



2022 VQI Annual Meeting Quality Improvement Abstracts

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1. Iliac Limb re-interventions following Endovascular Aortic Repair (pre-approved 2022)

Authors: *Elena Saremi, Naomi Eisenberg, Graham Roche-Nagle*

Boston Medical Center, Boston University School of Medicine, Boston, MA
Supported by a Vascular Study Group of New England Quality Improvement Award

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 1b 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 1b 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.

2. Variations in vascular surgery practice for abdominal aortic aneurysm repair between Canada and the United States (pre-approved 2022)

Authors: *Li B, Rizkallah P, Eisenberg N, Forbes TL, Roche-Nagle G.*

Objective:

The therapeutic decision about whether to repair an abdominal aortic aneurysm (AAA) or to choose a conservative management requires multiple considerations of a balance of risk. The same decision process applies in the choice of the procedure. The objective of this study was to compare diameters of intact aneurysms (non-ruptured and asymptomatic) at the time of repair between Canada and United States (USA). We were also searching for differences in the technique used to repair elective AAA between the two countries.

Methods:

The Vascular Quality Initiative (VQI) database was used to identify all patients undergoing open abdominal aortic aneurysm repair or endovascular aneurysm repair (EVAR) from January 2003 to December 2019 in 544 centers in Canada and the USA. Only elective AAA repairs were studied. We compared practice differences between USA and Canada relative to the aneurysm diameters at the time of repair, the procedure (EVAR vs open aortic repair) and demographic characteristics of patients receiving the appropriate surgical management. According to the type of variable, X2 and t-test analysis were used to assess for differences between the two countries.

Results:

We identified 52 395 patients who had an elective AAA repair in Canada (n = 1446) and the USA (n = 50 949). The mean size of the AAA at the time of repair was slightly smaller in the USA compared to Canada (Canada: 59 mm vs USA: 56 mm; $p < .001$). Of these patients, 46% had an aneurysm < 55 mm in the USA compared to 20% in Canada ($p < .001$). A higher proportion of patients had an open abdominal aortic aneurysm repair in Canada for an intact aneurysm (Canada: 31% vs USA: 15%) compared to an EVAR (Canada: 69% vs USA: 85%; $p < .001$). Overall, patient demographic characteristics and risk factors for AAA were similar in both countries.

Conclusions:

In conclusion, variations were observed between Canada and USA centers in the proportion of asymptomatic AAA < 55 mm that were repaired electively in circumstances where best practice guidelines exist. We also found differences in the surgical technique used for these cases. Further studies are warranted to assess the underlying reasons for the regional variations and the clinical impact that it may have.

3. The Ohio State University, Wexner Medical Center, Ross Heart Hospital - Improving patient outcomes for TEVAR & TAA through use of a Multi-Disciplinary Clinical Practice Guideline and Education

Sheila Chucta, APRN-CNS; Kristine Orion, MD; Timur Sarac, MD; Jovan Bozinovski, MD, Erica Stein, MD, Lisa Post, BSN, RN

Problem Statement:

Patients undergoing TEVAR and TAA procedures involve disruption in the normal flow of blood supply to the spinal cord. Care management standards were in place but after 2 episodes of paralysis related to inconsistent assessment, monitoring and documentation of patients post-operatively from thoracoabdominal aneurysms review of system processes revealed a gap in the management of these patients. It was found that improvement would require coordination of the entire care management team.

Goal:

Development of Multidisciplinary Clinical Practice Guideline to assure consistent care management of lumbar drains in the TEVAR and TAA patient population to maximize neuro/vascular post-operative outcomes.

Improvement Strategy:

A multidisciplinary team (surgeons, anesthesia, and ICU nursing staff) was created to develop care guidelines for this high risk patient population. The guideline focused on the management of the lumbar drain both pre, intra, and post-operatively. It clearly identified interventions to be completed if neurological changes were noted as this is a time sensitive emergency. Additionally, nursing personnel completes in person and eLearning modules to strengthen knowledge of this patient population.

Results:

Since the initiation of the education in May of 2020 and subsequent publication of the Clinical Practice Guideline (August 2021) we have not had any incidences of post-operative paralysis related to the assessment, monitoring and management of TEVAR and TAA patients in the Cardiac Surgical ICU (CVICU).

Challenges/Lessons Learned:

There was a gap between the education and the publication of the guideline but found this did not have an impact on improved care management of lumbar drains for this patient population. The tubing on the lumbar drain is very thin and pliable and with turning has broken at the connection. Have provided re-education to staff on this tubing to prevent shearing in the future.

Success:

This process provides closed loop communication via a multi-disciplinary guideline and education assuring that all team members have clear consistent communication about the care management of this high-risk patient population; leading to improved patient outcomes.

4. The Ohio State Wexner Medical Center - Process Improvement Initiative to Reduce Surgical Site Infections in Lower Leg Amputations

Authors: Patricia Blake RN, MSN, Kristine Orion M.D., Divya Vinod, Sandra Campbell RN, Christopher McQuinn M.D., Anna Morrison NP, Nora Colburn M.D., Katheryn Wyne M.D., Leonid Gorelik M.D., Karen Prenger RN, CNS, Shelia Chucta RN, CNS, Danielle Blais RPh, Kristin Brower RPh, Jennifer Bihary RPh, Heather Cech RN, Teryn Dougan RN, Lisa Smith RN, Megan Zaleha RN, Leanna Mann, Nancy Matre

Problem Statement:

Surgical site infection (SSIs) complications prolong wound healing and patient recovery. Our VQI registry report for January 1 – December 31, 2020 indicated a higher incidence of lower extremity amputation SSI's at a rate of 22% compared to all hospitals in the registry at 2.1%. A retrospective review was completed and indicated three areas of opportunity to improve care.

Goals:

The goal of our project was to identify and understand causal factors/co-morbidities associated with SSIs comparing those with and without SSIs. By identifying these variables, it would allow for standardization of care and implementation of evidence-based practices to reduce SSI's in the future.

Improvement Strategies:

Key stakeholders including vascular, infectious disease, endocrinology, anesthesiology, and nursing and pharmacy identified three opportunities to improve care- peri-op glucose control, pre-op ATB management and CHG bathing.

- Medication reconciliation including home insulin regimen. Glucose management included order set update to align with current guidelines for pre-op glucose control. Hemoglobin A1C on all patients. Protocol development for optimization of pre-operative glucose levels either using subcutaneous insulin or initiation of insulin in-fusion prior to OR.
- The antibiotic (ATB) grid was updated. Implementation process for re-culturing incision intraoperatively to ensure accurate ATB treatment.
- CHG bathing patient education was developed as well as an escalation process if patient refuses. Efforts are being made to add CHG bathing to medication administration record to improve documentation.
- While not yet complete, we are initiating an operative dashboard to verify medical readiness at the time of surgical intervention.

Results:

Baseline data was pulled from January 2018 through April 30, 2021. There were 123 patients without a SSI post lower leg amputation and 11 patients who had a post op SSI. All 11 SSI patients were included in the study as well as a random sample of 52 patients who did not experience the complication of SSI. After review and clean up our winter dashboard indicated the rate of SSI is 3.4%, still higher than the VQI benchmark and our goal.

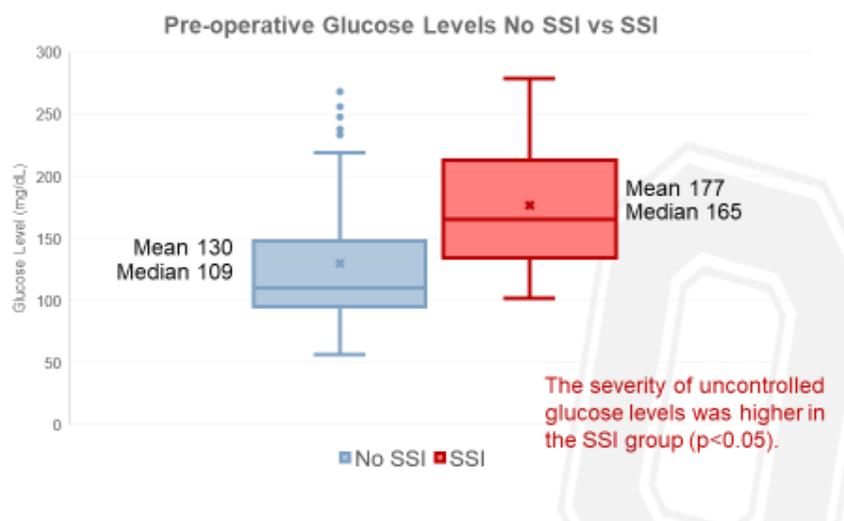
Challenges/Lessons Learned:

- One challenge discovered was misidentification of SSI’s by outside vendor for data review. A re-review of the cases by an internal abstractor resulted in a reduced SSI rate. A double check process was implemented for all complications.
- Another challenge was that our team focused on 3 strategies - glucose management, ATB management and CHG bathing - this required coordination of multiple groups. It required significant coordination to assemble and organize such a large team during the pandemic to develop an effective action plan.

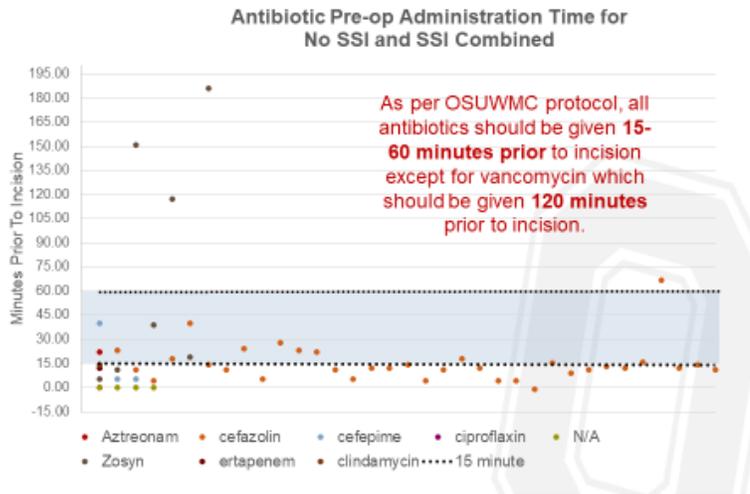
Success Factors:

- The team working to improve the outcomes are highly motivated clinicians, invested in problem solving and committed to implementation of the strategies.
- Implementation of crosscheck of all complications by our internal reviewer for any outside vendor cases.

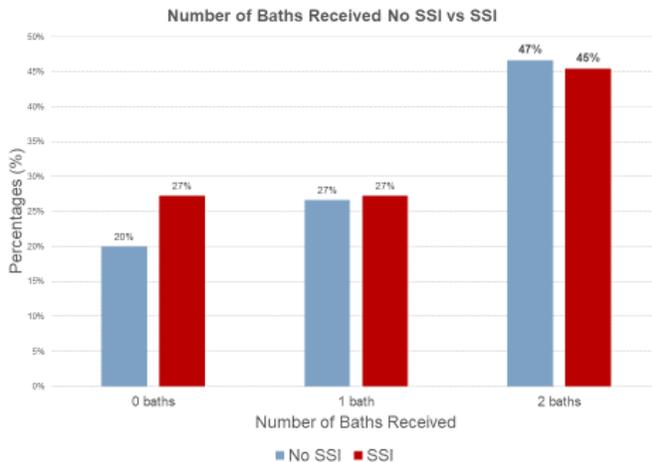
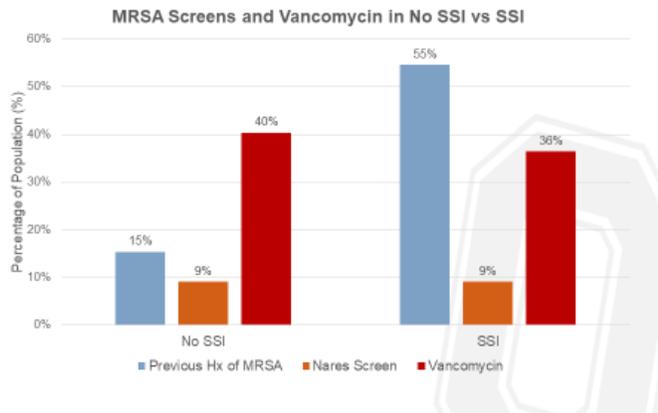
Glucose



Antibiotic Administration



MRSA Screens and Vancomycin



5. Use of Vascular Quality Initiative (VQI) modules to identify modifiable risk factors associated with post-operative arrhythmia

Authors: *Qvavadze T, Mason J, Oriowo B, Lurie F, Hallett K*

Problem Statement:

Over the last five years, we have observed higher than expected incidence of postoperative arrhythmia in our institution. The overall incidence of 5.3% was higher than reported 2-4% in the literature.

Goal:

The data from six VQI modules (EVAR, open AAA, infra-inguinal bypass, supra-inguinal bypass, CEA and CAS) was used to identify variables associated with incident post-operative arrhythmias.

Improvement Strategies:

The identified modifiable risk factors were used to design a research project aimed to verify such relationships using an extended data set from patients with carotid artery interventions.

Results:

Initial analysis of 1,100 most recent patients, whose data was entered in the six VQI modules during the last 5 years, revealed that the incidence of postoperative arrhythmias varied across the modules (Table 1). Univariate analysis showed that factors associated with post-operative arrhythmias were smoking ($P < 0.05$), and duration of surgery ($P < 0.05$). Factors protective against arrhythmias were preoperative use of beta-blockers ($p < 0.01$), preoperative use of calcium channel blockers ($P < 0.01$), and post-operative use of aspirin ($P < 0.05$).

Multivariate analysis adjusted by surgery type, age and gender, show that only preoperative use of beta blockers and calcium channel blockers, as well as post-operative use of aspirin had statistical significance.

Based on these findings, a matched case-control study was conducted on focused carotid interventions (CEA, CAS). Data extracted from medical records, including clinical and laboratory data that could be associated with arrhythmias were used in addition to the VQI data. This study showed that the preoperative use of beta-blockers ($p = 0.003$) and calcium channel blockers ($p = 0.003$) were associated with a statistically significant reduction in the incidence of postoperative arrhythmias. In addition, lower preoperative blood calcium levels ($p = 0.007$) were associated with a significantly greater risk for postoperative arrhythmias.

Lessons Learned:

These findings were used to justify a strong recommendation for monitoring the calcium level, and for pre-operative administration of beta-blockers and calcium channel blockers. We are in the process of prospective monitoring the adaptation of this recommendation, and its influence on incidence of post-operative arrhythmias.

Success Factors:

Institutional VQI data is a valuable source of information for identification of modifiable factors associated with post-operative complications, and for designing research and quality improvement measures.

Module	Number of patients	% of arrhythmias
EVAR	431	2.8
Open AAA	123	17.9
Supra-inguinal bypass	145	5.5
Infra-inguinal bypass	301	3.7
Carotid interventions	100	8.6

6. Using Vascular Quality Initiative (VQI) to support Vein Center Accreditation

Authors: Acino R, Mason J, Lurie F, Seiwert A, Aplin B, Russell T

Problem Statement:

Outpatient surgical centers and vein clinics that are accredited by the Intersocietal Accreditation Commission (IAC) require renewal of accreditation every 3 years with the submission of case studies and review of quality improvement program. More than 60% of accredited centers experienced delays in re-accreditation, mostly due to deficiencies in documentation. For the same reason, more than half of the first-time applicants are either denied accreditation, or are delayed in acquiring accreditation. Through our 6-year accreditation journey, opportunities to improve documentation and outcomes reporting was realized and in 2021, ProMedica began participation in the Varicose Vein (VV) module. This report aims to share our experience utilizing VQI's Varicose Vein module to support quality improvement and IAC Vein Center Accreditation processes.

Goal:

Incorporate the use of VQI's Varicose Vein module to support quality improvement and IAC Vein Center Accreditation processes.

Improvement Strategies:

VQI VV module data was used to identify missing documentation elements and trends among specific providers. In response, templates, provider education and reminder strategies were implemented into the vein center to target improvement of documentation. In addition, VQI data was used to identify and track patient outcomes, specifically post-procedure events that occurred during the short-term follow up window within 3 months.

Results:

Using VQI data to review and assess quality data at quarterly intervals we were able to identify that only 74.8% of varicose vein procedures have CEAP and VCSS scores documented in the medical record in Q1 2021 – a variable that is a requirement for both VQI's module and IAC documentation.

Review at quarterly quality meetings, education to physicians and vein center staff was implemented in Q2 and continuously monitored through the end of 2021. At the end of Q4, an improvement of over 11% was achieved with nearly 86% of procedures having CEAP/VCSS documented (Chart 1). Similarly, post-operative complications obtained via medical record review as part of the short-term follow up revealed that the Vein Center's complication log was missing a number of events recorded as part of the short-term follow up. Further auditing

revealed that the current process of manual recording of complications reported by physicians were being missed. The center’s complication log included only 13.7% of the post procedure

events (EHIT/DVT/Bleed/etc.) as compared to VQI (Chart 2). As a result, the complication reporting has been changed to use VQI as the primary data source for quality outcomes, including for both the Center’s QI processes and accreditation purposes.

Challenges/Lessons Learned:

Challenges with documentation still exist, specifically with a small number of physicians at our practice where individual trends in complete documentation showed only minimal improvements and/or varied throughout the year. Ongoing communication and education to continue to improve compliance is ongoing.

Success Factors:

Undertaking accreditation activities can require additional workload on clinical and managerial staff to meet reporting and accreditation renewal. Our center’s participation in the VQI Varicose Vein module provided benefit to the Center through increased collaboration between quality personnel to assist with the requirements to support our Vein Center Accreditation process.

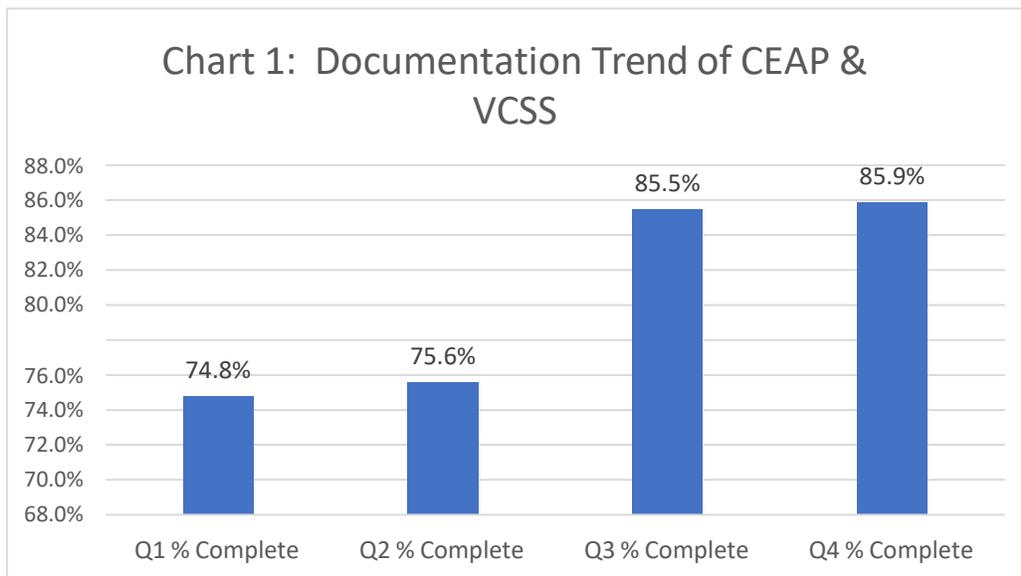
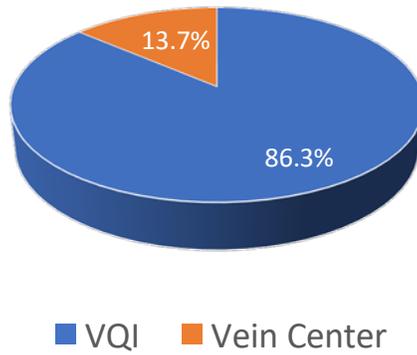


Chart 2: Percentage of Reported Post Procedure Complications



7. VQI Multi-Regional EVAR SVS Guideline Hashtag# Project

Authors: *Donna Fleming, RN, MSN, Stacy Giardina, RN, BSN, Donna Albergo, RN, BSN*

Problem Statement:

VQI Regional Reports indicate that Hospital X had ___% of EVAR Elective Patients with AAA Diameter within SVS Guideline (≥ 5.5 cm for Men; ≥ 5 cm for Women). It is important to identify patients who are undergoing intervention without meeting SVS guidelines for repair.

AAA size appropriateness for repair has been raised as an important topic across the VQI. There was interest amongst several different regions to work on this Quality Project. They include Cleveland Clinic from the Great Lakes Vascular Group, Stony Brook Hospital from the Vascular Study Group of Greater New York, and WVU Medicine from the Virginias Vascular Study Group. The core group of data managers decided to use the hashtag process within the VQI database to collect the data.

Goal:

To work as a multi-regional group and use hashtags to collect data over a large group of centers to show the need to implement changes in the VQI database. Additionally, a dataset will be identified that would create an avenue for further quality improvement projects.

Improvement Strategies:

The Core Group listed above initially met to discuss the scope of the project and identified the list of mitigating factors for operating on small aneurysms with the guidance of the lead VQI physician at each hospital: Dr. Christopher Smolock, Dr. Apostolos Tassiopoulos, and Dr. Samantha Minc. These reasons were created into hashtags and approved by VQI.

The Data Managers introduced this project at their respective Regional Meetings. Once sites expressed interest in participating, several training opportunities were provided as to how to enter approved hashtags into Pathways. FAQ's were also provided to address ongoing questions and to ensure accuracy in data collection.

Data entry was completed on February 28, 2021. Lead Data Managers on this project reviewed and compiled the results.

Results:

38 Centers participated in the hashtag data entry.

Of these 38 sites, 623 patients had hashtags entered from our list.

- Aneurysm w/ thrombosis
- Concomitant treatment of atherosclerotic aortoiliac disease- occlusive
- Concomitant treatment of atherosclerotic aortoiliac disease- dissection
- Concomitant/isolated iliac aneurysm
- Distal embolization
- Need for chemotherapy
- Need for transplantation
- Patient request/anxiety
- PAU
- Rapid expansion
- Saccular
- Symptomatic but Scheduled as Elective
- Other reasons

Challenges/Lessons Learned:

Emphasize directions to avoid missing or confusing data.

Require a meeting with all parties (SVS/PSO, Fivos) to clarify approved hashtags. Unfortunately we lost free text data that was believed to be in an approved hashtag format, but later found out was not.

As novices in this process, we were unaware of what information we would be provided from each site. In the future, we would make a clear guideline/agreement for interested sites as to what data would be provided from Fivos.

Success Factors:

Many participating centers submitted their own individualized charters to VQI, thus identifying strategies for improvement.

Results from this project were shared with VQI in hopes of adding additional variables in VQI AAA modules to identify mitigating factors for AAA repair when size threshold is not met.

Data from this project has been reviewed by the Physicians at the lead Centers. We will be supporting future Quality Research based on these findings with the hopes of expanding the data collection.

8. Use of VQI Registry to Implement Appropriate Use Criteria for Atherectomy in Peripheral Vascular Intervention

Authors: *Lillian Camino, Hanna Dakour Aridi, Ashley Gutwein, Jill Gall, Andrea Price, Jamison Wilson, Alok Gupta , Raghu Motaganahalli*

Affiliations:

Indiana University Health¹ , Indiana University School of Medicine² .

Objective:

Atherectomy is an adjunctive technique used for peripheral vascular interventions (PVI). Despite the cost and lack of adequate benefit to improve the outcomes of the intervention, this remains a commonly used practice in arterial revascularization. Much of this intervention is likely driven by the Medicare physician reimbursement incentives. Using the Vascular Quality initiative (VQI) - PVI Registry and Appropriate Use Criteria (AUC) for using atherectomy, Indiana University Health System (IUH) desired to reduce the utilization of atherectomy devices in PVI across 6 hospitals among all specialties performing these procedures.

Methods:

VQI-PVI Registry data from 2017-2022 YTD was utilized to analyze and construct reports on atherectomy utilization. In Q3 of 2020, as a part of a system wide initiative to improve the adherence to AUC, IUH used published societal guidelines for atherectomy for physician education during system process improvement (PI) meetings. Patients undergoing either unilateral or bilateral procedures for occlusive disease were included in this study cohort. Patients included had atherectomy with either directional, orbital/rotational, excisional/aspiration and/or laser technique of one of more vessels. De-identified data further analyzed by hospital, specialty, and physician was discussed at the meetings with individual physicians provided reports that contained percent utilization of atherectomy in the PVI. Cost savings was computed using the direct cost of the device and utilization before and after the implementation of AUC. Regression analysis was performed to compare the reduction of atherectomy over time and with specialty practice.

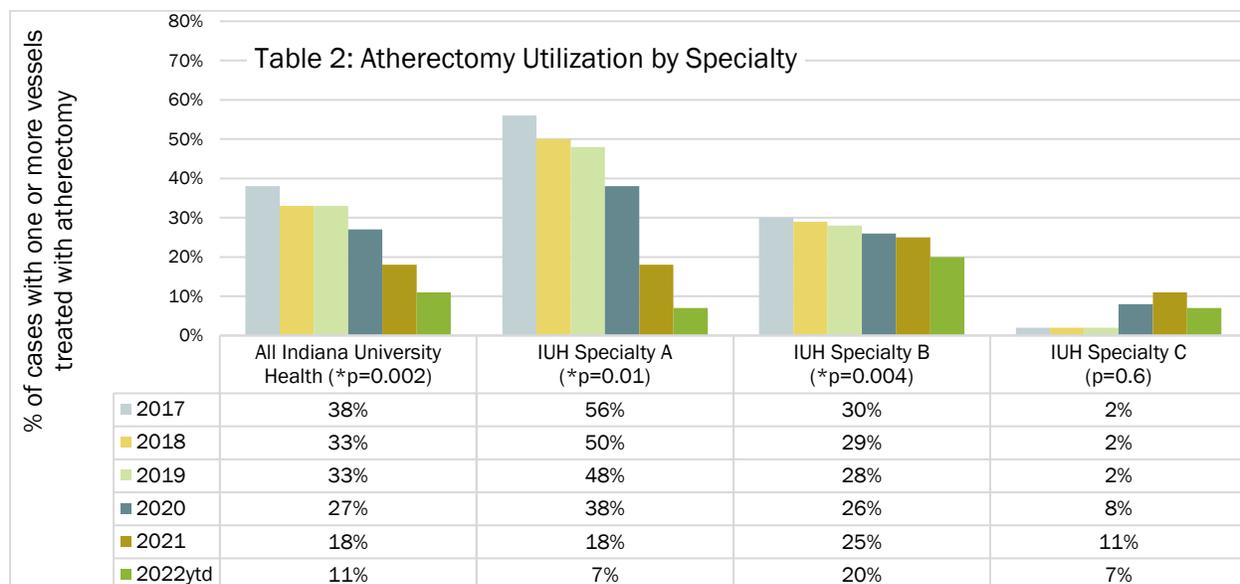
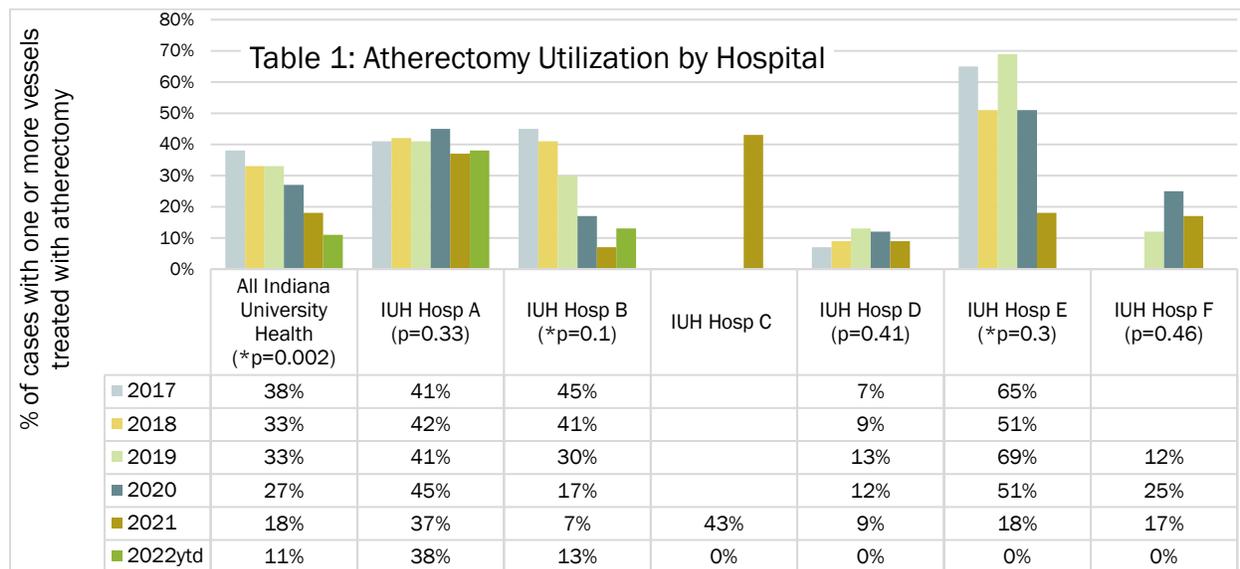
Results:

A total of 4389 procedures from 2017-2022 YTD were included in the analysis. Table 1 shows percent distribution of cases treated with atherectomy during the study period for revascularization of one or more vessels across a 6-hospital health care system. Table 2 shows specialty wide differences in the utilization of atherectomy as a treatment option. After the implementation of the initiative, rate of overall atherectomy utilization reduced from 38% in 2017 to 11% in 2022 YTD with a 71% reduction in use across the healthcare system ($p < 0.002$). Table 2 shows similar reduction in the atherectomy utilization across all specialties performing

PVI ($p < 0.002$). This reduction translated to \$866,300 cost savings for the health system directly related to cost of the devices.

Conclusions:

A system wide initiative using VQI- PVI Registry data can be used to implement appropriate use criteria for atherectomy devices in vascular interventions. Physician education and consistent messaging at the PI meetings ensures compliance with guidelines for patient care and cost savings to the health system.



9. COVID-19 Pandemic Effect on LTFU Rates In The VQI

Authors: *Rouchelyn Fallorina, Carlos Moreno*

Background:

The COVID-19 pandemic has impacted the delivery of care. In the initial period of the pandemic both State and Local governments issued Stay-at-Home orders. These mandates coupled with reductions of the healthcare labor force resulted in the postponement and reduced availability of appointments.

VQI PSO surveyed data managers on collection of LTFU information and reported 20% COVID-19 Pandemic related patient concerns and 5% staff resignations. As of June 30, 2020, 41% of U.S. adults delayed or avoided medical treatment during the pandemic (Figure 1).

Problem Statement:

At our institution, we noticed changes in yearly LTFU rates from before the pandemic to those during the pandemic. For this project, we will investigate the effect of the COVID-19 Pandemic on LTFU visit rates.

Methods:

In this descriptive analysis, we examined the volume of cancellations between March 16th, 2020, and December 31st, 2021 and compared to an equivalent pre-pandemic period. LTFU visit and cancellation volumes during the pandemic were compared to community COVID-19 additive cases for two surrounding counties. We obtained the data using the File Download tool from the VQI web interface.

Results:

Comparing the pre-pandemic vs. pandemic periods (Table 1) revealed an increase in cancellations for administrative reasons from 18.8% to 30.7%, respectively. While total clinic cancellations rose from the pre-pandemic period, the average number of monthly LTFU visits (Figure 2) also rose from 16.2% to 19.3%.

When comparing against community COVID-19 cases, initially the number of cancellations increased in response to Stay-at-Home mandate and operational changes. After that initial period, cancellations plateaued and only experienced fluctuations during the second, third and fourth pandemic waves (Figure 3).

Similarly, the number of LTFU visits increased as operations began to normalize, remaining steady with small fluctuations during pandemic waves (Figure 4).

Conclusion:

Patient perception about the COVID-19 pandemic may only play a small role during the pandemic, while operational responses and community mandates have a stronger effect on the ability to provide long-term follow-up care.

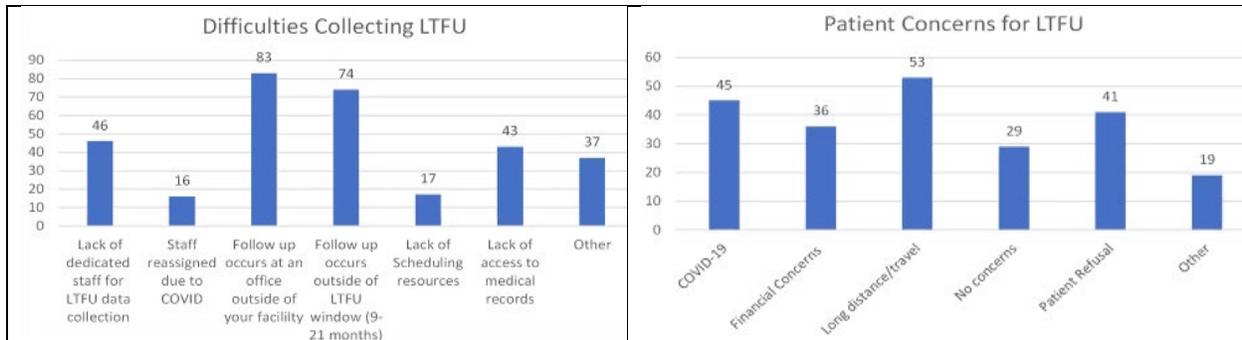


Figure 1. SVS-PSO Difficulties collecting LTFU data and patient concerns Data Manager survey results.

	PRE-PANDEMIC 6/1/2018 - 3/15/2020		PANDEMIC 3/16/2020 - 12/31/2021		Relative Change (%)
	n	% From Total	n	% From Total	
Total No. of Clinic Scheduled Visits	10,913		10,968		0.5%
No Show	497	4.6%	400	3.6%	-19.5%
Total number of Cancellations	6,071	55.6%	6,658	60.7%	9.7%
REASON FOR CANCELLATION					
Pt Initiated More than 24 hrs. notice	2,657	24.3%	1,863	17.0%	-29.9%
Pt Initiated less than 24 hrs. notice	640	5.9%	294	2.7%	-54.1%
Cx via Televox	151	1.4%	130	1.2%	-13.9%
Cx Via Interface	25	0.2%	0	0.0%	-100.0%
Pt Admitted	117	1.1%	212	1.9%	81.2%
Deceased	88	0.8%	3	0.0%	-96.6%
Provider Initiated	21	0.2%	1	0.0%	-95.2%
Other reasons (administrative)	2,057	18.8%	3,363	30.7%	63.5%
NEW MEASURES					
Appt No Longer Needed (feel better, etc.)			209	1.9%	1.9%
Provider/Resource-Epidemic/Pandemic			133	1.2%	1.2%
Pt Initiated Epidemic/Pandemic			588	5.4%	5.4%

Table 1. Comparison data between pre-pandemic and pandemic period illustrating the types of cancellation categories, volume % differences and relative change from pre-pandemic volumes.

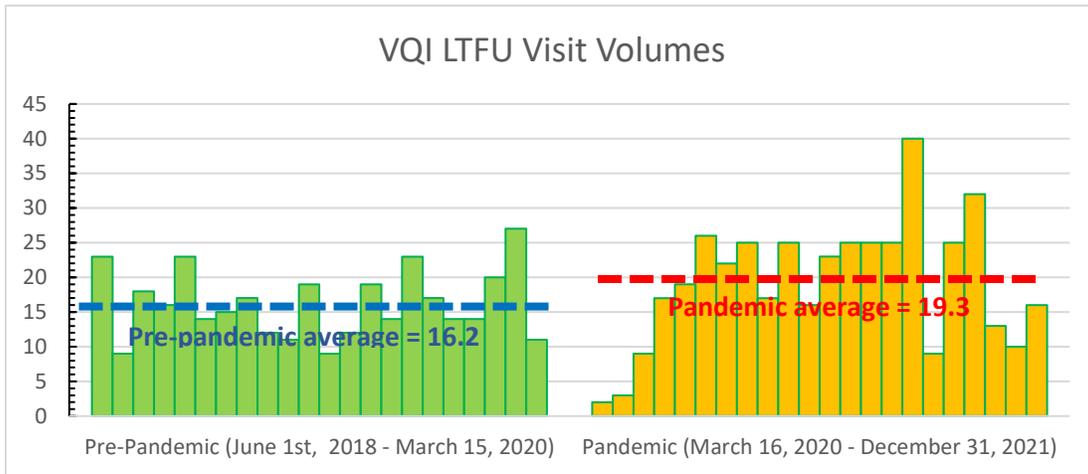


Figure 2. Comparison of LTFU visit volumes before versus during the COVID-19 pandemic.

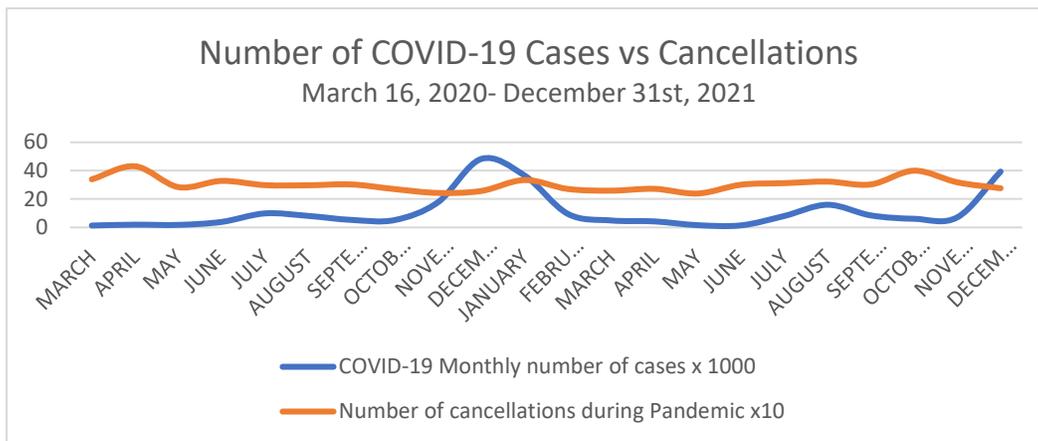


Figure 3. Comparison of visit cancellation volumes versus the number of reported cases of COVID-19 in two surrounding counties.

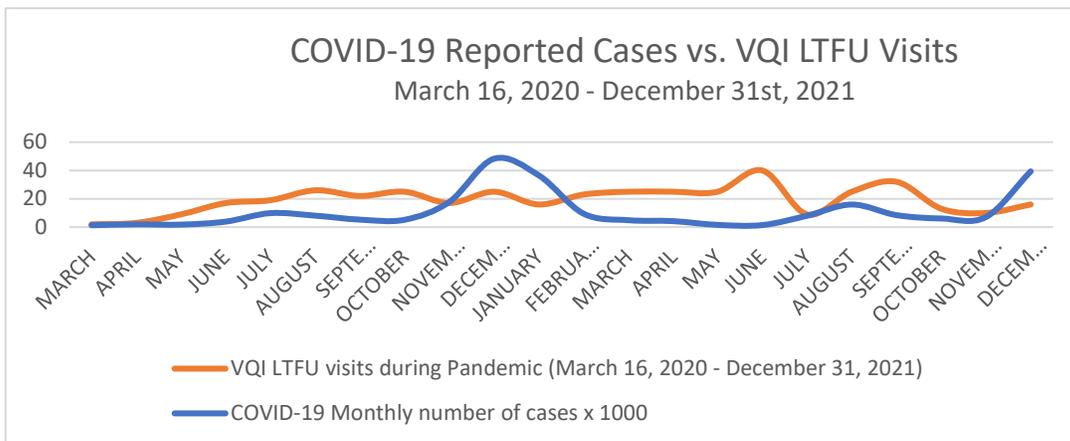


Figure 4. Comparison of LTFU visit volumes versus the number of reported cases of COVID-19 in two surrounding counties

10. Quality Improvement Project on The Long-Term Follow-Up with Focus on Aortic Sac Diameter Reporting on EVAR and TEVAR Patients

Authors: Ritu Karki Sitaula, RN, MSN

Problem Statement:

Regular long-term follow-up (LTFU) for vascular surgery patients is crucial to ensure treatment success. For EVAR/TEVAR patients this includes sac diameter reporting. Our VQI data from procedures performed 7/2018 – 6/2019 was 67%, with sac diameter reporting of 77% for EVAR and 50% for TEVAR.

Goals/Objective:

UC Davis Health established a goal to increase the percentage of patients receiving LTFU (9 – 21 months post-procedure) and the sac diameter reporting for TEVAR and EVAR procedures.

Improvement Strategy:

Existing workflows were evaluated by all stakeholders, including quality improvement, vascular providers, and vascular clinic/nursing staff. Standard workflow was developed: Initially, the quality team would register the eligible patient in the pathways and update the Specialty Note section in the Epic to communicate with the clinical staff about the patient's inclusion in the VQI and the time frame they need to be scheduled for follow up. A shared spreadsheet between quality team and clinical staff was developed that included VQI patients who didn't have one-year follow-up visit. A similar process was applied for the TEVAR and EVAR cases with the aortic coordinator.

A smart phrase was implemented for visit documentation that included relevant data fields including the sac diameter for EVAR and TEVAR. Phone call and video follow-up was also utilized for those who could not make it to the center for in-person visit. Imaging was retrieved from outside centers for phone/video follow-ups and were reviewed by the providers.

Results:

Consistent communication and collaboration worked well and as a result we were able to increase our LTFU rate up to 80% within a year (FIGURE). The sac diameter reporting upon LTFU for EVAR and TEVAR patients also increased significantly (55% to 90% for TEVAR; 46% to 89% for EVAR). These increases surpassed our internal targets. the follow up period. This includes patients who will be out of their window soon so that they can be scheduled more urgently.

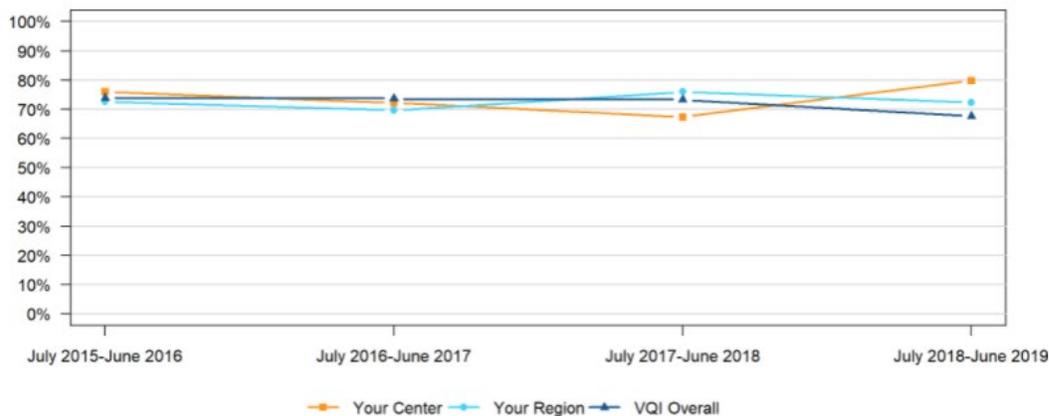
Challenges/Lessons Learned:

Bringing all the team member together and delegating the responsibilities was challenging initially. Providing the proper guidance and educating the clinic staff about the VQI requirements was helpful. Patient compliance and image retrieval remains an ongoing challenge, especially with the ongoing pandemic and for those residing at great distances from our institution.

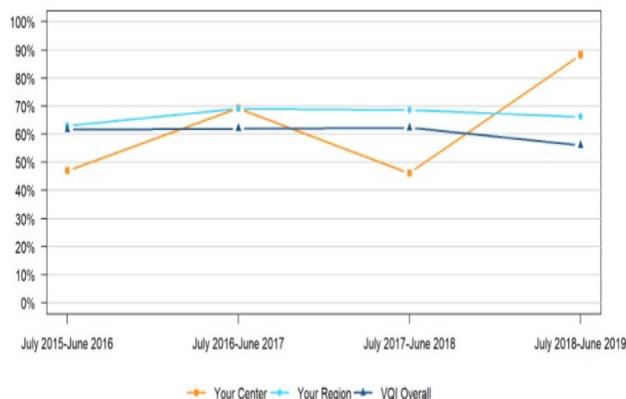
Success Factors:

Multidisciplinary workflow which included data quality team, vascular clinic staff, aortic coordinator and physicians lead to seamless workflow and the success of the project. Communication between patient, other center/clinic where patients are following and making sure the scheduled follow-ups fall between the VQI requirement increased the compliance. Utilizing the specialty note section of the EMR to identify the patients VQI enrollment and timelines has been effective. Communication between the data quality team and other team members regarding the progress played key role in motivating everybody involved.

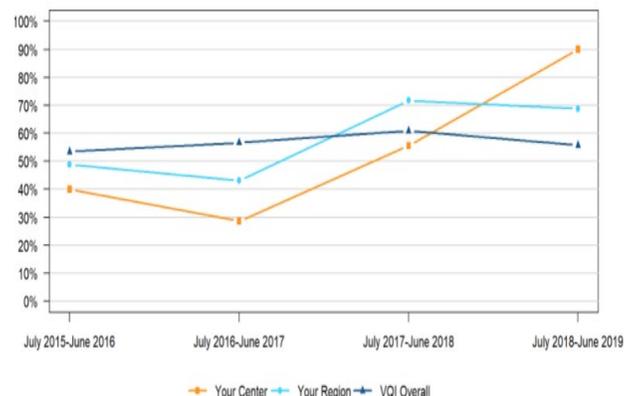
Long-Term Follow-Up by Year



EVAR Sac Diameter Reporting by Year



TEVAR Sac Diameter Reporting by Year



11. Multi-center Implementation of the Clinical Frailty Scale within Vascular Surgery Clinic Workflow: Utilizing VQI Hashtag Data Collection for Regional Quality Improvement Programs

Author: *Julie Hales, RN, MSN; Benjamin S. Brooke, MD, PhD, FACS, DFSVS; Judy Daniel, BS, Kevin J. Bruen, MD, Megon Berman, BA, Scott Berman, MD, MHA, RVT, FACS, DFSVS, Cathy Black, PAC, MPAS, Tze-Woei Tan, MBBS, MPH, FACS, & Larry Kraiss, MD, FACS*

Problem statement:

Frailty is a multidimensional syndrome where patients lose their physiological reserves (energy, physical ability, cognition, health) and become vulnerable to surgical stress. Frailty-based instruments such as the Clinical Frailty Scale (CFS) have been shown to predict long-term clinical and functional outcomes after patients experience the stress of vascular surgery. However, a patient's frailty status is not currently captured by VQI registries before or after surgery.

Goals:

To implement the CFS in vascular surgery clinic workflow by utilizing VQI hashtag data collection at the pre-operative and long-term follow up (LTF) 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 who were undergoing VQI-eligible procedures at the pre-operative and LTF time points. VQI data managers documented the provider-assigned CFS in hashtag format within corresponding VQI patient forms. The project team presented education and training at biannual 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. Two and a half years after project onset, the CFS hashtags were centrally 'pulled' and aggregated.

Results:

From September 13, 2019 through February 7, 2022, vascular surgery providers at four VQI centers (University of Utah, St. Vincent Healthcare, PIMA Heart & Vascular, and University of Arizona) assigned the CFS to 1,665 patients at the pre-operative time point and 675 patients at the long-term follow-up (LTF) time point. Of the total 2,340 CFS assignments, there were 336 unique patients with paired pre-operative and LTF CFS scores. Among this patient cohort, 29% underwent HD Access, 29% PVI, 8% CAS, 7% INFRA, 6% EVAR, 2% TEVAR, 1% SUPRA and 1% OAAA.

Challenges/Lessons Learned:

Due to the onset of the COVID-19 pandemic in March 2020, vascular surgery clinic visits largely transitioned from face-to-face to telephone and/or video platforms for several months during the study period. Providers were unable to accurately assign the CFS when a physical examination was not performed. Further, obtaining LTF is a recognized challenge within the VQI. Without a LTF face-to-face encounter, a patient's frailty status was unable to be accurately determined. To ensure the Standardize Op Notes template was being used, the abstractor had to look through ~40 cases from both DVS & DVIR for a two-week period and to highlight any non-compliance issues.

Success Factors:

Provider champions across regional VQI centers are effective in promoting the collection of the CFS within clinic workflow at the pre-operative and LTF time points. Documentation of CFS using hashtags within the VQI registry will aid future research and quality improvement efforts aimed at using frailty assessments to predict long-term outcomes following vascular surgery.

12. Design and Implementation of a Data Visualization Tool to Inform Quality Improvement Opportunities and VQI Expansion in a Growing Healthcare System

Author: Alexis Neill

Problem Statement:

Emory Healthcare has grown significantly in recent years, including the acquisition of three community hospitals totaling approximately 1500 additional beds. With this growth have come challenges in monitoring vascular surgery quality across multiple campuses and among 22 surgeons using separate medical record systems. A robust Vascular Quality Initiative (VQI) program enables tracking of quality metrics and drives improvement at the flagship academic hospital, but no reliable process previously existed at other sites to analyze quality performance. In order to prioritize VQI expansion at newer sites, we needed a more complete understanding of vascular procedure types, volumes, and key quality conditions across the Emory Healthcare enterprise.

Goals:

Our goal was to design a data visualization tool for tracking volumes and high-level quality metrics for all VQI-eligible vascular surgical procedures, which would provide baseline awareness of performance and inform future expansion of VQI participation at Emory Healthcare.

A secondary goal was to utilize the visualization tool to validate current VQI-reported outcomes.

Improvement Strategies:

Team building and product design lasted approximately nine months:

1. Multidisciplinary Team: Vascular surgeons and pertinent clinicians, VQI Data Manager, Department of Quality leadership and analytics personnel
2. Data Source Identification and Validation: where to access accurate data for each site
3. Visualization Tool and Metric Selection: which high-level metrics and how best to display the metrics on selected Tableau platform

Results:

Our efforts resulted in development of an accurate data visualization (see image) that can be securely accessed by Emory leadership and the quality team, readily updated monthly, and easily used to identify where volume and/or quality metrics suggest value of VQI expansion and opportunity for improvement.

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Challenges/Lessons Learned:

Data source identification and validation was our biggest challenge. With differing medical record and administrative systems, data sources were disparate by site. Validation of administrative data required multiple reiterations and was time-consuming, although essential for accuracy.

Success Factors:

The multidisciplinary team set the foundation for success of this effort. Clinical expertise, analytics and database proficiency, and experience with translation of metrics into real-world improvement were all essential. The group remains committed to ongoing use of and evolution of the visualization tool.

Vascular Surgery Quality Outcomes

Outcomes by procedure category:

Carotid Endarterectomy	Open AAA Repair	Infrainguinal Bypass
Carotid Stent	Thoracic & Complex EVAR	Peripheral Vascular Intervention
Endo AAA Repair	Suprainguinal Bypass	Lower Extremity Amputation

Summary metrics:

VQI Discharge meds: EUH	Return to OR	AMI
VQI Discharge meds: ESJH	RBC Use	Readmissions (30d)
VQI Long term follow-up: EUH	Stroke	Mortality
VQI Long term follow-up: ESJH		

Metrics:

Case volume: The number of cases with an associated CPT code under a VQI procedure category. *Does NOT* take into account VQI exclusion criteria, therefore volume is expected to be higher than VQI-reported cases.

Hospital LOS: The number of midnight census days an encounter was in the hospital (discharge day - admit day).

Deaths: The frequency of cases who expired during their hospital encounter. May not capture cases still in-house.

Post-op ICU LOS: The frequency of cases who spent at least 1 night in an ICU after their procedure, and the number of nights they were in an ICU post-procedure.

Return to OR: The number and percent of cases who had a subsequent OR procedure during encounter, related or unrelated, at any point after index case.

In-hospital stroke: The frequency of cases who had an ICD-10 diagnosis code indicated as not present on admission, per Medical Records, for cerebrovascular infarction (I63.xx, I97.821). Note: may or may not be related to procedure, and may have occurred prior to procedure.

AMI: The frequency of cases who had an ICD-10 diagnosis code indicated as not present on admission, per Medical Records, for an Acute Myocardial Infarction. Note: may or may not be related to procedure, and may have occurred prior to procedure.

Procedure categories based on VQI CPT codes
Note: Dashboard in development and subject to change

13. Length of Stay Following Major Amputations: A Problem Analysis

Authors: West AB, Smith AL, Ametu S, Ramos CR, Rajani RR, Benarroch-Gampel J

Background:

Longer hospital stays are associated with higher costs as well as increased risk of complications (i.e., infections, falls, and delirium) as well as delayed transition to post-acute rehabilitation following surgery. According to the VQI dashboard, our large safety-net hospital has longer average length of stay (LOS) following non-traumatic major lower extremity amputations performed by vascular surgeons compared to the national and regional averages. Therefore, the objective of this study was to deploy quality improvement (QI) tools to determine factors contributing to this quality gap.

Methods:

An interdisciplinary team consisting of a vascular surgery attending, QI fellow, and two physical therapists was formed. A current state swim lane diagram of the process from operation to discharge was iteratively constructed with input from stakeholders. Data reflecting the time between process steps were collected from patients who underwent non-traumatic major lower extremity amputations performed by vascular surgeons between January 2019 and December 2021. Semi-structured interviews were conducted with six stakeholders including vascular surgery residents, physical and occupational therapists (PT/OT), a social worker (SW) and a case manager (CM).

Results:

The current process from operation to discharge is shown in Figure 1 and highlights inconsistencies in communication practices resulting in inefficient information exchange and a lack of standardized ordering of ancillary service. Themes from stakeholder interviews similarly highlighted difficulties in interdisciplinary communication and identified the current discharge paperwork workflow (not in the electronic medical records) as contributing to communication breakdowns and inefficiencies in time spent on task completion. As shown in the XbarS chart in Figure 2, the mean postoperative LOS after major amputation was 14.4 days and has been stable since December 2019. The steps in the current process found to be contributing the most were: time from operation to PT/OT evaluation (mean 3.2 days), time from PT/OT evaluation to SW/CM evaluation (mean 2.5 days), and time from SW/CM evaluation to discharge (mean 6.4 days).

Conclusions:

Based upon the findings from this problem analysis, the Model for Improvement is being applied to initiatives such as: decreasing time from operation to PT/OT evaluations by standardizing post-op order sets, reducing workflow inefficiencies by allowing PT/OT directly communicate discharge recommendations via SW/CM orders, and improving inter-disciplinary care communication via the development of a care coordination dashboard.

Figure 1: Swim Lane Diagram of

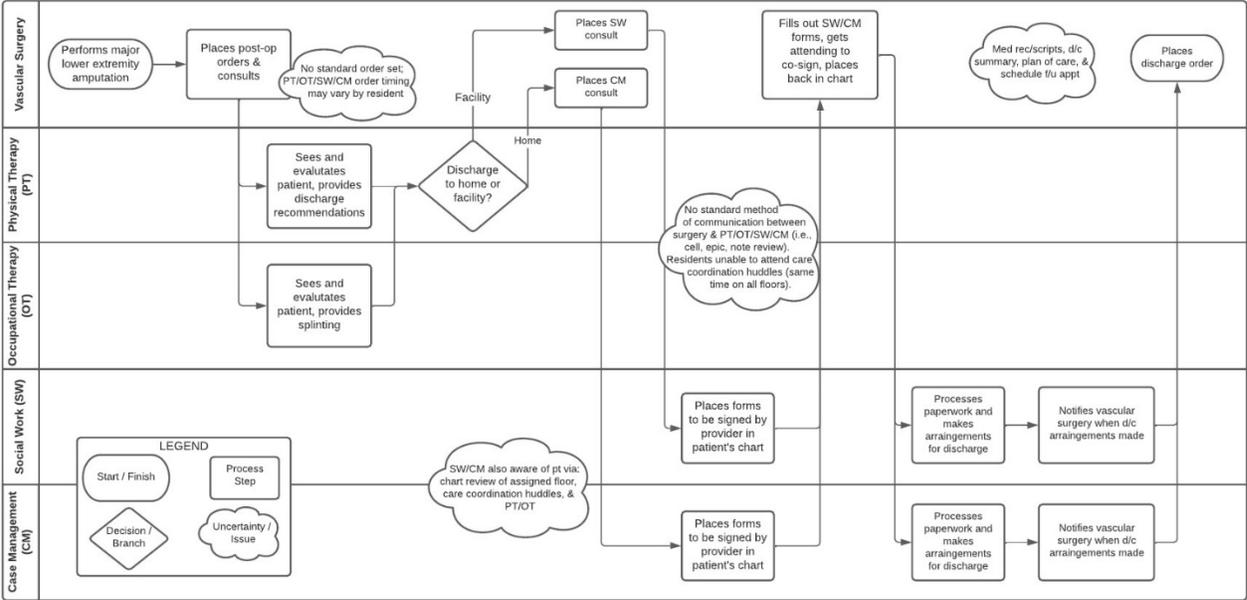
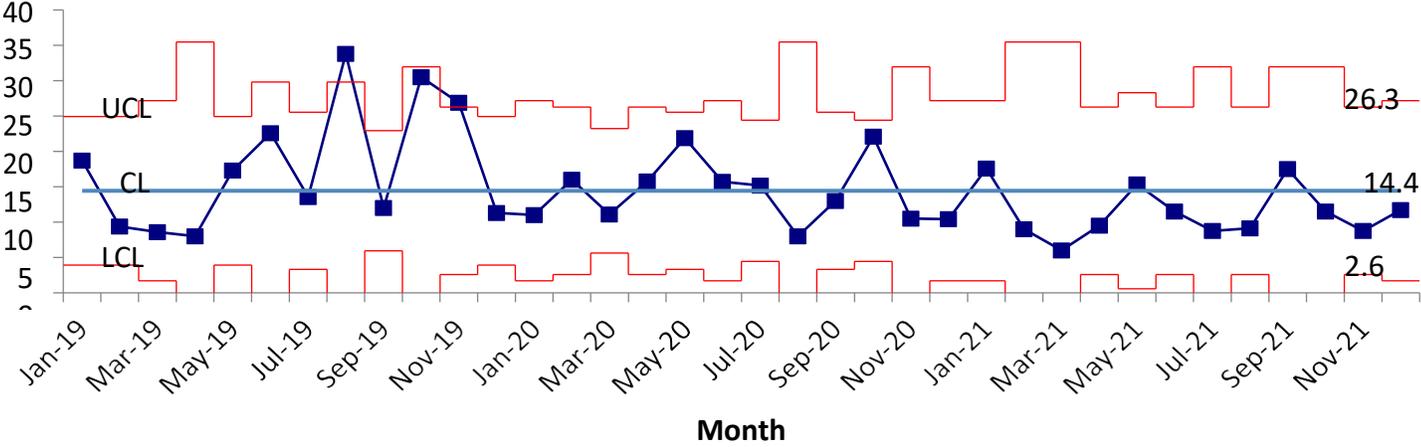


Figure 2: Average Monthly Post-Op Length of Stay XbarS Chart



14. Coordinating Aortic Follow-Up Surveillance for Multiple Registries

Author: Priya Padmanabhan, MHA

Problem Statement:

Beyond managing the acute phase of aortic pathology, patients should be followed over their lifetime with serial surveillance regardless of the initial treatment strategy (medical or surgical). Baylor Scott & White Heart and Vascular Hospital Dallas submits aortic data to 3 national registries - Vascular Quality Initiative (VQI), The Society of Thoracic Surgeons (STS) National Database, and most recently to the International Registry of Acute Aortic Dissections (IRAD). Participation across these consortia recommends follow-up surveillance to occur at varying intervals. A multidisciplinary aortic center at Baylor Scott & White Heart and Vascular Hospital Dallas has sought to structure and coordinate a systematic surveillance process to facilitate timely follow-up and data collection to meet each registry's requirements.

Goals:

Our objective is to develop teams of stakeholders to coordinate a tailored approach aimed at optimizing existing scheduling processes, to align with recommendations of all the registries. The overall goal is for the teams to implement and operationalize strategic workflow systems for each patient cohort to create efficient follow-up care continuity.

Improvement Strategies:

The tailored intervention will require regular interdepartmental meetings to assess current state, as well as obstacles to overcome in establishing a standardized workflow. Developing a structured strategy will entail mapping out how patients who require follow-up will be identified. Based on the recommended follow-up interval for the registry, a scheduling process will be created for each patient group. This coordinated effort will require consistent communication between the registry manager and aortic center staff. There will be systems in place to report on and track patients' appointment status to ensure that there are no misses. We are also in the process of consolidating key data elements from the multiple registries into a single form, to eliminate complexities of the various data collection forms. Lastly, we are evaluating ways to improve documentation in Epic to potentially eliminate paper forms completely.

Challenges/Lessons Learned:

Since there are multiple stakeholders involved, some potential challenges we expect to encounter are conflicting priorities for each team. This will necessitate transparency and communication between the teams. Consistent assessment of status and tracking of progress is required to keep team members accountable.

Success Factors:

We anticipate an allied focus and collaborative partnership between critical team members of the aortic center to be instrumental in achieving the vision of a comprehensive surveillance program. Continued effective engagement will be crucial to sustain improvement efforts and we will need to establish the cadence and process for that purpose. We will also be identifying any additional. Though we are in the very early stages of this initiative, our expected results include implementing an efficient and standardized means to coordinate aortic surveillance, by ensuring all patients have a follow-up (and imaging) scheduled at the time of discharge, in accordance with registry recommendations/criteria which will enable us to achieve our goals.

15. Case Log Capture Challenge: Missed cases during the transition to EPIC

Author: Nilima Lovekar MPH, Sora Park RN, Virendra Patel MD

Problem Statement:

We struggled with case capture during our legacy EMR's transition to Epic. About 7-9 % of cases were identified on end of the year billing data cross-match to be missing (2018-2019). Entering all missed cases at the end of the year for 11 modules was a burden and race against time. Etiology for missing cases included emergent cases, cases embedded in other major surgical cases like Cardiac Bypass + Carotid Endarterectomy, Cardio Vascular Thoracic Surgical procedures, and simply missed cases. To rectify the errors of missing cases we came up with a systematic strategy:

- Communication with departments
- Working with Epic IT team
- Operational and billing data cross match
- Analytics Vascular dashboard

Goals:

1. Access to OR scheduling calendar on shared website for department.
2. Have EPIC IT team identify and correct errors in mislabeled credentials and codes.
3. Access to EPIC tools to filter OR cases by date location, surgeon, procedure, and department.
4. Have billing and EPSI departments cross match data for quarterly release.
5. Create interactive Analytics Vascular Dashboard.

Improvement Strategies:

We gained access to the Neurosurgery website to view OR calendar and host a VQI documents folder. Folder contents included the following and were shared with surgeons:

- VQI modules.
- Inclusion /Exclusion criteria.
- Data entry spreadsheets of cases for past and current year.
- Data needs and clinical quality enquiries from surgeons or abstractors for transparency.

This helped to have quality checks on data input, and present carotid outcomes which were used in Mortality & Morbidity presentations and shared with the Stroke Committee for the joint commission survey.

EPIC IT team worked on:

- Corrections of mislabeled surgeon credentials
- Identification of concomitant procedures as individual primary procedures under proper surgeons.
- Gave access to abstractors to EPIC 'My Reports' and surgeon OR log calendar to drill down and create case list.

Vascular Dashboard:

Hosted past and current case logs for all departments taking part in the VQI registry.

Billing/EPIS:

Release of OR case log and volumes for vascular procedures on quarterly basis.

Challenges/Lessons Learned:

All departments acknowledged the importance of capturing missing cases. It was a challenge to:

- Standardize methods across departments and centers for NYP.
- Navigate university and corporate restrictions from IT department to implement these changes.

Success Factors:

- Weekly phone calls and huddles to follow up to update progress,
- Missing cases decreased to 1-2% from total of 30-40 to 5-7 from 2020-2021
- Increase in case input volume for VQI
- Continuous communication and collaboration across multiple departments (Surgery, IT, Analytics) played a key role in our success.

16. Long Term Follow-Up Improvements

Author: *Hui Qing Su, RN Sharif Ellozy, MD, Brian G DeRubertis, MD, FACS*

Problem Statement:

There is inadequate follow-up entered into VQI registry database for cases entered in 2018. Our overall long-term follow-up rate for our center was 32%.

Goals:

Improve our overall long-term follow up rate to 75% for cases entered in 2019 and coming years.

Improvement Strategies:

1. Assessed current LTFU rates and cases to complete to achieve improvement goal.
2. Quality Management Specialist/Data Manager met monthly with quality analytics team members, the vascular service line, and vascular physicians to discuss LTFU.
3. Presented 2021 VQI Spring and Fall Regional Reports to track our center, regional, and overall VQI LTFU rates at monthly quality meetings.
4. Quality Management Specialist/Data Manager teams conducted bi-weekly huddles to discuss long- term follow-up completion status.
5. Identified root cause of lack of follow-up.
6. Physicians and scheduling team must be informed of future prospective LTFU appointments.

Results:

Our overall long-term follow-up rate for our center was 67% for cases entered in 2019.

Challenges/Lessons Learned:

1. Our long-term follow-up rate in 2018 was 32% due to personnel changes that contributed to a low volume of cases and follow-ups that were entered. Additionally, new staff did not begin until July 2019 further delaying entry. Once new staff were recruited and improvement strategies implemented, the 2019 rates increased to 67%. Strategies are still in progress and will continue for cases entered in 2020. We anticipate a 10-15% increase in follow-ups for cases entered in 2020 and subsequent years.
2. Unfortunately, for cases entered for 2019, the follow-up window of 9-21 months occurred during the peak of the COVID-19 pandemic in NYC (March-May 2020)

3. contributing to lower follow-up appointment rates. This may have been a deterrent for patients returning for long-term follow-up appointments.
4. Quality Management Specialists at our institution are not allowed to contact patients directly. Within the EMR, we can only determine that the patients are lost to follow-up.
5. Scheduling system for future prospective LTFU appointments is still in progress.

Success Factors:

1. The data management team performed bi-weekly updates on follow-up completion.
2. VQI 2021 reports were presented to the vascular team, including long-term follow-up rates and goals. This helped anticipate our needs and track our long-term follow-up rates in comparison to our region and VQI overall.
3. Accessing the VQI tool, “Long-Term Follow-Up Completion Rate by Procedure” (Vascular Quality Initiative, 2022), to assess our progress.
4. We hope to continue with the project and track LTFU follow-up rate in 2020 and coming years.

17. A “Hard Stop” at Discharge Improves Antiplatelet and Statin Therapy Adherence

Authors: *Laura C. Healy, MD, Patricia Bozeman, APRN, Kristen Hallisey, RN, Edward Gifford, MD*

Problem Statement:

Previous studies within the Vascular Quality Initiative (VQI) have found that patients who received postoperative antiplatelets and statins had a survival benefit after all vascular surgeries. In our annual quality improvement dashboard, we noted failure to obtain >75th percentile adherence with antiplatelet and statin adherence at time of discharge.

Goal:

We sought to obtain >75th percentile adherence with antiplatelet and statin prescriptions at discharge.

Improvement Strategies:

We implemented a hard stop within the electronic medical record (EMR) on December 20, 2019 to ensure that all patients were prescribed or had documented intolerance to antiplatelet and statin medication at time of discharge from the vascular surgery service.

Results:

Over the four-year study period 2312 patients underwent intervention, of whom 2234 were discharged and had no documented intolerance to statin medication. None of the treated patients had a documented intolerance to antiplatelet agents. Prior to the hard stop within the EMR, antiplatelet and statin adherence at discharge was 86.3%, whereas after the EMR hard stop antiplatelet and statin adherence rose to 92.4% ($P < 0.001$). Pre-hard stop year over year rate of antiplatelet and statin adherence demonstrated no change (86.2% for 2018 vs 86.6% for 2019, $P = 0.82$). However, adherence for 2020 was 91.2% ($P = 0.02$ from year prior). While rates improved again in 2021 to 93.4%, this was not a significant improvement from the prior year ($P = 0.18$). Patients excluded for statin intolerance were not significantly different pre and post EMR hard stop (1.6% pre, 1.8% post, $p = 0.7$).

Challenges/Lessons learned:

Our initiative increased antiplatelet and statin adherence at discharge but did not reach the >75th percentile in adherence. This is likely multi-factorial but one hurdle is that the hard stop is only in the vascular discharge order set. If a patient is discharged from a different service or the provider is unfamiliar with the correct order set, this EMR hurdle will not be encountered.

Future efforts may benefit from implantation of a non-service specific EMR flag for patients who undergo vascular procedures during hospitalization.

Success Factors:

A hard stop and communication of its implementation to the in-house team in charge of discharging patients was successful in increasing adherence to maximum medical therapy on discharge, as antiplatelet and statin prescriptions increased significantly in the first year of implementation. Rates improved again in year two after implementation, although not statistically significant. Stable rates of documented statin intolerance point to improved overall prescribing of these crucial medications following common vascular procedures.

References:

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De Martino, Randall R., et al. "Perioperative management with antiplatelet and statin medication is associated with reduced mortality following vascular surgery." *Journal of vascular surgery* 59.6 (2014): 1615-1621.

18. Carilion Clinic Long Term Follow-up Initiative

Authors: *Suzanne Beels, Michelle Martin*

Problem Statement:

Vascular Quality Initiative (VQI) regional reports indicated that Carilion Roanoke Memorial Hospital (CRMH) had varying compliance with long term follow-up (LTFU) appointments for the subscribed procedure groups. Rates were as low as 14% for 2015 LTFUs. The facility was given a probationary period to improve rates to 50% or better. The approach to improving LTFU compliance was multi-faceted, across two physician groups including Jefferson Surgical Clinic (JSC) and Carilion Aortic Center (AC).

Goals:

The goal was to obtain and maintain $\geq 90\%$ compliance with LTFUs for procedures performed in 2019 prior to the 2021 registry deadline. Expectations to meet VQI guidelines include a follow up appointment at 2 Weeks, 6 months, and 9-21 months. Telephone visits are acceptable when live visits are not possible. The 90% goal aligned the facility with VQI's established star ratings.

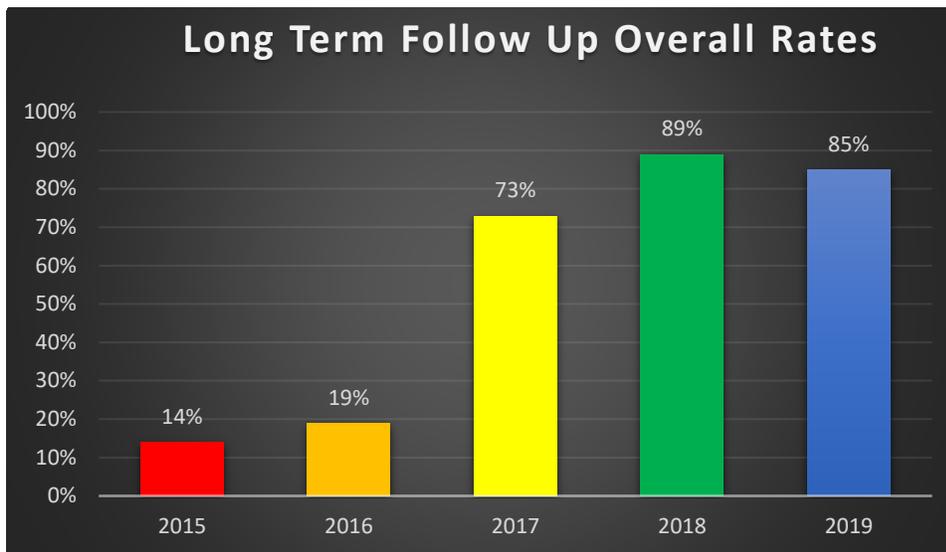
Improvement Strategies:

A complete evaluation of processes and barriers was performed. Situational awareness was important along with awareness that improved compliance would positively impact inclusion in future research studies. An obstacle to overcome early on was the review of LTFU compliance at non-Carilion as well as Carilion offices since both perform these surgeries at CRMH. The data abstractor began reviewing electronic medical records (EMR) at the 9-month post-procedure time point. A spreadsheet was created to identify a follow up appointment schedule. The spreadsheet allowed for improved communication of expectations and provided a roadmap for LTFU completion.

The distance some patients needed to travel to obtain care from these rural offices created an obstacle. COVID played a role in non-compliance. Phone visits became increasingly important. Michelle Martin created a phone visit form then later an EMR smart phrase for patients who were unable to come for an appointment.

Results:

After going on probation in August 2019 and gaining remote access to the JSC EMR the lead abstractor went back to all 2017 charts that did not have follow ups. The rate at the time of probation was 39%. By September 9, 2019, it had improved to 71%. Ongoing work with both JSC and the AC increased the LTFU overall rate to 89% in 2018 and 85% in 2019.



Challenges/Lessons Learned:

Gaining remote access to the non-C office EMR in 2019 was a significant step to improved data harvesting of LTFU appointments. Prior to this access the abstractor would have to travel to the clinic to gain access to patient charts. Due to current regulations the abstractor cannot make phone calls to these patients. Clinic resources must make calls to patients for follow up before the patient falls out of the LTFU window.

Since the initial data collection began, a C-based physician group was added thus increasing patient volume.

LTFU is a work in progress. Continued efforts with JSC and AC will be necessary for continued improvement and maintenance of outcomes. Quarterly updates are provided to the surgeons for awareness and engagement.

Success Factors:

Information sharing has increased over the past few months. It is expected to improve as we move forward.