

# Analysis of emergency vascular surgery consults within a tertiary health care system

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**Objective:** Patients with vascular disease often have multisystem atherosclerosis and multiple comorbidities requiring comprehensive interdisciplinary specialty care. Consultation is a critical component of a tertiary vascular surgery practice, but analysis of this service is under-reported in the literature. After-hours inpatient consultations and interhospital transfers are associated with urgent patient care.

**Methods:** A retrospective analysis of vascular surgery consultations was carried out from January 1, 2013, to December 31, 2013. Consultations included inpatient services, the emergency department, surgical and medical intensive care unit, and interhospital transfers. Data analysis included number of consults, time of consultation (during hours, 0700-1859; after hours, 1900-0659), referring service, nature, and outcome of consultation. Consultations were then classified as urgent if vascular surgical intervention was required as an intraoperative consultation, within 24 hours, or during the same hospitalization. Patients without a same-hospital vascular surgical intervention were classified as nonurgent.

**Results:** During a 1-year period, 823 independent consult requests of 749 patients were analyzed. It was found that 57.8% of after-hours consults resulted in urgent patient care ( $P = .003$ ); 29.7% of medicine, 33.3% of medical intensive care unit, 41.9% of trauma surgery, and 60% of emergency department after-hours consultations were urgent; 73% of surgery and 79.2% of interhospital after-hours consults required urgent vascular surgical intervention. Extremity ischemia, aortic disease, and iatrogenic consults accounted for 44.8%, 20.4%, and 11.1% of after-hours consults, with 57.9%, 56.4%, and 70% requiring urgent vascular surgical intervention, respectively.

**Conclusions:** After-hours consultations are not always associated with an urgent vascular surgical intervention. Nonurgent after-hours consultations are requested more frequently from some services and may present an opportunity for education that could improve workflow of the vascular workforce. (*J Vasc Surg* 2016;63:177-81.)

Patients with vascular disease often have multisystem atherosclerosis and multiple comorbidities requiring comprehensive interdisciplinary specialty care. Consultations from inpatient services and interhospital transfers are a critical component of a tertiary vascular surgery practice, but analysis of this service is under-reported in the literature. The need for multidisciplinary input leads to the utilization of resources and can be a challenge for an efficient inpatient encounter. We hypothesized that after-hours inpatient consultations and interhospital transfers are associated with urgent patient care. Our objective was to evaluate the utilization of an emergency vascular consult service within a tertiary health care system. We seek to improve workflow

with regard to these patient encounters, especially in regard to after-hours and emergency vascular care needs.

## METHODS

Approval was obtained from the Institutional Review Board of the University of Alabama at Birmingham. Requirement for the informed consent was waived.

A retrospective analysis of vascular surgery consultations from January 1, 2013, to December 31, 2013, was evaluated. Data were described as absolute numbers and percentage prevalence. The  $\chi^2$  test or Fisher exact test, where applicable, was used to compare frequencies. A  $P$  value of  $<.05$  was considered statistically significant. All data were analyzed with SPSS version 20 package (IBM Inc, Armonk, NY). Consultations included referrals from the emergency department, surgical and medical intensive care unit (ICU), inpatient services, and interhospital transfers. Inpatient services were further divided into medicine and surgery, separate from ICU services. Medicine services include internal medicine, medicine subspecialties, and an inpatient hospitalist service, which functions without resident involvement. Surgical services included general surgery, orthopedic surgery, neurosurgery, obstetrics and gynecology, otolaryngology, urology, and cardiothoracic surgery. Trauma surgery was categorized separately. The University of Alabama at Birmingham is the major tertiary care facility in Alabama. Our institution has approximately 1100 beds with 50,000 discharges annually.

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The majority of interhospital transfers were within a 250-mile radius of the institution.

Data analysis included number of consults, time of consultation (during hours, 0700-1859; after hours, 1900-0659), referring service, nature, and outcome of consultation. Nature of consultation included aortic disease, cerebrovascular disease, extremity ischemia, iatrogenic injury, venous disease, postoperative concerns, lymphatic disease, radiographic image abnormality, preoperative assistance, and medical management of vascular disease.

Patient data were obtained using a self-maintained clinical database, a separate billing database, and the electronic health record of inpatient referrals and interhospital transfers during this period. Data collection was performed by electronic medical record review. The referring service, time of consultation, and category of consult were noted. The entire hospital course was reviewed, including all electronic notes, operation reports, and discharge summaries.

Timing of consultation was grouped as follows. Consultations were classified as urgent if vascular surgical intervention was required during the patient's same hospitalization, including intraoperative and emergency consultations. This included consultations when vascular surgical intervention was recommended although not performed because of the patient's decision or an increased risk of the clinical condition or comorbidity. Patients without a same-hospital vascular surgical intervention were classified as nonurgent.

Reasons for vascular consultation were subcategorized on the basis of the vascular disease process. Aortic disease category included aortic, renal, and visceral vessel disease processes. Cerebrovascular disease included carotid disease and vertebrobasilar insufficiency. Extremity ischemia included acute and chronic arterial insufficiency involving the upper and lower extremities and vascular-related compartment syndrome. Further categorization included type of consultation. Iatrogenic consultations included intraoperative or bedside procedures and a minor amount of adverse events after medical therapies. Preoperative consults included assistance with spine exposure and harvesting of conduit for other surgical services. Radiographic image abnormality consultations included incidental findings on imaging not associated with a patient's initial diagnosis.

Subsequent consult requests for the same patient were included only if the consult was about a separate concern. Consultations were excluded if new concerns arose while vascular surgery was actively observing the patient and for repeated consults of the same patient because of persistence or progression of the initial problem. Consultations for known postoperative complications, such as wound breakdown or hematoma, were excluded from our data set.

The primary focus of this analysis was evaluating the utilization of after-hours consults by the outcome of consultation. Our comparative groups were referring services. This analysis is purely descriptive.

## RESULTS

During a 1-year period, 823 independent consult requests of 749 patients were analyzed. Of the total

**Table.** Outcome of consultation by hour requested

<i>Time</i>	<i>After hours</i>	<i>%</i>	<i>During hours</i>	<i>%</i>
Intraoperative	10	3.7	12	2.2
Emergency	63	23.3	86	15.6
Urgent	83	30.7	161	29.1
Nonurgent	114	42.2	294	53.2
Total	270		553	

consultations, 33% were initiated after hours. It was found that 57.8% of after-hours consults resulted in urgent patient care, whereas 42.2% did not require vascular surgical intervention during the patient's hospitalization ( $P = .003$ ). Of the after-hours consultations, 3.7% (10 consultations) were intraoperative, requiring immediate vascular surgical intervention, and 23.3% (63 consultations) were emergencies with vascular surgical intervention performed within 24 hours. Vascular surgical intervention was performed >24 hours from consultation although during the same hospitalization for 30.7% (83 consultations) of after-hours consultations (Table).

In categorizing consults on the basis of the requesting service, 50% of emergency department consults, 40% of trauma surgery consults, and 67% of outside hospital transfers were called after hours, whereas the majority of surgery, medicine, and ICU consults occurred during hours (Fig 1). Analysis of originating services showed that 29.7% of medicine, 33.3% of medical ICU, 41.9% of trauma surgery, and 60% of emergency department after-hours consults were urgent. This was contrasted by 73% of surgery and 79.2% of interhospital after-hours consults that required urgent vascular surgical intervention (Fig 2).

Extremity ischemia, aortic disease, and iatrogenic consults accounted for 44.8%, 20.4%, and 11.1% of after-hours consults, with 57.9%, 56.4%, and 70% requiring urgent vascular surgical intervention, respectively. The majority of extremity ischemia after-hours consultations were referred by the emergency department (43%) and trauma surgery (22.3%); the majority of aortic disease after-hours consultations, by the emergency department (32.7%) and interhospital transfers (38.2%); and the majority of iatrogenic after-hours consultations, by medicine (40%) and surgery services (33.3%).

## DISCUSSION

These data analyze the referral pattern and evaluate the utilization of a vascular surgery consult service within a high-volume tertiary medical center. Literature regarding vascular surgery consultations is scarce. We included >800 independent consult requests during 1 year, despite strict exclusion criteria. A small percentage of patients had two or more different consultations during the hospitalization, whereas a few patients had more than one hospitalization during the year and required additional vascular surgery consultations, unrelated to previous requests.

Of the total number of consultations during 1 year, 33% occurred after hours. This percentage seems expected

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