Monday, March 30th
Scientific Session I – Aneurym

Presentation Number: 1

Publishing Title: Impact of Physician Specialty and Operator Experience upon Outcomes Following EVAR

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Abstract Body:

OBJECTIVES: Endovascular aneurysm repair (EVAR) is commonly performed by interventional radiologists, cardiologists, general surgeons, cardiothoracic surgeons, and vascular surgeons, with each specialty having differences in residency structure, operative experience, and subspecialty training. The aim of this study is to evaluate the impact of surgeon specialty on outcomes following EVAR.

METHODS: Patients who underwent EVAR were identified from the 2007-2009 Nationwide Inpatient Sample (NIS). Physician identifiers in the NIS were used to determine surgical specialty and operative experience. Multivariate analysis adjusted for mortality risk was used to compare differences in demographics, complications, outcomes, and hospital covariates.

RESULTS: A total of 5,147 EVARs were identified within the NIS, of which 88.3% were completed by vascular surgeons. There were no significant differences in demographics between the specialties. Cardiothoracic surgeons were more likely to have a postoperative stroke (3.1% vs. 0.2%, OR 14.6, 95% CI 1.8-117.8, P<0.05) and cardiac complications (9.4% vs. 2.0%, OR 5.0, 95% CI 1.5-16.6, P<0.01) compared to other specialties. Vascular surgeons were somewhat more likely to have postoperative respiratory complications (0.7% vs. 0.0%, P<0.05). Overall costs were lowest for vascular surgeons ($32,094), and highest for cardiothoracic surgeons ($41,663, P<0.05). Postoperative mortality was highest for general surgeons (7.4% vs. 2.5%, OR 3.2, 95% CI 1.1-8.9, P<0.05). Only vascular surgeons completed more than 10 EVARs per year.

CONCLUSIONS: Physician specialty and operative experience impacts patient outcome following EVAR. Low volume surgeons have a higher rate of complications, cost, and mortality, but this was not the case for interventional cardiologists or radiologists. These findings may impact patient referral patterns and hospital privileges for providers.

Table I. Patient characteristics by specialty.

Variable	Interventional Radiologist	Interventional Cardiologist	General Surgeon	Cardiothoracic Surgeon	Vascular Surgeon
Demographics					
Total cases	373 (7.2%)	141 (2.7%)	54 (1.0%)	32 (0.6%)	4,547 (88.3%)
Age	73.6 +/- 10.4	73.4 +/- 9.1	73.9 +/- 11.4	67.1 +/- 11.7	73.7 +/- 8.7
Female gender	19.8%	17.7%	22.2%	18.8%	18.6%
Elective	79.9%	82.9%	74.1%	75.0%	82.7%
DRG mortality risk	1.8 +/- 0.9	1.9 +/- 0.9	2.9 +/- 1.2^	1.9 +/- 1.1	1.8 +/- 0.9
DRG severity of illness	1.9 +/- 0.9	1.9 +/- 0.8	2.9 +/- 0.9^	1.9 +/- 1.0	1.9 +/- 0.8
Complications					
Bleeding	4.6%	2.8%	1.9%	3.1%	3.5%

Stroke	0.3%	0.0%	0.0%	3.1%^	0.2%
Cardiac	1.6%	1.4%	0.0%	9.4%^	2.0%
Respiratory	0.0%	0.0%	0.0%	0.0%	0.7%*
Vascular	0.3%	0.7%	0.0%	3.1%	1.0%
SSI	0.3%	0.0%	0.0%	0.0%	0.4%
Other	1.3%	0.0%	0.0%	0.0%	0.7%
Outcomes					
Length of stay (days)	4.0 +/- 4.9	3.2 +/- 3.5	4.5 +/- 10.6	5.4 +/- 7.0	3.7 +/- 7.1
Costs	$38,667#	$33,599	$33,274	$41,663*	$32,094#
Mortality	1.3%	0.7%	7.4%*	6.3%	2.5%
Hospital Covariates					
Urban location	93.4%	96.9%	100%	100%	95.1%
Teaching hospital	38.0%#	40.6%	71.4%	73.3%	58.4%#

* P<0.05; ^ P<0.01, # P<0.001.

Table II. Mortality risk-adjusted multivariate analysis of practitioner specialty and outcomes following EVAR.

Variable	Interventional Radiologist			Interventional Cardiologist			General Surgeon			Cardiothoracic Surgeon			Vascular Surgeon		
	OR	**CI**	**P**	**OR**	**CI**	**P**	**OR**	**CI**	**P**	**OR**	**CI**	**P**	**OR**	**CI**	**P**
Bleeding	1.32	0.79-2.20	N.S.	0.81	0.29-2.21	N.S.	0.52	0.072-3.79	N.S.	0.89	0.12-6.56	N.S.	Reference		
Stroke	1.22	0.16-9.55	N.S.	N/A			N/A			14.64	1.82-117.83	<0.05	Reference		
Cardiac	0.78	0.34-1.80	N.S.	0.69	0.17-2.83	N.S.	N/A			4.95	1.48-16.55	<0.01	Reference		
Respiratory	N/A			N/A			N/A			N/A			Reference		
Vascular	0.28	0.038-2.00	N.S.	0.73	0.10-5.34	N.S.	N/A			3.30	0.44-24.72	N.S.	Reference		

SSI	0.76	0.10-5.76	N.S.	N/A			N/A			N/A			Reference
Other	1.92	0.74-4.95	N.S.	N/A			N/A			N/A			Reference
Death	0.54	0.22-1.33	N.S.	0.28	0.040-2.04	N.S.	3.17	1.13-8.92	<0.05	2.64	0.62-11.18	N.S.	Reference

Table III. Impact of volume on EVAR outcomes by physician specialty.

Variable	Interventional Radiologist	Interventional Cardiologist	General Surgeon	Cardiothoracic Surgeon	Vascular Surgeon	
Volume	Low volume	Low volume	Low volume	Low volume	Low volume	High volume
Bleeding	4.6%	2.8%	1.9%	3.1%	3.7%	2.9%
Stroke	0.3%	0.0%	0.0%	3.1%	0.3%	0.1%
Cardiac	1.6%	1.4%	0.0%	9.4%	2.0%	2.1%
Respiratory	0.0%	0.0%	0.0%	0.0%	0.6%	0.1%
Vascular	0.3%	0.7%	0.0%	3.1%	1.0%	0.7%
SSI	0.3%	0.0%	0.0%	0.0%	0.4%	0.1%
Other	1.3%	0.0%	0.0%	0.0%	0.8%	0.5%
Length of stay (days)	4.0 +/- 4.9	3.2 +/- 3.5	4.5 +/- 10.6	5.4 +/- 7.0	3.8 +/- 7.6	3.5 +/- 2.0
Costs	$32,858	$33,599	$33,274	$25,801	$32,130	$31,950
Mortality	1.3%	0.7%	7.4%	6.3%	2.4%	2.7%

Presentation Number: 2

Publishing Title: Endovascular Repair of Ruptured Abdominal Aortic Aneurysms does not Independently Reduce Long-Term Mortality Compared to Open Repair

Author Block: **William P. Robinson, MD**, Andres Schanzer, MD, Francesco Aiello, MD, Julie Flahive, MS, Danielle R. Doucet, MD, Jessica P. Simons, MD, MPH, Elias Arous, MD, Louis M. Messina, MD.
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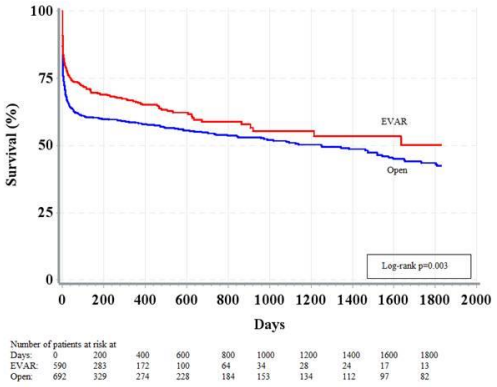
Abstract Body:

OBJECTIVES: Endovascular repair (EVAR) of ruptured abdominal aortic aneurysms (RAAA) reduces in-hospital mortality compared to open repair (OR) but it is unknown whether EVAR reduces long-term mortality. We hypothesized that EVAR of RAAA would independently reduce long-term mortality compared to OR.

METHODS::The Vascular Quality Initiative (VQI) database (2003-2013) was used to determine Kaplan-Meier 1-year and 5-year mortality after EVAR and OR of RAAA. Multivariate analysis was performed to identify patient and operative characteristics associated with mortality at 1 and 5 years after RAAA repair.

RESULTS: Among 590 patients who underwent EVAR and 692 patients who underwent OR of RAAA, the lower mortality seen in-hospital after EVAR (EVAR: 23% vs. OR: 35%, p<0.001) persisted at 1-year (EVAR: 34% vs. OR: 42%, p=0.001) and 5 years (EVAR: 50% vs. OR: 58%, p=0.003, Figure) after repair. After adjusting for patient and operative characteristics, EVAR did not independently reduce mortality at 1 year (HR .88 [.7-1.1]) or 5 years (HR .95 [.77-1.2]) compared to OR. Women (HR 1.3 [1.04-1.6]), age (HR 1.06 [1.05-1.08] per 5 years), home oxygen use (HR 1.9 [1.3-2.7]), dialysis-dependence (HR 3.9 [1.8-8.6]), cardiac ejection fraction <50 % (HR 1.5 [1.03-2.1]), as well as preoperative systolic blood pressure< 90 mmHg (HR 1.4 [1.1-1.8]), loss of consciousness (HR 1.7 [1.3-2.2]), and cardiac arrest (HR 3.4 [2.5-4.5]) on admission predicted mortality at 1 and 5 years after RAAA repair. Type I endoleak (HR 2.2 [1.2-3.8]) also predicted mortality at 1 year.

CONCLUSIONS: EVAR does not independently reduce long-term mortality compared to OR. Patient comorbidities and indices of shock on admission are the primary independent determinants of long-term mortality. However, the lower early mortality observed in the VQI for patients selected to undergo EVAR of RAAA compared to patients selected for OR is sustained over time, supporting the use of EVAR for RAAA in appropriate candidates. Better elucidation of the key selection factors, including aneurysm anatomy, is needed to best select patients for EVAR and OR in order to reduce long-term mortality.



Presentation Number: 3

Publishing Title: Abdominal Aortic Aneurysm Anatomic Severity Grading Score Predicts Aortic Branch Vessel Complications, Non-Aortic Adverse Events, and Survival

Author Block: **William B. Best, BS**, S Sadie Ahanchi, MD, Kedar S. Lavingia, Chad P. Ammar, MD, Sebastian Larion, MS, Jean M. Panneton, MD, FRCSC.
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Abstract Body:
OBJECTIVES: Our aim was to examine the predictive value of ASG score on aortic branch vessel complications, non-aortic adverse events, and survival.
METHODS: Using 3D reconstruction of preoperative CTA imaging (TeraRecon Aquarius iNtuition Workstation, Foster City, CA), we retrospectively reviewed EVARs from 2009-2012. Two independent patient groups were created based on ASG score: < 14 (low-score group) and ≥ 14 (high-score group). Aortic branch vessel complications, non-aortic adverse events, and survival were collected and analyzed in relation to ASG score.
RESULTS: 218 patients were analyzed: mean age 74 years (range 48-92), 75% male and 83% caucasian, 114 were in the low-score group and 104 were in the high-score group. Excluding age, there were no other differences in demographics between groups. There were 17 patients with 30-day aortic branch vessel complications: claudication or rest pain (50%), renal insufficiency (39%), and spinal or mesenteric ischemia (11%). The incidence of 30-day branch vessel complications was significantly different between the low-score group (n=5, 4%) and the high score group (n=12, 11%), (p=.049). There were 23 patients with 30-day non-aortic adverse events: pulmonary dysfunction (46%), coagulopathy (32%), deep vein thrombosis (DVT) (14%), myocardial infarction (4%), and cerebrovascular accident (CVA) (4%). The incidence of 30-day non-aortic adverse events trended toward statistical significance when analyzing the low-score group (n=8, 7%) versus the high-score group (n=15, 14%), (p=0.075). When we combined 30-day aortic branch vessel complications with 30-day non-aortic adverse events, we found that the low-score group was statistically different from the high-score group (n=10, 9% versus n=23, 22%), (p=0.006). After 30 days, there were 40 patients who had midterm aortic branch complications and 41 patients who had non-aortic adverse events. After Kaplan-Meier Analysis, the freedom from adverse events was statistically different at both 1 year (80% vs 71%) and 2 years (79% vs 65%), (p=.006). Lastly, Kaplan-Meier analysis revealed a significantly longer survival in the low score group (93% and 90% at 1 and 4 years) versus the high score group (88% and 80% at 1 and 4 years), p=.022.
CONCLUSIONS: The AAA ASG score can not only be used to predict operative complexity and reinterventions, but also 30-day and midterm aortic branch vessel complications, non-aortic adverse events, and survival.

Presentation Number: 4

Publishing Title: Penetrating Ulcers of the Abdominal Aorta and Iliac Arteries: Harbingers of Aortic Catastrophe or Benign?

Author Block: **Tanya R. Flohr, MD**, Patrick Norton, MD, Amit Jain, MD, Margaret C. Tracci, MD, John A. Kern, MD, Irving L. Kron, MD, Irving L. Kron, MD, Kenneth J. Cherry, MD, Gilbert R. Upchurch, Jr., MD.
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Abstract Body:
OBJECTIVES: Penetrating aortic ulcers can be a concerning finding on imaging. They are believed to be the predecessors for intramural hematomas, dissections and aneurysm degeneration. It is hypothesized that penetrating ulcers of the abdominal aorta (PUAA) and iliac arteries (PUIA), like their thoracic counterparts, signal impending vascular catastrophe.
METHODS: With the institution of electronic medical records at our health system in 2010, a search for the words "penetrating ulcer" in radiology reports became possible. Fifty-three patients were identified as having a penetrating ulcer of the abdominal aorta (PUAA) on CTA over a 10 month period from October 2010 through August 2011. Thirty-four patients were identified as having a penetrating ulcer of the iliac vessels (PUIA). The patients' clinical course was followed through August 2014. No specific intervention for the ulcers was performed; however, if the patient had additional aortic pathology necessitating intervention, it was performed. Retrospective and prospective review of imaging was performed when possible. Student's t and chi square tests were performed for statistical analysis.
RESULTS: The table below compares the two populations studied, PUAA and PUIA.

	PUAA, n=53	**PUIA, n=34**	***p***
Age (years)	76.7 ± 10.2	74.5 ± 10.0	0.315
Males	35 (66%)	28 (82%)	0.097
Length of Follow-up (months)	35.7 ± 29.9	34.7 ± 20.6	0.613
Patients w/Serial Imaging	30 (57%)	19 (60%)	0.940
Length of Time for Serial Imaging (months)	20.6 ± 30.5	29.6 ± 19.7	0.626
Concurrent Aortic Dissection or Aneurysm	23 (46%)	19 (56%)	0.255
Change in Ulcer Appearance or Aortic Diameter	13 of 30 (43%)	1 of 19 (5%)	*0.004*
If Change, Worsening	8 of 30 (27%)	1 of 19 (5%)	0.059
Deceased During Follow-up	19 (36%)	7 (21%)	0.129
Cause of Death Related to Aortic Pathology	5 of 19 (26%)	1 of 7 (14%)	0.518

Eight patients had both PUAA and PUIA. Of the five PUAA deaths related to aortic pathology, one died from complications related to type B dissection, three died from complications related to lower extremity thromboembolism, and one died from multisystem organ failure after attempted surgical repair of his iliac artery aneurysm. The one PUIA death related to aortic pathology died from complications related to lower extremity thromboembolism.
CONCLUSIONS: The patients identified with penetrating ulcers of the abdominal aorta and iliac artery were generally elderly with multiple comorbidities. A large percentage of patients had concurrent, separate, aortic pathology, most frequently aortic aneurysms which were treated if size indicated. Small changes in the appearance of the PUAA were frequent, but did not equate with abdominal aortic catastrophe. Thromboembolic events occurred not infrequently in these patients. The mortality for these populations was high, but the change noted in the ulcers' appearance during follow up did not suggest ulcer treatment would improve survival.

Presentation Number: 5

Publishing Title: Impact of Physician Specialty upon Outcomes Following TEVAR

Author Block: **Jason Andre, MD**, Nick Nolte, MD, James Pan, MD, Douglas Hood, MD, Kim J. Hodgson, MD, Sapan S. Desai, MD, PhD, MBA. Southern Illinois University, Springfield, IL, USA.

Abstract Body:

OBJECTIVES: Thoracic endovascular aneurysm repair (TEVAR) is commonly performed by interventional radiologists, cardiologists, general surgeons, cardiothoracic surgeons, and vascular surgeons, with each specialty having differences in residency structure, operative experience, and subspecialty training. The aim of this study is to evaluate the impact of surgeon specialty on outcomes following TEVAR.

METHODS: Patients who underwent TEVAR were identified from the 2007-2009 Nationwide Inpatient Sample (NIS). Physician identifiers in the NIS were used to determine surgical specialty and operative experience. Multivariate analysis adjusted for surgeon experience and mortality risk was used to compare differences in demographics, complications, outcomes, and hospital covariates.

RESULTS: A total of 2,531 TEVAR cases were completed during the study period, of which 73.8% were completed by vascular surgeons, 15.8% by cardiothoracic surgeons, 8.0% by interventional radiologists, and the remainder by interventional cardiologists and general surgeons. Interventional cardiologists and general surgeons had too low of a sample size for valid statistical analysis. Interventional radiologists had significantly more elective cases (77.8%, P<0.001) than cardiothoracic surgeons (47.2%) or vascular surgeons (53.8%), but had a significantly higher rate of stroke (7.6% vs. 1.1%, P<0.001), cardiac events (7.2% vs. 3.6%, P<0.001), respiratory complications (4.8% vs. 1.9%, P<0.001), vascular complications (7.5% vs. 2.6%, P<0.01), and surgical site infection (2.8% vs. 0.8%, P<0.01). Despite these complications, length of stay (10.7 days) and median costs ($52,156) were similar across the three specialties. Cardiothoracic surgeons completing TEVAR have the highest mortality rate (8.6% vs. 2.6%, P<0.01). Vascular surgeons have a low stroke rate (1.1%, P<0.05 vs. interventional radiologists) and lower rate of cardiac events (3.6% vs. 6.1%, P<0.01) despite caring for patients with higher DRG mortality scores (3.6 vs. 3.4, P<0.05).

CONCLUSIONS: Physician specialty impacts patient outcome following TEVAR. Vascular surgeons have the lowest overall morbidity following TEVAR compared to the other specialties, and lower mortality compared to cardiothoracic surgeons. These findings may impact patient referral patterns and hospital privileges for providers.

Table I. Patient characteristics for those who underwent TEVAR by specialty.

Variable	Interventional Radiologist	Interventional Cardiologist+	General Surgeon+	Cardiothoracic Surgeon	Vascular Surgeon
Demographics					
Total cases	203 (8.0%)	40 (1.6%)	20 (0.8%)	400 (15.8%)	1,868 (73.8%)
Age	62.4 +/- 20.2	49.8 +/- 23.4	38.8 +/- 11.7#	66.3 +/- 14.1	66.4 +/- 15.7#
Female gender	39.6%	49.6%	25.7%	37.5%	42.5%
Elective	77.8%#	26.5%	0.0%#	47.2%^	53.8%
DRG mortality risk	3.5 +/- 0.9	1.5 +/- 0.5	+	3.4 +/- 1.1	3.6 +/- 1.0*
DRG severity of illness	2.4 +/- 0.9	3.1 +/- 1.1	+	2.6 +/- 0.9	2.6 +/- 1.0
Complications					
Bleeding	5.4%	+	+	9.1%	7.8%
Stroke	7.6%#	+	+	0.0%*	1.1%*
Cardiac	7.2%*	+	+	6.1%	3.6%^

Respiratory	4.8%^	+	+	1.2%	1.9%
Vascular	7.5%#	+	+	2.4%	2.6%
SSI	2.8%^	+	+	0.0%	0.8%
Other	0.0%	+	+	0.0%	0.2%
Outcomes					
Length of stay (days)	10.7 +/- 14.1	15.1 +/- 14.4	27.7 +/- 16.0#	9.3 +/- 10.3	10.1 +/- 13.2
Costs	$52,156	$72,447	$52,742	$45,120	$46,450
Mortality	2.6%	+	+	8.6%^	5.5%
Hospital Covariates					
Urban location	100%	100%	100%	100%	96.3%^
Teaching hospital	59.7%#	100%	100%	87.5%	84.3%

+ Insufficient sample size; data do not accurately represent population-level estimates. * P<0.05; ^ P<0.01, # P<0.001.

Presentation Number: MP1

Publishing Title: Trends in Aortic Repair at a Tertiary Academic Center 2007-2014

Author Block: **Mathew Wooster, MD**, Adam Tanious, MD, Alexis Powell, MD, Paul Armstrong, DO, Martin Back, MD, Karl Illig, MD, Brad Johnson, MD, Murray Shames, MD.
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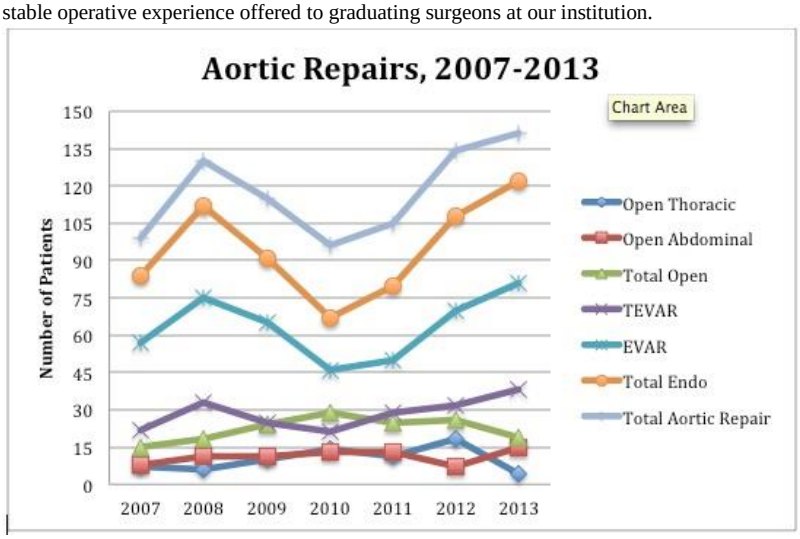
Abstract Body:

OBJECTIVE: Concern has arisen regarding the ability to train future surgeons in open aortic exposure as endovascular repair has blossomed. Recognizing these concerns and the current literature suggesting trainee experience has decreased, we sought to review the trends in open versus endovascular aortic repair in a tertiary referral center responsible for training nine vascular and general surgery graduates annually.

METHODS: Deidentified billing records were reviewed by CPT and ICD-9 codes to identify all patients treated for thoracic or abdominal aortic pathology from 2007 (first year of the integrated vascular surgery residency) to 2014. Data from the current year was excluded from all comparisons involving gross volume per year given that it is incomplete, but was included in comparisons involving relative proportions.

RESULTS: Over the 7-year period studied, total aortic repairs fluctuated with a nadir of 96 in 2010 and peak 141 in 2013. Thoracic, abdominal, and total aortic repairs all decreased from 2007 to 2010, then increased to a peak in 2013. There was a concomitant increase in proportion of open repairs as the total number decreased, followed by a decrease in proportion of open repairs as the total number increased (Figure). Open repair accounted for 15-40% of procedures annually and ruptured aneurysms accounted for 3-14 cases annually. The primary insurance provider was Medicare for 60-75% of patients through the study period.

CONCLUSIONS: Total case volume has increased, and despite the growth of endovascular repair, there remains a stable volume of open aortic experience. The trends in volume and proportion of endovascular versus open repairs as well as thoracic versus abdominal repairs suggest an increased complexity of cases. A possible reason for the increase in volume may be attributed to an increase in salvage procedures for failing endografts and the introduction endovascular procedures for juxtarenal and suprarenal AAA's. Future work is needed to compare the relative complexity and indications for repairs, but overall, there appears to be a stable operative experience offered to graduating surgeons at our institution.



Presentation Number: MP2

Publishing Title: The Impact of Percutaneous Access on the Outcomes of Endovascular Abdominal Aortic Aneurysm Repair

Author Block: **Cassius Iyad N. Ochoa Chaar, MD, MS**[1], Laura A. Skrip, MPH[2], Bart E. Muhs, MD, PhD[1], Jeffrey E. Indes, MD[1], Bauer E. Sumpio, MD, PhD[1], Timur P. Sarac, MD[1], Alan Dardik, MD, PhD[3]
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Abstract Body:

OBJECTIVES: Percutaneous access for endovascular abdominal aortic aneurysm repair (EVAR) is increasing in popularity despite controversial advantages derived mostly from case series. This is the first study to compare outcomes after percutaneous and open access for EVAR derived from a national vascular database.

METHODS: The American College of Surgeons NSQIP files targeting EVAR for the years 2011 and 2012 were reviewed. Two groups were selected for comparison based on EVAR access: totally percutaneous (PEVAR) and bilateral surgical cut down (SEVAR). Only procedures performed electively for asymptomatic aneurysm growth were included. Patients with fenestrated grafts were excluded, as well as patients undergoing concomitant procedures such as renal artery stenting. The outcomes of EVAR were examined and statistical comparison between the 2 groups was performed using SAS version 9.3.

RESULTS: There were 918 SEVAR and 360 PEVAR. 5 patients had open cut down after failed percutaneous access. The open conversion rate was 1.4%. There was no statistical difference between the 2 groups in age (p=0.78), sex (p=0.98), or functional status (p=0.42). The comorbidities were comparable with respect to incidence of diabetes (p=0.651), hypertension (p=0.70), heart disease (p=0.99), smoking (0.08), morbid obesity (p=0.21), and renal failure (p=0.99). PEVAR was performed more frequently with local and regional anesthesia (PEVAR =8.1% vs SEVAR 3.7%, p=0.005). The total operating time was significantly decreased with percutaneous access (PEVAR = 124 ± 46 min vs SEVAR = 145 ± 76, p < 0.001). SEVAR patients had significantly more wound complications (SEVAR = 1.85% vs PEVAR =0.28%, p=0.033). There was no difference in mortality (p=0.515), lower extremity ischemia (p=0.999), aneurysm rupture (p =0.484), myocardial infarction (p=0.908), pneumonia (p=0.359), between the 2 groups. The time from operation to discharge (p = 0.391), the length of the ICU stay (0.936), and the discharge destination (p=0.500) were no different. There was no difference in 30-day readmission rate (p=0.969) or return to the OR (p= 0.368). (Table)

CONCLUSIONS: PEVAR is performed with low conversion rate to open access. Percutaneous access decreases operating time and wound complications of EVAR. These results justify the emerging trend of performing PEVAR, but its cost effectiveness remains to be determined.

Outcomes of PEVAR and SEVAR

Outcome	SEVAR N(%)	PEVAR N(%)	p - value
wound complications	17 (1.85%)	1 (0.28%)	0.033
Myocardial infarction	12 (1.31%)	5 (1.39%)	0.908
Aneurysm Rupture	1 (0.11%)	1 (0.28%)	0.484
Low Extremity Ischemia	6 (0.65%)	2 (0.56%)	0.999
Length of ICU Stay (days)	1.71 ± 2.32	1.73 ± 1.80	0.936
Time from Operation to Discharge (days)	2.35 ± 3.27 Range:0-50	2.19 ± 2.89 Range:0-40	0.391
Return to the OR	26 (2.83%)	7 (1.94%)	0.368
Readmission	15 (1.66%)	6 (1.69%)	0.969

Death (within 30 days)	7 (0.76%)	4 (1.11%)	0.515

Presentation Number: MP3

Publishing Title: In-hospital Mortality Following Aortic Reconstructions for Occlusive Disease Varies by Indication as well as Concomitant Abdominal Aortic Aneurysm, 2003 - 2010

Author Block: **Vijaya T. Daniel, MD, MPH**[1], Naren Gupta, MD, PhD[2], Joseph D. Raffetto, MD[2], James T. McPhee, MD[3]
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Abstract Body:

OBJECTIVES: National data evaluating outcomes for occlusive abdominal aortic reconstructions are well described. The relative effect of operative indication, as well as the presence of concomitant AAA on in-hospital mortality is not well defined.

METHODS: The Nationwide Inpatient Sample (NIS) was queried to identify patients who underwent open aortic surgery (2003-2010). Indication for surgery was classified by ICD-9 diagnostic codes to identify isolated occlusive indications as well as combined occlusive disease and AAA. Primary outcome was in-hospital mortality. Secondary outcomes were complications and discharge disposition.

RESULTS: Overall, 56,374 underwent aortic reconstruction, 48,591 for occlusive disease (86.2%) and 7783 for combined occlusive disease with AAA (13.8%). Intermittent Claudication (IC) was the most common indication for intervention (60.9%) while 39.7% underwent intervention for CLI (22.2% rest pain, 17.6% gangrene). ICs had more concomitant AAA (17.3%), than did CLIs (8.4%). The baseline characteristics for those with occlusive disease and combined occlusive with AAA disease were similar in terms of obesity (4.8% vs 4.2%, P=0.27) and CHF (6.6% vs 6.3%, P=0.65), but differed by age (62.2 yrs vs. 68.4 yrs, P<0.0001) and HTN (65.4% vs. 69.1%, P=0.005). Patients with combined occlusive and AAA disease had higher mortality than those with occlusive disease alone (3.9% vs. 2.7%, P=.01). Outcomes stratified by indication are shown in the table. On multivariable regression, factors associated with in-hospital mortality included gangrene with AAA compared to gangrene alone (2.8 [1.6, 4.7], P<0.0002), age > 65 years age (3.1 [2.4, 4.1], P<0.0001), renal failure (2.7 [1.9, 3.8], P<0.0001), and concurrent lower extremity revascularization (1.3 [1.1, 1.7], P<0.02).

CONCLUSIONS: IC or CLI with concomitant AAA carries a higher mortality than IC or CLI alone, especially in older patients with gangrene requiring revascularization and renal insufficiency. Preoperative risk stratification strategies should focus on the indication for surgery as well as the presence of concomitant AAA.

In-hospital Mortality Following Aortic Surgery for Occlusive Indications ± Concomitant AAA

Variable	Claudication N=34,357 (60.9%)			Rest Pain N=12,514 (22.2%)			Gangrene N=9896 (17.6%)		
	Isolated N=28,423	AAA N=5934	P value	Isolated N=11,414	AAA N=1100	P value	Isolated N=9109	AAA N=787	P value
Mortality	1.9%	2.7%	0.0048*	2.4%	4.2%	0.14	5.6%	13.2%	0.0001*
LOS, Days	7.3 ± 0.1	8.0 ± 0.2	<0.0001*	8.4 ± 0.2	9.3 ± 0.5	<0.0001*	14.6 ± 0.4	16.4 ± 1.2	0.16
Discharge to Facility	8.6%	15.5%	<0.0001*	12.5%	22.2%	<0.0001*	38.8%	47.1%	0.05*

Tracheostomy	0.6%	0.2%	0.11	0.6%	1.9%	0.03*	1.3%	4.9%	0.0004*

Presentation Number: MP4

Publishing Title: Contemporary 30-day Outcomes for Percutaneous Endovascular Aneurysm Repair Using the ACS-NSQIP Database

Author Block: **Nathan Orr, MD**, Daniel L. Davenport, PhD, Joseph Bobadilla, MD, Eleftherios S. Xenos, MD, David J. Minion, MD.
University of Kentucky, Lexington, KY

Abstract Body:

OBJECTIVE: Previous review of 30-day outcomes of percutaneous Endovascular Aneurysm Repair (pEVAR) using the ACS-NSQIP data from the years 2005-2008 revealed decreased operative times, but increased composite morbidity and similar mortality and length of stay compared to standard EVAR via open femoral exposure. In contrast, the recent FDA pEVAR trial conducted from 2010-2012 demonstrated non-inferiority of pEVAR to standard EVAR in trained operators using the Perclose ProGlide. The purpose of this study was to examine contemporary real world experience with pEVAR.

METHODS: We queried the ACS-NSQIP public use file from 2012. This data specifically listed the type of access as documented in the operative note, including “bilateral groin cutdown”, “attempted percutaneous access converted to open cutdown” and “percutaneous bilateral.” Based on intention to treat, the “attempted” and “successful” percutaneous access cases were combined to the pEVAR group. Cases of unilateral cutdown with contralateral percutaneous were excluded, as were non-elective cases. We then compared preoperative and perioperative data between pEVAR and standard EVAR, as well as 30-day outcomes and length of hospital stay.

RESULTS: Specific access codes were documented for 1,413 EVAR procedures: 408 percutaneous (including 14 conversions) and 1005 via groin cutdown. Compared to the pEVAR group, the standard EVAR group included a higher percentage of patients that were ASA class IV or V (21% vs 16%, p=0.02) or Obese BMI>30 (33% vs 28%, p=0.04). Outcomes are summarized in Table 1. Of note, the decreased wound complication rate for pEVAR lost statistical significance when corrected for obesity.

CONCLUSIONS: Contemporary data suggests that pEVAR continues to be associated with decreased operative times, but no longer is associated with increased morbidity compared to standard EVAR. In addition, Length of Stay was decreased in the pEVAR group. However, the results may have been influenced by selection biases favoring pEVAR.

Table 1

Variable	Percutaneous	Groin Cutdown	P-Value
No. of Procedures	408	1005	
Median Duration of Operation, min. (IQR)	120 (96 – 159)	138 (108 – 180)	< .001
Median Length of Hospital Stay, days (IQR)	1 (1 – 3)	2 (1 – 3)	.005
% 30-day mortality	1.8	1.3	.484
% 30-day morbidity (any of the following)	20.8	22.7	.427
%Transfused w/in 72 h. of operation,	10.1	11.4	.482
% Return to the OR	2.9	4.2	.251
% Readmitted w/in 30 days	8.6	8.9	.922
% Cardiac or Respiratory Failure	3.3	3.1	.876

% Graft Failure w/in 30 days	0	0	1.000
% Surgical Site Infection or Dehiscence	0.7	2.3	.024
% Renal Insufficiency or Failure	2.6	2.5	.860
% Pneumonia	0.9	0.9	1.000
% Sepsis/Septic Shock	0.7	1.0	.773
% Treated DVT/Pulmonary Embolism	1.1	0.9	.781

Monday, March 30th
Scientific Session II – Lower Extremity I

Presentation Number: 6

Publishing Title: Predictive Ability of the SVS Lower Extremity Guidelines Committee Wound, Ischemia, and foot Infection (WIfI) Scale

Author Block: **Jeremy D. Darling, B.A.**, John C. McCallum, M.D., Yifan Meng, B.S., Peter Soden, M.D., Sara Zettervall, M.D., Dominique Buck, M.D., Mark Wyers, M.D., Allen Hamdan, M.D., Marc L. Schermerhorn, M.D.
Beth Israel Deaconess Medical Center, Boston, MA, USA.

Abstract Body:
OBJECTIVES: The Society for Vascular Surgery (SVS) Lower Extremity Guidelines Committee has composed a new threatened lower extremity classification system that reflects the three major factors that impact amputation risk and clinical management: Wound, Ischemia, and foot Infection (WIfI). Our goal was to evaluate the predictive ability of this scale following any infrapopliteal endovascular intervention for Critical Limb Ischemia (CLI).
METHODS: From 2004 to 2014, 673 patients underwent an infrapopliteal endovascular intervention for tissue loss (77%), rest pain (13%), stenosis of a previously treated vessel (5%), acute limb ischemia (3%), or claudication (2%). Patients without an initial grade in all WIfI categories were excluded. Patients were stratified both into clinical stages 1 to 4 based on the SVS WIfI classification for 1-year amputation and revascularization risk, as well as a novel composite score from 0 to 9. Outcomes included the SVS objective performance goals (major amputation, amputation-free survival, and wound healing) as well as mortality and RAS events (revascularization, major amputation, or stenosis [>3.5x step-up by duplex]). Analyses were performed using multivariable logistic regression, Cox regression models, and Kaplan-Meier survival estimates.
RESULTS: Of the 596 CLI patients, 551 were classified in all three WIfI domains on a scale of 0 (least severe) to 3 (most severe). Of these 551 patients, 84% were treated for tissue loss and 16% for rest pain. A Cox regression model illustrated that an increase of 1 clinical stage increases the rate of major amputation (Hazard Ratio [HR], 1.4; 95% Confidence Interval [CI], 1.0-2.0). A separate regression model showed that a 1-unit increase in the composite WIfI scale is associated with an increase in the rate of RAS events (HR, 1.2; 95% CI, 1.1-1.3) and a decrease in wound healing (HR, 1.2; 95% CI, 1.0-1.3).
CONCLUSIONS: This study suggests that the SVS WIfI classification system can predict 1-year amputation, RAS events, and wound healing following any endovascular infrapopliteal intervention for CLI.

1-Year Amputation Risk Following an infrapopliteal Endovascular Intervention

1-Year Amputation (n=77)

	Ischemia-0				Ischemia-1				Ischemia-2				Ischemia-3			
W-0	-	-	-	-	-	-	-	-	1%	-	-	-	4%	2%	-	-
W-1	-	-	-	-	1%	0%	0%	-	2%	2%	0%	0%	7%	7%	2%	0%
W-2	-	-	-	-	2%	4%	1%	-	8%	10%	4%	-	0%	2%	17%	8%
W-3	-	-	-	-	0%	0%	3%	-	2%	0%	2%	2%	2%	3%	2%	-
	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3
Clinical Stage 1*	W-Wound, fI- Foot Infection															
Clinical Stage 2*	*-Based on SVS WIfI Classifcation System															
Clinical Stage 3*																
Clinical Stage 4*																

Revascularization Risk Following an infrapopliteal Endovascular Intervention

Revascularization (n=117)

	Ischemia-0				Ischemia-1				Ischemia-2				Ischemia-3			
W-0	-	-	-	-	-	-	-	-	1%	-	-	-	11%	2%	-	-
W-1	-	-	-	-	1%	0%	1%	-	1%	4%	2%	0%	11%	7%	3%	0%
W-2	-	-	-	-	4%	3%	3%	-	6%	7%	5%	-	10%	4%	3%	1%
W-3	-	-	-	-	1%	1%	0%	-	1%	2%	2%	0%	1%	0%	2%	-
	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3
Clinical Stage 1*	W-Wound, fI- Foot Infection															
Clinical Stage 2*	*-Based on SVS WIfI Classifcation System															
Clinical Stage 3*																
Clinical Stage 4*																

Presentation Number: 7

Publishing Title: Effects on Renal Function after Percutaneous Mechanical Thrombectomy using Angiojet.

Author Block: **Matthew R. Abate, MD**, Dillon Burks, BS, Ahsan Ali, MD, Matthew R. Smeds, MD, Guillermo A. Escobar, MD.
University of Arkansas for Medical Sciences, Little Rock, AR, USA.

Abstract Body:

OBJECTIVES: Percutaneous mechanical thrombectomy (PMT) is a popular and useful tool for thrombus removal in acute thrombotic syndromes. Angiojet uses high pressure spray to break up and aspirate thrombus, in addition to delivering plasminogen activators. This is known to cause hemolysis, and all practitioners have noted periprocedural hematuria. Despite this, to our knowledge, there is no study evaluating the consequences to renal function after using this device. We sought to determine the incidence of acute kidney injury, and associated risk factors after using Angiojet for thrombolysis.

METHODS: With IRB approval, we retrospectively reviewed a prospectively-maintained database of all patients managed by the Vascular Surgery service from 2009-2012 with procedural codes describing thrombolysis (CPT 37201, 37187, 37209 and 75898), and/or Percutaneous Mechanical Thrombectomy (CPT 37187). We identified those treated with Angiojet and reviewed demographics, indications, laboratory values before and after the procedure (up to 3 days) and determined the incidence of acute kidney injury (AKI). AKI was defined as an increase in creatinine (Cr) >25% of baseline within 24-72hrs. Patients on dialysis before Angiojet, or without lab values before and 24-72hrs after treatment were excluded.

RESULTS: 144 lysis procedures were identified, and 53 were treated with Angiojet. Average age was 50 (range 87-20, median 49). Arterial thrombus was the indication in 68%; venous in the rest. AKI occurred in 15/53 (28%). Baseline Cr in AKI and non-AKI patients was similar, while Cr after Angiojet was not (p=0.01). Only 4 patients had a baseline Cr >1.4 (two in each group). Average age of AKI group was 54 (range 36-74, medium 49), 47% were male, and only one had a baseline Cr >1.4mg/dL (NS for all). Average creatinine increase from baseline in AKI group was 0.5mg/dL (167% rise p=0.003) compared to -0.07mg/dL (NS) in non-AKI patients. When compared to 53 lysis cases that did not use Angiojet, Cr change in Angiojet's group was higher (p=0.03).

CONCLUSIONS: This preliminary study suggests that AKI may occur in over one quarter of patients treated with Angiojet, independently of traditional risk factors for AKI (diabetes, baseline creatinine and age). This risk may be due to hemolysis, and is under-reported in the literature. Prospective studies and long-term consequences should be undertaken to better define this risk.

Presentation Number: 8

Publishing Title: Increasing Obesity Adversely Affects Limb Salvage Following Lower Extremity Revascularization in a 20 year Population Based Study

Author Block: **Animesh Rathore, MBBS**, Manju Kalra, MBBS, Jeffrey A. Nienaber, MD, Thomas Bower, MD, Audra A. Duncan, MD, Gustavo Oderich, MD, Randall De Martino, MD, Mark Fleming, MD, Peter Gloviczki, MD, Courtney Heins, William S. Harmsen.
Mayo Clinic, Rochester, MN, USA.

Abstract Body:

OBJECTIVES: We have previously reported trends of decreasing amputations along with increasing endovascular interventions for peripheral arterial disease (PAD) in a defined population between 1990 and 2009. The aim of this study was to analyze preoperative risk factors affecting outcomes in these patients.

METHODS: A retrospective cohort study of residents of a single county was conducted. Procedures were identified by ICD9/CPT codes and data collected through chart review. Endpoints of the study were major adverse limb events (MALE)), major amputations (AMPU), amputation-free survival (AFS) and mortality. Statistical analysis was performed using the Cox-proportional hazards model.

RESULTS: A total of 1906 lower extremity procedures were performed in 957 person limbs with PAD; 622 patients (M/F: 363/259) with a mean age 67.8 years, (range 27-98). These included open (713), endovascular (610), hybrid (75) revascularizations; primary (192) and secondary (340) amputations. Half the procedures (52%) were performed for critical limb ischemia (CLI) and 7% were emergent. The study population was predominantly white (96 %); comorbidities included dyslipidemia (62%), coronary artery disease (CAD, 47%) 26% with prior intervention, current smoking (42%), diabetes mellitus (DM, 37%) and renal insufficiency (RI, S. creatinine >2.0, 8%). On univariate analysis the most significant risk factor associated with MALE and AMPU was presence of CLI (HR 3.1 / 7.1), followed by RI on dialysis (HR 3.2 /5.2), emergent procedure (HR 3.0 / 2.5), DM (HR 2.0 / 3.9) and CHF (HR 1.9 / 3.4). The prevalence of significant obesity (BMI >35) increased from 6% in the 5 year interval 1990-94 to 12% in 2005-09, and was also significantly associated with MALE, AMPU and AFS (HR 2.4 / 4.3 / 1.5). In addition, factors associated with AFS and mortality included, age > 75 years (HR 2.4 / 2.8), anemia (HR 2.7 / 2.8), CAD without intervention (HR 1.6 / 1.8). Table I summarizes multivariate analysis for factors significantly associated with all endpoints.

CONCLUSIONS: This population based study confirms the traditional risk factors for adverse outcomes following revascularization for PAD. Severe obesity is emerging as an important risk factor not previously reported especially in light of increasing incidence in the population.

	MALE		Amputation		AFS		Mortality	
	N=217		N=85		N=466		N=301	
	HR (95%CI)	P-value	HR (95%CI)	P-value	HR (95%CI)	P-Value	HR (95%CI)	P-value
Race								
Non-white	2.0 (1.02-3.9)	.04	----------		----------		----------	
White	1.0 (reference)							
Chronic Dialysis								
Yes	2.0 (1.1-3.4)	.01	2.7 (1.4-5.0)	0.002	2.2 (1.4-3.6)	<.001	2.0 (1.2-3.4)	.01
No	1.0 (reference)		1.0 (reference)		1.0 (reference)		1.0 (reference)	
Diabetes Mellitus								
Yes	1.5 (1.1-2.1)	.008	2.4 (1.3-4.1)	0.003	1.5 (1.2-1.9)	.002	1.4 (1.1-1.8)	.007
No	1.0 (reference)		1.0 (reference)		1.0 (reference)		1.0 (reference)	
Type								
CLI	2.4 (1.8-3.3)	<.001	5.0 (2.6-9.5)	<.001	2.1 (1.7-2.7)	<.001	2.0 (1.5-2.6)	<.001
Claudication	1.0 (reference)		1.0 (reference)		1.0 (reference)		1.0 (reference)	
Urgency of Procedure								
Emergent	2.3 (1.5-3.6)	<.001	----------		1.7 (1.1-2.7)	.01	1.7 (1.1-2.6)	.009
Elective	1.0 (reference)				1.0 (reference)		1.0 (reference)	
Congestive Heart Failure								
Yes	----------		1.7 (1.01-3.0)	.048	2.2 (1.6-3.0)	<.001	2.3 (1.7-3.2)	<.001
No			1.0 (reference)		1.0 (reference)		1.0 (reference)	
Age								
>75	----------		----------		2.1 (1.6-2.7)	<.001	2.3 (1.8-2.9)	<.001
≤75					1.0 (reference)		1.0 (reference)	
BMI								
≥35	----------		----------		1.5 (1.01-2.1)	.04	----------	
<35					1.0 (reference)			
COPD/ Emphysema								
Yes	----------		----------		1.3 (1.01-1.8)	.04	1.4 (1.1-1.9)	.02
No					1.0 (reference)		1.0 (reference)	
Hematocrit ≤30								
Yes	----------		----------		----------		1.6 (1.07-2.3)	.02
No							1.0 (reference)	
Coronary Artery Disease/ Intervention								
CAD with Intervention								
CAD with No Intervention	----------		----------		1.1 (.85-1.5)	.38	1.2 (.87-1.6)	.30
NO CAD					1.4 (1.04-1.8)	.02	1.6 (1.2-2.1)	.003
					1.0 (reference)		1.0 (reference)	

Presentation Number: 9

Publishing Title: Early and Mid-Term Outcomes of PTFE-Covered Stent versus Bare Metal Stent in the Primary Treatment of Severe Iliac Artery Obstructive Lesions.

Author Block: **Michele Piazza, M.D.**[1], Luca Milan, M.D.[1], Paola Scrivere, M.D.[1], Stefano Bonvini, M.D.[1], Joseph J. Ricotta, Jr., M.D.[2], Franco Grego, M.D.[1], Michele Antonello, M.D.[1].
[1]Vascular and Endovascular Surgery Clinic, Padova University., Padova, Italy, [2]Vascular and Endovascular Surgery, NorthSide, Atlanta, GA, USA.

Abstract Body:
OBJECTIVES: Objective of this study was to compare early and mid-term outcomes of PTFE-covered stent (CS) versus bare metal stent (BMS), in the primary treatment of severe TransAtlalntic InterSociety Consensus II (TASC) C and D iliac artery obstructive lesions.

METHODS: Between January 2009 and July 2014, 134 patients underwent 177 iliac arteries stenting; CS was implanted in 91 iliac arteries (51%), while BMS in 86 (49%). All patients were prospectively enrolled in a dedicated database. Thirty-day outcomes, mid-term patency and limb salvage were compared; follow-up results were analyzed with Kaplan-Meier curves. Clinical presentation, lesion site, extension and laterality, were evaluated for their association with patency in the two groups using multiple logistic regressions.

RESULTS: Overall**,** mean age was 69±9.27 with a Society for Vascular Surgery (SVS) comorbidity score of 0.89±0.55 with no differences after stratification by CS and BMS (p=0.7); iliac lesions were classified as TASC C (n=96; 54%) and D (n=81; 46%) with 89 being monolateral and 44 bilateral (67% vs 33%). Comparing CS and BMS, technical success was 99% in both groups (p=0.2); 30-day cumulative rate of surgical complications (4% vs 7%; p=0.51) mortality (0% vs 1.3%; p=0.34) and morbidity (3% vs 4.5%; p=0.63) were equivalent. At 18 months primary patency of CS vs BMS was similar (95% vs 92%; p=0.74) and was maintained after stratification by TASC C (97% vs 94%) and D (91% vs 89%); secondary patency was 97% vs 93% (p=0.91) and limb salvage was 99% and 98% (p=0.25) respectively. Multivariate analysis indicated that CS in long segment stenosis involving both common and external iliac artery was positive predictor of patency (OR, 2.8; 95% CI, 1.1-8.6; p=.03).

CONCLUSIONS: Overall the use of CS for severe iliac lesions has similar early and mid term outcomes compared to BMS. In a subcategory of TASC D lesions, with long segment severe stenosis of both common and external iliac artery, CS should be considered as primary line of treatment.

Presentation Number: 10

Publishing Title: Increased Pulse Pressure in Patients with Critical Limb Ischemia predicts Procedural Complications and Reinterventions.

Author Block: **Dominique B. Buck, MD**, Vanessa Lee, Jeremy D. Darling, BA, John C. McCallum, MD, Sara L. Zettervall, MD, Peter A. Soden, MD, Marc L. Schermerhorn, MD, Raul J. Guzman, MD.
BIDMC, Boston, MA, USA.

Abstract Body:
OBJECTIVES: Pulse Pressure (PP) is a non-invasive measure of arterial stiffness. Because it reflects lower arterial elasticity and compliance, it is thought to limit the success of endovascular interventions. In this study, we sought to determine whether increased PP was associated with worse long-term outcomes in patients undergoing endovascular infrapopliteal interventions.
METHODS: From 2004 to 2014, 596 patients underwent infrapopliteal angioplasty for critical limb ischemia (CLI). PP was derived from blood pressure measurements obtained within 24 hours of the procedure. Patients were divided into 2 groups, those with PP < 80 and those with PP ≥ 80. Outcomes included procedural complications, reintervention, major amputation, and mortality. Predictors were identified using multivariable logistic regression, Cox regression models, and Kaplan-Meier survival estimates.
RESULTS: Of 596 patients, 323 patients had a PP<80 and 273 had a PP≥80. Patients with PP≥80 were more likely to have hypertension (88 vs 82%, P=0.04), however, no other significant differences in patient demographics and comorbidities were identified. Three year reintervention rates and mortality were significantly more common in patients with PP ≥ 80 (29% vs. 20%, P=.02; 55% vs 45%, P=.01, respectively). (Table) A cox proportional hazards model illustrated that, over time, mortality was significantly higher in patients with PP ≥ 80 (Hazard Ratio [HR], 1.1; 95% CI, 1.3-2.0). In multivariable analysis, a PP ≥ 80 was a predictor of procedural complications (OR1.8, 95% CI 1.2-2.8, p=<.01) and reinterventions (OR 1.7, 95% CI 1.2-2.6, p=<.01).
CONCLUSIONS: Increased pulse pressure is associated with increased procedural complication rates, reintervention, and 3 year mortality suggesting that arterial stiffness plays an important role in outcomes after endovascular intervention for CLI.

Patient outcomes for patients with PP<80 and PP≥80. (* based on proportional hazards)

Outcomes, No. (%)	PP < 80 N=323	PP ≥ 80 N=273	P-value
Stent	91 (28)	91 (33)	0.17
Procedural complications	46 (14)	60 (22)	0.01
Length of stay (days) (mean[SD])	8.1 [7.7]	6.1 [6.4]	<.01
3-year reintervention	58 (20)	69 (29)	0.02 *
3-year repeat PTA/S	34 (12)	48 (16)	0.15 *
3-year bypass	23 (8)	32 (13)	0.04 *
3-year restenosis	79 (27)	82 (34)	0.07 *
3-year major amputation	45 (15)	30 (12)	0.36 *
3-year mortality	145 (45)	150 (55)	0.01 *

Presentation Number: MP5

Publishing Title: **The Impact of Geniculate Artery Collateral Circulation on Lower Limb Salvage Rates in Injured Patients**

Author Block: **Anahita Dua, MD, MS, MBA**[1], Sapan Desai, MD, PhD, MBA[2], Sean Johnston, MD[3], Naga R. Chinapuvvula, MD[3], Charles E. Wade, PhD[3], Charles J. Fox, MD[4], John B. Holcomb, MD[3], Sheila M. Coogan, MD[3]
[1]Medical College of Wisconsin, Milwaukee, WI, [2]Southern Illinois University, Springfield, IL, [3]University of Texas-Houston, Houston, TX, [4]Denver Health Medical Center, Denver, CO

Abstract Body:
OBJECTIVES: This study aimed to determine the association between geniculate artery flow on admission CTA and limb salvage outcomes in patients with lower extremity arterial injury.
METHODS: All injured patients at a level I trauma center with CT-angiogram (CTA) confirmed lower extremity common femoral artery (CFA), superficial femoral artery (SFA), profunda femoral artery (PFA), popliteal artery, and/or tibial artery trauma were included. Demographics, injury severity score (ISS), mechanism of injury, physiological parameters, the presence of geniculate artery collateral circulation (superior medial, superior lateral, medial, inferior medial, inferior lateral), and 30 day limb salvage outcome were recorded. Statistical analysis was completed
using descriptive statistics and chi-square tests.
RESULTS: From 2009 to 2012, a total of 84 patients with lower extremity arterial injury underwent diagnostic evaluation with CTA on admission. A total of 10 patients (12%) underwent amputation. Primary amputation was performed in 3 (4%) patients and secondary amputation was performed in 7 (8%) patients. There was no difference in age, gender, ISS, extremity AIS, mechanism of injury, admission systolic blood pressure, heart rate, or respiratory rate, transfusion volume or type of vascular interventions between patients who had successful limb salvage and those who received an amputation. The number of patent geniculate arterial vessels was inversely associated with amputation with 3.3 patent geniculate arteries in the limb salvage group compared to 2.1 in the amputation group ($P<0.05$). The two geniculate artery vessels that were significantly associated with limb salvage were the superior lateral geniculate and the inferior medial geniculate arteries ($p<0.05$).
CONCLUSIONS: Geniculate collateral circulation may have an important role in limb salvage after lower extremity vascular injury. The geniculate arteries that are associated with the highest rates of limb salvage appear to be the superior lateral geniculate and the inferior medical geniculate artery.

	Limb Salvage (N=74)	**Amputation (N=10)** *[3 primary, 7 secondary]*	**P Value**
Superior Medial Geniculate	32 (47%)	3 (30%)	0.32
Superior Lateral Geniculate	60 (87%)	6 (60%)	***0.03***
Medial Geniculate	42 (59%)	5 (50%)	0.59
Inferior Medial Geniculate	54 (77%)	3 (30%)	***0.002***
Inferior Lateral Geniculate	44 (63%)	4 (40%)	0.17
Number of Open Geniculates	3.3 +/- 1.3	2.1 +/- 1.8	***0.01***

Presentation Number: MP6

Publishing Title: Outcomes with and without Femoral Endarterectomy in Lower Extremity Bypass

Author Block: **Peter A. Soden, MD**, Sara L. Zettervall, MD, Dominique B. Buck, MD, John C. McCallum, MD, Jeremy D. Darling, BA, Marc L. Schermerhorn, MD.
Beth Israel Deaconess Medical Center, Boston, MA

Abstract Body:

OBJECTIVES: Femoral endarterectomy (FEA) is often used in conjunction with lower extremity bypass. There is limited literature addressing complications related to FEA. This study will look at complication rates of FEA in lower extremity bypass (LEB) patients.

METHODS: All patients undergoing non-emergent LEB in the Vascular Targeted NSQIP database from 2011-2012 were identified. Patients were divided into LEB alone and LEB with FEA. These groups were further divided into claudication and critical limb ischemia (CLI). Chi-square, t-test, and multivariable logistic regression were used to compare pre-op characteristics and outcomes, including SSI, bleeding, return to OR, and death.

RESULTS: Out of the 2621 patients undergoing LEB 356 underwent concomitant FEA (29.5% for claudication and 69.5% for CLI). (Table) Pre-operatively in the claudication group, LEB with FEA patients had a higher rate of COPD compared to LEB alone (22.9% vs 11.9%, p = 0.00) but were otherwise similar. Age (Table) and Race (LEB w FEA: 79.3% white vs LEB alone: 71.1%, p = 0.01) were the only differences within the CLI group. There was no difference in proportion of patients with tissue loss (58.6% vs 59%, p = 0.95) and rest pain in LEB versus LEB w FEA respectively. Operative time was increased when FEA was added to a LEB in both claudicants (235 vs 191 min) and patients with CLI (260 vs 222 min). In claudicants, bleeding, defined as any transfusion or return to OR for bleeding, was higher in LEB with FEA (18.1% vs 8.0%, p = 0.00) but not for CLI (21.5% vs 19.1%, p = 0.39). All other outcomes (including wound infection, myocardial infarction, amputation, LOS, and readmission), were similar between LEB and LEB with FEA.

CONCLUSIONS: FEA in LEB, whether for claudication or CLI, adds operative time. FEA also increases bleeding in claudicants. Despite increased operative time and possibly bleeding there is no difference in length of stay, readmissions, wound complications, or death when FEA is added to LEB. The addition of FEA does not substantially increase the morbidity and mortality of LEB bypass.

Comparison of LEB with and without FEA in Claudicant and CLI groups

	Claudication, LEB only (N=739)	Claudication, LEB with FEA (N=105)	OR (95% CI) or P-value	CLI, LEB only (N=1526)	CLI, LEB with FEA (N=251)	OR (95% CI) or P-value
Age (years, mean)	67.5	66.9	p = 0.15	68.2	69.6	p = 0.01
Obesity (BMI > 30)	33.1%	27.6%	0.77(0.49-1.2)	29.5%	23.8%	0.75(0.55-1.0)
OR time (min, median w quartiles)	191(141-251)	235(178-327)	p = 0.00	222(168-296)	260(193-327)	p = 0.00
Death	0.5%	0.0%	1.0(0.99-1.0)	2.8%	2.8%	1.0(0.45-2.3)

Bleeding	8.0%	18.1%	2.6(1.5-4.5)	19.1%	21.5%	1.2(0.84-1.6)
SSI	7.0%	6.7%	0.94(0.42-2.1)	9.2%	11.2%	1.2(0.8-1.9)
Return to OR	7.8%	4.8%	0.59(0.23-1.5)	19.3%	21.1%	1.1(0.8-1.6)
Re-admission in 30 days	2.7%	0.0%	0.97(0.96-1.0)	5.2%	4.4%	0.83(0.44-1.6)
Length of stay (days, median w quartiles)	3(2-5)	4(3-6)	p = 0.18	7(4-13)	7(4-12)	p = 0.90

Presentation Number: MP7

Publishing Title: What matters most in limiting amputations among diabetics: where you start, where you finish, or how much you improve?

Author Block: **Karina A. Newhall, MD**[1], Dan Gottlieb, MS[2], Adrienne Faerber, PhD[2], Emily Spangler, MD, MS[1], Jonathan S. Skinner, PhD[2], David Stone, MD[1], Philip Goodney, MD, MS[1]
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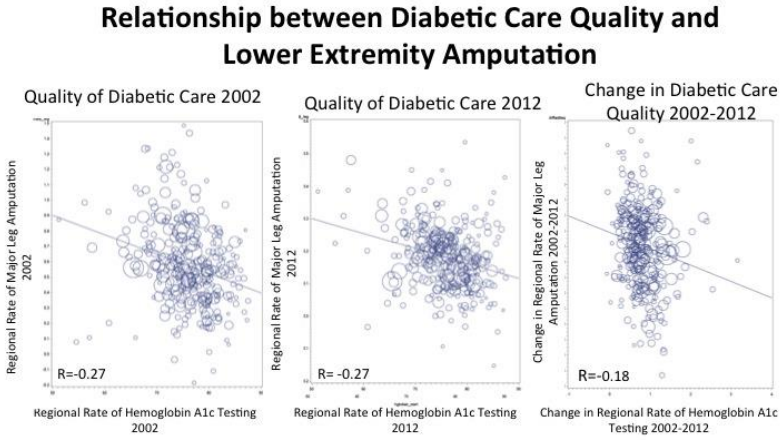
Abstract Body:
OBJECTIVE: The risk of major leg amputation among patients with diabetes has declined over the past decade. This decline has coincided with increased focus on preventative measures for patients with diabetes, such as hemoglobin A1C monitoring and lipid testing. While many attribute the decline in amputations to improvements in the adoption of preventive measures, the relationship between the quality of diabetic care and amputation risk remains unclear.
METHODS: We examined annual rates of hemoglobin A1C testing among all Medicare patients with diabetes between 2002 and 2012 across the 306 hospital referral regions (HRRs) defined in the Dartmouth Atlas of Healthcare. Within these regions, we examined annual rates of major leg amputation. We calculated correlation coefficients to examine the regional relationships between markers of diabetic care quality (annual hemoglobin A1C testing, lipid testing, and eye exams).
RESULTS: Overall, we found that 71% of diabetic patients had at least one hemoglobin A1c test, one blood lipid test, and one eye exam performed annually in 2002, and this proportion increased to 78% by 2012. Similarly, major leg amputation rate was approximately 4.4 per 1,000 among Medicare patients with diabetes in 2002, and decreased to 2.3 per 1,000 by 2012. When we compared relationships between regional-level hemoglobin A1C testing and amputation rate at start of our study period in 2002, at the end of our study in 2012, and by the rate of change during that time period, we found that high quality of diabetic care at the start and end of our study was more closely associated with lower amputation risk (R=0.27) than rapid improvement in the quality of diabetic care (R=0.18). Overall, none of these relationships were closely related to amputation risk (Figure).
CONCLUSION: While improvements in the quality of diabetic care have occurred in recent years, these changes are not directly associated with a decline in amputation rate among Medicare patients with diabetes. Multifactorial studies examining the roles of specific preventive and therapeutic measures, not simply prevention, are needed to explain why amputation rates have improved for patients with diabetes.



Presentation Number: MP8

Publishing Title: Contemporary outcomes of open and endovascular popliteal artery aneurysm repair

Author Block: **Andrew E. Leake, MD**, Rabih Chaer, MD, Michael Singh, MD, Michel Makaroun, MD, Luke Marone, MD.
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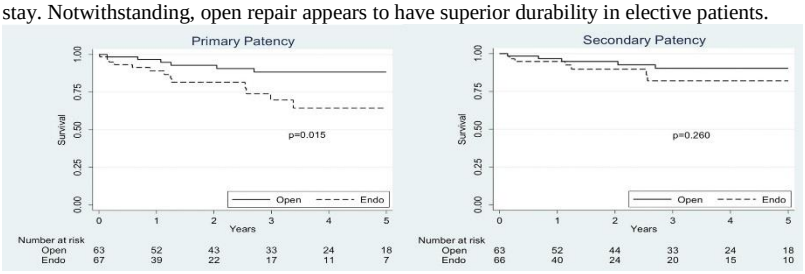
Abstract Body:
INTRODUCTION: The purpose of this study was to evaluate contemporary results and outcomes of open repair (OR) or endovascular repair (ER) for popliteal artery aneurysms (PAA).
METHODS: Consecutive patients with PAA treated from January 2006 to March 2014 were reviewed under an IRB approved protocol. Demographics, anatomic characteristics, and outcomes were collected. Most acute cases were managed by OR with an increasing trend of ER use in elective procedures, all treated with Viabahn stent grafts (WL Gore, Flagstaff, AZ). Standard statistical methods were used.
RESULTS: 186 PAAs were repaired in 156 patients (110 OR, 76 ER). Mean age was 71 years and most were male (96%). Mean follow up was 32.3 months (OR 34.8, ER 28.3, P=NS). Co-morbidities were similar between groups. Concomitant aneurysms were noted in the common femoral artery (10%) and the abdominal aorta (47%). OR included more patients with PAA thrombosis (41.8% vs. 5.3%, P<.001), acute ischemia (24.5% vs. 9.2%, P=.01) and ischemic rest pain (34.5% vs. 6.6%, P<.001). Mean tibial runoff score was 5 for OR vs. 3.3 for ER (P=.006).
OR had increased 30-day complications (22% vs. 2.6%, P<.001), and mean length of stay (5.8d vs. 1.6d, P<.001). OR complications were related to infections (10%), bleeding (5%), or thrombosis (2%). Mortality was slightly higher in OR (1.8% vs 0%, p=NS) as was major amputation rate (3.7% vs1.3%, P=NS). Primary, primary-assisted and secondary patency rates were similar to 3 years (OR: 79.5, 83.7 and 85% vs ER: 73.2, 76.3 and 83% p=NS). ER thrombosis was noted in 8/24 patients treated in 2006-08 (33% @ mean 19.6m), but only 4 of 51 in 2009-13 (7.8% @ mean 12m), suggesting a steep learning curve.
Among 130 patients presenting electively without acute ischemia or thrombosed PAA (63 OR and 67 ER), OR had better 3 year primary (88.3 vs 69.8, p=.03) and primary assisted (90.2 vs 73.5% p=.051) but similar secondary patency (90.2 vs 82% p=.26). (Figure).
CONCLUSION: Endovascular repair is a safe and durable option for PAA repair, with lower complications and shorter length of stay. Notwithstanding, open repair appears to have superior durability in elective patients.



Presentation Number: MP9

Publishing Title: Debulking of the Medial Gastrocnemius Antero-Lateral Quadrant in High Performance Athletes With Functional Popliteal Entrapment Syndrome

Author Block: **Mohamed A. Zayed, MD PhD**, Michael Fredericson, MD, Dominik Fleishmann, MD, Jason T. Lee, MD
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Abstract Body:
OBJECTIVE: Functional popliteal entrapment (FPE) is a rare, but disabling condition in young patients that limits performance. We developed a highly specialized algorithm for the workup, diagnosis, and operative technique that involves provocative CT-A and debulking of a specific portion of the medial head of the gastrocnemius muscle.

METHODS: 21 (62% female) high performance athletes (11 runners, 2 triathletes, 2 soccer players, 2 lacrosse players, 1 basketball player, 1 gymnast, 1 diver, and 1 high jumper) unable to compete due to claudication were evaluated with a unique CT-A protocol with provocative maneuvers. All patients underwent posterior approach operative mobilization of the popliteal artery, and debulking of the antero-lateral quadrant of the medial gastrocnemius muscle to alleviate compression of the artery onto the lateral femoral condyle.

RESULTS: Of the 21 patients treated, 9 had bilateral symptoms (43%), and all 30 popliteal arteries demonstrated obliteration on CT-A with provocative maneuvers. All resting ABIs were normal, but only 42% had abnormal exercise ABIs. Popliteal artery mobilization and debulking of the medial gastrocnemius (mean 7.6 cm3 muscle removal) was performed in all patients. One patient had a postoperative seroma (3%), and all resting ABIs remained normal. During a mean followup of 9 months, 100% of patients had resolution of short distance claudication. 20% of the patients developed some degree of recurrent symptoms, and 53% returned to prior competitive levels.

CONCLUSIONS: In patients with FPE, CT-A with provocative maneuvers can guide surgical intervention, which involves debulking of the hypertrophied antero-lateral quadrant of the medial gastrocnemius muscle. Functional outcomes in high performance athletes are adequate, and in the majority of patients provides improved pain-free walking capacity and ability to return to full competitive sport.