The significant burden of iatrogenic vascular injury on the vascular surgery workforce at a tertiary care center: what can and should be done to offset this problem…

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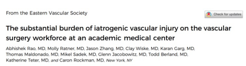
From the Eastern Vascular Society

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The substantial burden of iatrogenic vascular injury on the vascular surgery workforce at an academic medical center

Abhishek Rao, MD, Molly Ratner, MD, Jason Zhang, MD, Clay Wiske, MD, Karan Garg, MD, Thomas Maldonado, MD, Mikel Sadek, MD, Glenn Jacobowitz, MD, Todd Berland, MD, Katherine Teter, MD, *and* Caron Rockman, MD, *New York, NY*


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ABSTRACT

Objective: Vascular surgeons are often called upon to provide emergent surgical assistance to other specialties for iatrogenic complications, both intraoperatively and in the inpatient setting. The management of iatrogenic vascular injury remains a critical role of the vascular surgeon, especially in the context of the increasing adoption of percutaneous procedures by other specialties. This study aims to characterize consultation timing, management, and outcomes for iatrogenic vascular injuries.

Methods: This study identified patients for whom vascular surgery was consulted for iatrogenic vascular complications from February 1, 2022, to May 12, 2023. Patient information, including demographic information, injury details, and details of any operative intervention, was retrospectively collected from February 1, 2022, to October 13, 2022, and prospectively collected for the remainder of the study period. Analyses were performed with R (version 2022.02.03).

Results: There were 87 patients with consultations related to iatrogenic vascular injury. Of these, 42 (48%) were female and the mean age was 59 years (±18 years). The most common consulting services were cardiology (32%), cardiothoracic surgery (26%), general surgery (8%), and neurointerventional radiology (10%). Reasons for consultation included hemorrhage (36%), limb ischemia (36%), and treatment of pseudoaneurysm (23%). A total of 24% of consults were intraoperative, 20% of consults related to extracorporeal membrane oxygenation cannulation, and 16% of consults related to ventricular assist devices including left ventricular assist device and intra-aortic balloon pump. The majority of these consult requests (60%) occurred during evening and night hours (5 PM to 7 AM). Emergent intervention was required in 62% of cases and consisted of primary open surgical repair of arterial injury (54%), endovascular intervention (21%), and open thromboembolectomy (15%). Overall, in-hospital mortality for the patient cohort was 20% and the reintervention rate was 23%, reflecting the underlying complexity of the illness and nature of the vascular injury in this patient group.

Conclusions: Vascular surgeons play an essential role in managing emergent life-threatening hemorrhagic and ischemic iatrogenic vascular complications in the hospitalized setting. The complications require immediate bedside or intraoperative consult and often emergent open surgical or endovascular intervention. Furthermore, many of these require urgent management in the evening or overnight hours, and therefore the high frequency of these events represents a potential significant resource utilization and workforce issue to the vascular surgery workforce. (J Vasc Surg 2024;80:373-8.)

Keywords: Iatrogenic injury; Resource utilization; Surgical repair; Consultation

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Introduction

- Vascular surgeons provide emergent surgical assistance to other specialties for **iatrogenic complications**, both intraoperatively and in the inpatient setting.
- As the number of procedures requiring large profile vascular access increases, handling iatrogenic vascular injuries has become a larger burden on the vascular surgeon's practice, particularly at tertiary centers.
- This study aims to characterize **timing**, **management**, and **outcomes** for iatrogenic vascular injuries.

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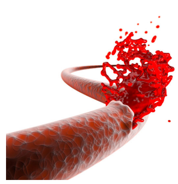
Methods

- Identified all vascular surgery consultations for iatrogenic vascular complications at a single tertiary care academic medical center
- Characterized:
  - Demographic information,
  - Injury mechanism, and
  - Details of any intervention,
- Retrospectively collected from February 1 – October 13th
- Prospectively collected from October 13-May 15



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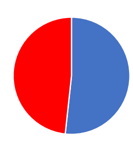
Patient Cohort

- There were **87 patients**
- 42 (48%) were female
- Mean age was 59 years (± 18 years)



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Consulting Service

Service	Number	Percent
Cardiology	28	32%
CT Surgery	23	26%
General Surgery	7	8%
Neuro IR	6	7%
Orthopedic Surgery	6	7%
MICU	5	6%
ENT	2	2%
Other	10	10%

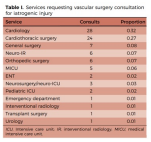

Table I. Services requesting vascular surgery consultation for iatrogenic injury

Service	Consults	Proportion
Cardiology	28	0.32
Cardiothoracic surgery	24	0.27
General surgery	7	0.08
Neuro-IR	6	0.07
Orthopaedic surgery	6	0.07
MICU	5	0.06
ENT	2	0.02
Neurosurgery/neuro-ICU	3	0.03
Pediatric ICU	2	0.02
Emergency department	1	0.01
Interventional radiology	1	0.01
Transplant surgery	1	0.01
Urology	1	0.01

ICU, intensive care unit; IR, interventional radiology; MICU, medical intensive care unit.

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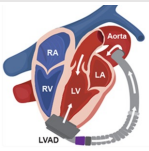
Clinical Context

- 25% of consults were intraoperative
- 19% of consults related to ECMO cannulation
- 19% of consults related to ventricular assist devices including LVAD and IABP.



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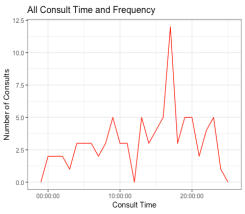
Timing of Consultation

Table II. Timing of consult for iatrogenic injury

Service	Consults	Proportion
Regular hours (7-5)	39	0.45
Late (after 5)	30	0.34
Early (before 7)	17	0.20



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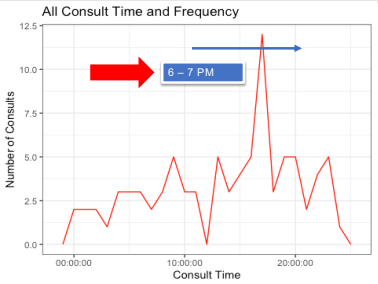

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Reason for Consult

Complication	n	Percentage
Hemorrhage	34	40%
Ischemia	32	37%
Pseudoaneurysm	20	23%

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Reason for consultation / necessity of intervention

Table III. Reason for consult for iatrogenic injury

Complication	Nonoperative	Operative	Total	Total proportion
Hemorrhage	6	26	32	0.37
Ischemia/revascularization	17	14	31	0.36
Pseudoaneurysm	7	13	20	0.23
Arterial dissection	1	1	2	0.02
Compartment syndrome	1	0	1	0.01
Foreign body in artery	0	1	1	0.01

- For hemorrhage: 81% required intervention
- For ischemia: 45% required intervention
- For pseudoaneurysm: 65% required intervention

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Interventions

Table IV. Intervention performed for repair of iatrogenic injury

Operation needed	Consults	Proportion
Primary repair	18	0.34
Open thrombectomy	8	0.15
Patch angioplasty	9	0.17
Stent placement	7	0.13
Thrombin injection	4	0.07
Open bypass	2	0.04
Coil embolization	1	0.02
Diagnostic angiogram	1	0.02
Open exploration	1	0.02
Distal reperfusion catheter	1	0.02
Endovascular thrombolysis	1	0.02

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Patient Outcomes

- **Emergent or urgent intervention was required in 63% of cases:**
  - Open surgical repair of arterial injury (45%),
  - Open thromboembolectomy (15%).
  - Endovascular intervention (13%)
- Even if intervention is not immediately required, there is still work / time / effort involved in seeing and evaluating the patient!
- Overall, **in-hospital mortality** for the patient cohort was **22%**
- Reintervention rate was 23%

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- **Vascular surgery plays an essential role in managing emergent life-threatening hemorrhagic and ischemic iatrogenic vascular complications in the hospitalized setting.**
- **The complications require immediate bedside or intraoperative consult and often emergent open surgical or endovascular intervention.**
- **Furthermore, many of these require urgent management in the evening or overnight hours, and therefore the high frequency of these events represents a potential significant resource utilization and workforce issue to vascular surgery departments and divisions.**

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What to do?

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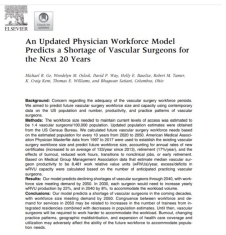
Vascular Surgery Workforce

- With increase in hospital performed percutaneous vascular procedures/ interventions and anticipated shortages in the vascular surgical workforce, this problem is likely to continue to worsen



An Updated Physician Workforce Model Predicts a Shortage of Vascular Surgeons for the Next 20 Years

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Vascular Surgery Hospitalist Program

The influence of a Vascular Surgery Hospitalist program on physician and patient satisfaction, resident education, and resource utilization

Table I The organizational structure and important elements of the Vascular Surgery Hospitalist (VSH) Program

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Vascular Acute Care Surgery

- Predictable schedule
- Improved quality of life for surgeons and trainees
- Decrease in burnout / increase in recruitment of workforce
- Potentially corresponding improvements in the timeliness and quality of patient care.
- How will this be supported financially?

Implementation of a vascular acute care surgery service model is associated with decreased surgeon burnout

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Conclusions

- Vascular surgery plays an essential role in managing emergent life and limb threatening hemorrhagic and ischemic iatrogenic vascular complications in the hospitalized setting.
- These complications require immediate bedside or intraoperative consultation and often emergent open surgical or endovascular intervention.
- Many of these require urgent management in the evening or overnight hours, and therefore the high frequency of these events represents a potential significant resource utilization and workforce issue to vascular surgery departments and divisions.
- With the increasing prevalence of such injuries due to the rise in more complex procedures, it is paramount for greater awareness and for an infrastructure in place to support timely and safe management of such injuries.
- Without the presence of a board certified vascular surgeon on stand by, hospitals simply cannot offer modern patient care in a safe manner

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