 retreatments for these. Postoperative complications accounted for the remaining complications (n=43), with myocardial ischemia (n=24) and dysrhythmias (n=10) being the highest contributors. Diabetes (B = 1.45, OR = 4.27, 95% C.I. = 1.09- 16.74, p = 0.037) was found to be multivariate predictor of complications. Most patients (88%) continued follow-up to an average of 20 months (range 0-72.5 months). An average patient attended three follow-up visits with CT or ultrasound imaging. Overall mortality was 13% (n=21), with 43% (n=9) occurring during index admission. Of those that died during index admission, all 9 were ruptured AAA ($\chi^2=37.3$, p = 0.0005). Patients who sustained a postoperative complication were found have significantly lower survival times (Figure 2; KM Log rank $\chi^2= 6.55$, p = 0.011). The average survival time post-EVAR was 58 months.

CONCLUSION: EVAR in octogenarians is a suitable form of therapy with acceptable short and long-term results in the elective setting. Diabetes was a predictor of complications in this population.

19. University of Alabama at Birmingham (Birmingham, AL)

Implementation of an Enhanced Recovery Program (ERP) for Lower Extremity Bypass

Authors: Novak Z, Laygo-Prickett M, Spangler E, Axley J, McFarland G, Beck AW

PROBLEM STATEMENT: We identified the lower extremity bypass (LEB) patient population as a group with a large amount to variation in care and at high risk for complications such as wound infection and readmission. We sought to implement an enhanced recovery program (ERP) utilizing existing institutional quality programs. Our ERP program for LEB is a clinical pathway consisting of 20 elements, collectively considered best practices across the continuum of care from before admission to surgical follow-up.

GOALS: Develop and implement leading practice guidelines for LEB patients, identify all patients scheduled for elective and urgent revascularization for claudication or chronic limb threatening ischemia. Project goals include a reduction of the observed to expected LOS index; reduction in percentage of 30-day all cause readmission; percentage of eligible patients undergoing the ERAS LEB pathway at least 80%; a reduction in SSIs rate and reduction of variable cost per case.

IMPROVEMENT STRATEGIES: The vascular surgery division sought to standardize care for all eligible elective and non-elective lower extremity bypass cases. ERP implemented elements include: Comprehensive patient education, best practice anesthetic & surgical pathways, techniques to prevent postoperative complications, perioperative regional anesthesia and systemic pain control, pre-& postoperative nutritional care, early mobilization.

Process metrics were measured utilizing a manual process audit and monthly Vizient quality data via Tableau, an analytics platform utilized at UAB. A manual method of auditing in real time was created to help ensure early compliance with the pathway and quick communication of opportunities to the team so they could be adjusted accordingly for each patient. Some of the process metrics audited and measured were proper scheduling of the surgery as ERP, completion of patient education, diabetes optimization processes, multimodal pain control, regional block, tobacco cessation processes, early diet and early mobility.

RESULTS: As a result, we experienced an improvement in observed to expected length of stay (LOS) in the fiscal year, 30-day all cause readmission, surgical site infections (SSI) and average variable cost per case. 60 patients have undergone through the ERP LEB pathway in the 10 months' post implementation.

20. University of California San Diego (San Diego, CA)

Outcomes following Eversion vs. Conventional Endarterectomy in the Vascular Quality Initiative Database

Authors: Hanaa Dakour Aridi, MD; Michael Ou, BS; Satinderjit Locham, MD; Ali AbuRahma, MD; Joseph R Schneider, MD, PhD; Mahmoud Malas, MD, MHS

BACKGROUND: While the majority of vascular surgeons perform conventional CEA (c-CEA), others prefer eversion CEA (e-CEA). Despite several RCT and single-center studies, the advantage of one technique over the other is still not clearly defined.

OBJECTIVES: Given the discordance and change in the findings of major studies across the years, this study will provide an update on the national trends in the use and outcomes of e-CEA in real-world practice by comparing the postoperative outcomes and durability of the e-CEA and c-CEA in a nationally representative sample of patients.

METHODS: A retrospective review of the VQI database between 2003 and 2018 was performed. Patients with prior ipsilateral carotid intervention and those undergoing concomitant procedures were excluded. Multivariable logistic and Cox-regression analyses were used to compare risk-adjusted peri-operative and 2-year outcomes (stroke, death, and high-grade restenosis (>70%)) between c-CEA (using direct closure and patch angioplasty) and e-CEA.

RESULTS: A total of 95,726 CEA cases were included, of which 12,050 (12.6%) were e-CEA. Patch angioplasty was used in 94.9% of c-CEA compared with 49.7% of e-CEA ($P<0.001$). There was a significant variation in the percentage of e-CEA performed by participating centers and surgeons in the VQI database across the time period and among different regions. On univariable analysis, no difference in perioperative outcomes was noted between the two approaches except for higher rates of in-hospital dysrhythmia (1.5% vs. 1.3%), post-procedural hemodynamic instability (27.3% vs. 24.3%) and cranial nerve injury (3.2% vs. 2.2%) after c-CEA compared with e-CEA (All $p<0.05$). On the other hand, e-CEA patients were more likely to return to the OR for bleeding (1.3% vs. c-CEA: 0.9%, $p<0.001$) (Table 1). The outcomes of e-CEA didn't differ if a patch was used or not. After adjusting for potential confounders and stratifying with respect to patch use, there was no difference in terms of in-hospital bleeding, 30-day stroke/death and restenosis and stroke/death at 2-years between e-CEA and c-CEA when a patch is used. However, when no patching was performed, e-CEA was associated with lower stroke/death at 30-days (OR: 0.72, 95%CI: 0.54-0.95) and at 2-years (HR: 0.77, 95%CI: 0.61-0.97) (Table 2). Sensitivity analysis of the gold-standard approaches (e-CEA without patching vs. c-CEA with patching) showed similar stroke/death and restenosis rates between e-CEA (without patch) and c-CEA (with patch angioplasty). However, e-CEA was associated with 42% higher odds of returning to the OR for bleeding compared to c-CEA (Table 2).

CONCLUSION: This study shows significant variability in the technique of e-CEA across the US. Both e-CEA and c-CEA are safe and durable techniques with similar stroke/death and restenosis rates up to 2-years of follow up, as long as c-CEA is performed with patch angioplasty. However, e-CEA is superior to c-CEA without patch angioplasty and is associated with 28% and 23% reduction in the odds of 30-day and 2-year stroke/death, respectively. The VQI affords access to detailed patient specific data and affords the unique opportunity to execute a valid and representative evaluation of perioperative and long-term outcomes.

Table 1- Comparison of Hospital and 30-Day Outcomes after c-CEA and e-CEA

	Conventional CEA	Eversion CEA	P Value
In-Hospital Outcomes			
Death	232 (0.3)	31 (0.3)	0.70
Ipsilateral Cortical Stroke	629 (0.8)	84 (0.7)	0.52
Stroke	826 (1.2)	124 (1.2)	0.90
Stroke/Death	987 (1.2)	145 (1.2)	0.82
Stroke/Death/MI	1,556 (1.9)	221 (1.8)	0.85
Myocardial Infarction	664 (0.8)	82 (0.7)	0.19
Dysrhythmia	1,290 (1.5)	150 (1.3)	0.01
Post-procedural Hemodynamic Instability	22,777 (27.3)	2,922 (24.3)	<0.001
Surgical Site Infection	42 (0.1)	7 (0.1)	0.72
Reperfusion Syndrome	127 (0.2)	26 (0.2)	0.10
Cranial Nerve Injury	2,682 (3.2)	265 (2.2)	<0.001
Immediate Re-exploration (For defect detected after closure during same operation)	1,336 (1.6)	222 (1.8)	0.05
Return OR for Bleeding	763 (0.9)	157 (1.3)	<0.001
Return OR for Neurologic Causes	341 (0.4)	60 (0.5)	0.15
Operative time in minutes, Mean (SD)	116.0 (43.5)	109.3 (46.0)	<0.001
Thirty-Day Outcomes			
Ipsilateral Stroke	713 (1.4)	89 (1.2)	0.06
Stroke	950 (1.9)	138 (1.8)	0.51
Death	550 (0.7)	76 (0.6)	0.74
Stroke/Death	1,393 (1.7)	198 (1.6)	0.87
Repeat Revascularization	1,568 (3.1)	274 (3.5)	0.06

Table 2. Outcomes in e-CEA vs. c-CEA Stratified with respect to Patch Use

	Multivariable Logistic Regression		
	Overall Cohort		
	c-CEA N=83,726 <i>OR/HR (95%CI)</i>	e-CEA N=12,050 <i>OR/HR (95%CI)</i>	p-value
Return to OR for bleeding	<i>Ref.</i>	1.32 (1.04-1.67)	0.02
30-day Stroke/Death	<i>Ref.</i>	0.87 (0.73-1.04)	0.12
2-Year Stroke/Death	<i>Ref.</i>	0.94 (0.82-1.10)	0.50
2-Year Restenosis	<i>Ref.</i>	0.92 (0.76-1.11)	0.36
	Without Patching		
	c-CEA N=4,288 <i>OR/HR (95%CI)</i>	e-CEA N=6,055 <i>OR/HR (95%CI)</i>	p-value
Return to OR for bleeding	<i>Ref.</i>	1.43 (0.89-2.29)	0.14
30-day Stroke/Death	<i>Ref.</i>	0.72 (0.54-0.95)	0.02
2-Year Stroke/Death	<i>Ref.</i>	0.77 (0.61-0.97)	0.03
2-Year Restenosis	<i>Ref.</i>	0.94 (0.70-1.27)	0.70
	With Patching		
	c-CEA N=79,351 <i>OR/HR (95%CI)</i>	e-CEA N=5,992 <i>OR/HR (95%CI)</i>	p-value
Return to OR for bleeding	<i>Ref.</i>	1.30 (0.98-1.73)	0.07
30-day Stroke/Death	<i>Ref.</i>	0.94 (0.76-1.16)	0.58
2-Year Stroke/Death	<i>Ref.</i>	1.05 (0.87-1.25)	0.63
2-Year Restenosis	<i>Ref.</i>	0.93 (0.73-1.19)	0.56
	c-CEA with Patching e-CEA without Patching		
	N=79,351 <i>OR/HR (95%CI)</i>	N=6,055 <i>OR/HR (95%CI)</i>	p-value
Return to OR for bleeding	<i>Ref.</i>	1.42 (1.06-1.91)	0.02
30-day Stroke/Death	<i>Ref.</i>	1.27 (0.99-1.64)	0.06
2-Year Stroke/Death	<i>Ref.</i>	0.98 (0.82-1.18)	0.85
2-Year Restenosis	<i>Ref.</i>	1.14 (0.94-1.39)	0.19

21. University of Kentucky (Lexington, KY)

Occurrence of Postoperative Complications Doubles 1-Year Mortality After Open and Endovascular AAA Repair

Authors: Badia D, Xenos ES, Davenport DL, Endean ED

PROBLEM STATEMENT: We hypothesize that the occurrence of a perioperative complication will have an adverse effect on one-year survival in patients undergoing abdominal aortic aneurysm (AAA) repair.

METHODS: A retrospective review was performed of prospectively collected Vascular Quality Initiative (VQI) data for patients undergoing endovascular (EVAR) and open AAA repair from 2012 to 2016. Primary outcomes were in-hospital complications, 30-day mortality, and 1-year mortality. Multivariable logistic regression was performed to assess the impact of complications on 1-year mortality with adjustment for patient and operative risk factors. The results from the regression analysis were verified with a case-matched analysis of patients with and without complications.

RESULTS: A total of 32,501 aneurysm repairs were done: 26,166 EVAR (80.5%); 6,335 Open (19.5%). After adjustment for multiple pre- and perioperative variables, patients who had a postoperative complication and were 30-day survivors had a significant risk for death at one year (OR 2.2, 95% CI 1.9-2.6, $p < 0.001$ for EVAR; OR 2.0, 95% CI 1.5-2.7, $p < 0.001$ for Open). The case-matched analysis yielded similar results for 1-year mortality (OR 2.3, 95% CI 2.0-2.8, $p < 0.001$ for EVAR; OR 2.1, 95% CI 1.5-3.0, $p < 0.001$ for Open). After adjustment, each complication predicted increased 30-day and 1-year mortality.

CONCLUSION: Respiratory complications had the greatest impact on 30-day mortality, while stroke had the greatest impact on 1-year mortality. This study demonstrates that a postoperative complication was associated not only with increased 30-day mortality but also a two-fold increase risk of death at one year in patients who had an AAA repair.

IMPROVEMENT STRATEGIES: Due to the preponderance of evidence showing the correlation between respiratory complications and 30-day mortality, The University of Kentucky Chandler Hospital has implemented aggressive strategies for reducing post-operative respiratory complications. Such strategies include: aggressive pulmonary toilet, immediate mobilization and physical therapy evaluation, and a reduction of intravenous fluid administration. Future analysis will focus on post-EVAR complication reduction.

22. University of Pittsburgh Medical Center (Pittsburgh, PA)

UPMC VQI Operative Note Template Project

Authors: Jason K. Wagner MD, Mohammad H. Eslami MD, Fern Schwartz, Ali Arak BS, Michael J. Singh MD, Michel Makaroun MD

PROBLEM STATEMENT: Through an internal assessment of data entry workflow, it was determined that capturing procedural data at the same time of operative note completion was considered a burden on the provider because of the need to use the VQI webform as well as a dictation system and the Electronic Medical Record (EMR). As result of the time required to enter data, surgeons were deferring data entry until a later time, often in their off hours. This led to the loss of valuable information on index cases performed by our surgeons. These physician work-related barriers to completion of data entry are compounded by the complexity of data required by VQI modules that are exceedingly hard to collect retrospectively.

GOAL: The goal of this project was to unify the process of operative note completion with the capture of procedural variables for VQI data entry through the creation of templated operative notes within the electronic medical record.

IMPROVEMENT STRATEGIES: Through the creation of procedure-specific operative note templates, providers will be able to utilize the electronic medical record to create and sign their operative note while simultaneously capturing procedural variables for entry into the webform by non-clinicians at any future point in time. Imbedding notes into the EMR allows for unified export of procedural variable and other patient/case specific values (hemoglobin/creatinine/medications) already captured within the medical record. This significantly reduces surgeon workload by streamlining the processes of operative dictation, and VQI data entry (in less time to complete than dictating an operative report). The notes are also structured to maximize compliance with regulatory and billing requirements.

RESULTS: Stakeholder meetings were held with providers in the division of vascular surgery, department of surgery, health system information services division, billing and coding compliance specialists, and the department of quality and patient safety, all resulting in unanimous support for this project. Currently, two operative note templates (carotid endarterectomy and IVC filter insertion) are available for use in all 40 UPMC hospitals. Additional notes are in the testing process, prior to their release into the EMR (carotid stenting, dialysis access).

CHALLENGES: Challenges to such a streamlined process include the complexity of developing data fields within the EMR documentation that can then be exported into multiple formats (spreadsheets and PDF) for easy entry into the VQI. Fortunately, this process becomes progressively faster as new notes can be built off of the data fields and template architecture of existing notes. A transition from highly-customized, text-heavy operative notes to versions that provide simpler descriptions of procedural steps and utilize form-style representation of certain variables (e.g. laterality and implant type) provide for much simpler note creation as well as updating as new devices become available.

SUCCESS FACTORS: Continued success will be determined by the increased utilization of such notes for the documentation of index procedures as well as an overall reduction in the time from index case completion until the time of submission to the VQI.

23. University of Rochester Medical Center (Rochester, NY)

VQI Regional Variations in the Use of Ultrasound-Guided Vascular Access

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PROBLEM STATEMENT: Access site complications are among the most common complications following peripheral vascular interventions. Previous studies have demonstrated a reduced rate of complications with ultrasound guided vascular access. Despite the evidence to support ultrasound guided vascular access, it is unknown how widespread the utilization of this modality has been.

GOAL: The objective of this project is to evaluate the regional variation of ultrasound guided vascular access within the Vascular Quality Initiative.

IMPROVEMENT STRATEGIES: Increased utilization of ultrasound guided vascular access has been shown to lead to reduced access site complications. Evaluating the heterogeneity of ultrasound use allows for more targeted educational and interventional approaches to increase the utilization of this modality. The Vascular Quality Initiative (VQI) peripheral intervention module between 2008-2016 was evaluated. Regional ID was used to compare distribution of ultrasound usage. Regions were grouped into thirds based on rate of ultrasound use.

RESULTS: Over 41,000 cases across the 18 VQI regions were evaluated. The average rate of ultrasound usage was 71% across the regions with a wide variation (range 38%-97%) (Figure 1). There is a significant difference between the top third (87 ±5%), middle third (79 ±1%) and bottom third (58 ±11%) ($p < 0.001$) in the rates of ultrasound utilization.

CHALLENGES: These data demonstrate that there is a wide variation in ultrasound usage across the VQI regions. These findings show that some regions use ultrasound guidance for the majority of their vascular access, others use it just more than one third of the time. Based on these results, there is room for improvement with the use of ultrasound guided vascular access throughout the VQI regions.

SUCCESS FACTORS: Successful implementation of standardized implementation of ultrasound guidance requires understanding of the regional variation in its utilization. Evaluation of outcomes comparison between the high utilization regions and low utilization regions will aid in discussion and education initiatives targeting these low utilization regions.

24. University of Utah (Salt Lake City, UT)

The Utilization of an Electronic Health Record Alert During Discharge Planning to Increase the Prescribing Rate of Antiplatelet and Statin Medications Among Vascular Surgery Patients

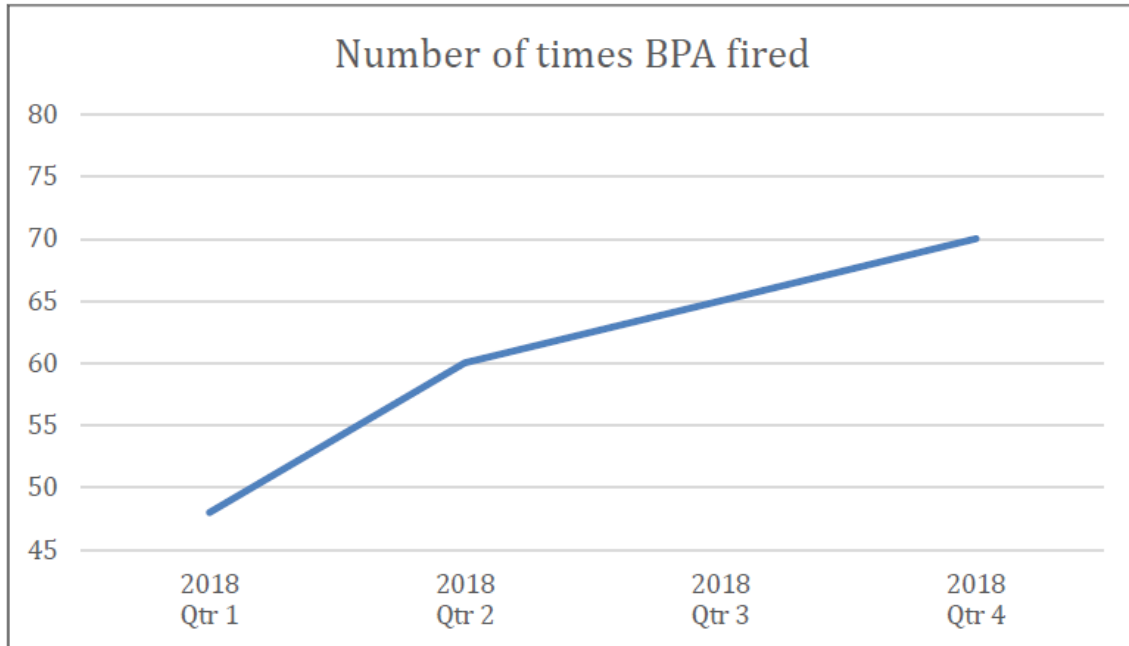
Authors: Julie Beckstrom, RN, MSN; Joanna Lynch, PA-C; Jake Groberg, Larry Kraiss, MD, Monica Hatch, PA-C; Benjamin S. Brooke, MD, PhD

PROBLEM STATEMENT: Compliance with antiplatelet and statin (AP + S) therapy has been associated with improved short and long-term survival following vascular surgery within multiple studies. Based on this evidence, the Society for Vascular Surgery Patient Safety Organization (SVS-PSO) recommends that all patients undergoing major vascular surgery are prescribed AP + S medications at time of hospital discharge unless there are contraindications. However, the individuals tasked with discharging vascular surgery patients are often surgical trainees (e.g. interns, residents, and fellows) or Advanced Practice Clinicians (APCs; e.g. nurse practitioners and physician assistants) who may not be aware of these SVS-PSO guidelines and would benefit from a reminder at the point of care during discharge planning.

GOAL: Develop an EPIC electronic health record (EHR) application to remind surgical trainees and non-physician providers within the University of Utah's Division of Vascular Surgery of AP + S medication-prescribing guidelines at the point of care.

IMPROVEMENT STRATEGIES: The University of Utah Division of Vascular Surgery developed and implemented a "Best Practice Advisory" (BPA) in November of 2017 - an application within the Epic EHR that presents users with an alerting pop-up window. The BPA reminds providers of AP + S SVS-PSO prescribing recommendations. The BPA was designed to fire in real time at the point of care while providers are completing patient electronic discharge orders, and only fires for patients without AP + S medications on their discharge medication list. All physicians and APCs that discharged patients following vascular surgery procedures received ongoing education regarding the BPA throughout 2018.

RESULTS: We analyzed all patients undergoing a vascular procedure at our institution during 2017-2018 that were captured within a VQI registry, including carotid endarterectomy, open abdominal aortic aneurysm repair, EVAR, peripheral vascular intervention, and lower extremity bypass surgeries. In total, discharging providers were alerted by the BPA for 243 unique patients. Average prescribing compliance prior to BPA implementation was 80%. One year after BPA implementation the average compliance rate increased to 94%. Concurrently there was a significant increase in the amount of times the BPA fired over this time period (see Figure). This suggested that providers were increasingly alerted of patients who might otherwise not have been prescribed AP + S medications at the time of discharge.



CHALLENGES: Initial design of the BPA didn't include all statin medications, therefore the BPA fired unnecessarily for some patients. The UU Pharmacy regularly incorporates new AP + S medications into their drug catalogue. Without ongoing surveillance of the drug catalogue and revisions to the BPA, it may fire unnecessarily.

SUCCESS FACTORS: Implementation of a BPA into the EHR provides an innovative approach to remind trainees and APCs at the point of care of AP + S prescribing guidelines.

25. West Virginia University (Morgantown, WV)

Smoking cessation treatment beginning during inpatient admission using the electronic health record

Authors: Authors: Samantha Minc, MD, MPH; Stacy Giardina BSN, RN; Megan Lauris; Marc Phillips, PharmD, CPHQ; Rebekah Matuga, PharmD, CPHQ; Luke Marone MD

PROBLEM STATEMENT: West Virginia (WV) has the highest prevalence of tobacco use (24.8%)¹ in the US and some of the highest rates of cardiovascular disease in the country. The WV University Health System provides care to a large portion of the state's population through multiple clinics and affiliated hospitals. Due to our presence across the state, a hospital driven intervention to decrease tobacco use could significantly decrease prevalence rates and improve vascular patient outcomes throughout the state. We propose using the electronic health record (EHR) to initiate Tobacco Quit Line (TQL) referral and nicotine replacement therapy (NRT) for our tobacco using inpatient population. This method has been described extensively by Bernstein et al.'s group at Yale, who found significant increases in TQL referrals, NRT initiation and communication with patient PCP's by using an EPIC-based program².

GOAL: The goal of our project was to decrease tobacco use by designing and implementing a process within our EHR to identify tobacco users and connect them with tobacco cessation resources, primarily the WV Quit Line.

IMPROVEMENT STRATEGIES: Our program relies on a Best Practice Alert (BPA) that alerts the provider that a patient is a tobacco user. The BPA suggests that the provider discuss tobacco cessation, and allows the provider to order a TQL referral, NRT and refer the patient to outpatient tobacco cessation services. Education was provided to individual service lines and included information on program workflow, tobacco cessation options and outpatient referral opportunities. The IT build was initially rolled out to services located within our Heart and Vascular Institute, then to academic medicine services and finally system-wide.

RESULTS: The program has been widely accepted and utilized by our providers. Since inception, 100% of all patients admitted to our health system have tobacco use assessed upon admission. The BPA has fired on 45.5% of all admissions, and we are currently seeing a 13.5% referral rate to the TQL throughout the system.

CHALLENGES/LESSONS LEARNED: We became aware that nurses were not required to record and/or update tobacco use in the patient's history upon admission. We held meetings with the nursing administration in order to make this a requirement and enforce it. In addition, the WV TQL requires a formal state-approved enrollment form be faxed to them upon referral. This has led to delays in patient enrollment because it's not realistic to require providers to print and fax separate forms when an electronic order has already been placed. We are currently working with our EPIC department and the TQL to streamline this process electronically.

SUCCESS FACTORS: Administrative support was instrumental in getting this project off the ground. The WV Hospital Association Honor's Program highlighted increased access to tobacco cessation as a requirement for Honor Roll designation in 2018. This provided administrative motivation to support the project. Identification of a physician champion was critical at the early stages in order to vet the program and engage physicians as the project

progressed. Our physician champion helped us decide which services to pilot the program in and to develop education for providers.

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NOTES



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