



Evaluation and Management of a Patient with Traumatic/Iatrogenic Vascular Injury

Description of the Activity	Vascular trauma and iatrogenic vascular injuries are encountered by all vascular surgeons, typically in the emergency setting. All vascular surgeons should be able to stabilize and treat a spectrum of vascular injuries and recognize the impact of other traumatic injuries on the timing and repair of vascular trauma. Vascular surgeons should also know the limitations of their scope of practice, depending on available resources, and understand when transfer to a higher level of care may be required.
Functions	<ul style="list-style-type: none">❖ Nonoperative/Preoperative<ul style="list-style-type: none">➤ Synthesize essential information from a patient’s records, prehospital providers, history, physical examination, and initial diagnostic evaluations as well as from the trauma (or other primary) team to identify the location and severity of the injury.➤ Complete a rapid, evidence-based evaluation of the patient with vascular trauma or injury.➤ Recognize vascular injuries requiring emergency operative intervention.➤ Identify patients in whom operative intervention may be contraindicated, including:<ul style="list-style-type: none">▪ Patients with prohibitive surgical or anesthetic risk secondary to other injuries or patients with preexisting morbidity who are unlikely to benefit from vascular surgical intervention.▪ Patients whose injuries or comorbidities exceed the capacity of the surgical environment. Transfer to a higher level of care should be discussed with the trauma team and the patient’s caregiver(s).▪ Patients whose vascular injuries are so severe that revascularization is not indicated and major amputation or palliative care is a better alternative.➤ Select a surgical approach consistent with a patient’s anatomy, comorbidities, acuity of presentation, location of presentation (e.g. trauma bay, intra-op), and local health system resources.➤ Synthesize an operative plan that demonstrates understanding of the operative anatomy, comorbidities, indications, contraindications, risks, benefits, alternatives, and potential complications.➤ Communicate a diagnosis and potential treatment options to the patient/caregiver(s) and the primary trauma team.➤ Obtain informed consent, even in an emergency. Describe the indications, risks, benefits, alternatives, and potential complications of the planned operation, including nuances relevant to the patient’s condition and comorbidities, and ensure patient/caregiver understanding.➤ Communicate and coordinate the care of a patient with multisystem injury with the trauma team and other consultants❖ Intraoperative<ul style="list-style-type: none">➤ Perform the procedures required to manage the spectrum of vascular trauma and iatrogenic injury across all anatomic distributions using both open and endovascular techniques consistent with published guidelines.<ul style="list-style-type: none">▪ Abdomen▪ Cervical▪ Chest▪ Extremities▪ Pelvis➤ Recognize the need for remedial procedures secondary to vascular injury, such as fasciotomy and planned abdominal exploration.

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	<ul style="list-style-type: none">➤ Integrate new information discovered intraoperatively that requires modification of the surgical plan or technique, such as:<ul style="list-style-type: none">▪ Identification of new injuries▪ Inadequate conduit for revascularization▪ Inadequate vascular control➤ Work with the trauma, anesthesia, and nursing teams and other perioperative health care professionals to create and maintain an intraoperative environment that promotes patient-centered care.❖ Postoperative<ul style="list-style-type: none">➤ Provide postoperative management for a patient with vascular trauma in coordination with the trauma and other consulting teams, including appropriate medical management and follow-up.➤ Communicate with the patient/caregiver(s) and members of the health care team to ensure understanding of postprocedure instructions and the patient's ability to carry out the resultant plan within the context of their life (eg, transportation, living situation, insurance, access to a pharmacy).➤ Recognize, evaluate, and manage early and late complications related to vascular reconstruction.<ul style="list-style-type: none">▪ Abdominal compartment syndrome▪ Bleeding▪ Extremity and end-organ ischemia▪ Extremity compartment syndrome▪ Graft infection▪ Graft thrombosis▪ Neurologic deficit➤ Identify a surveillance plan and indications for reintervention.
Scope	<ul style="list-style-type: none">❖ In scope<ul style="list-style-type: none">➤ Intraoperative consultations for iatrogenic vascular injuries➤ Penetrating and blunt injury to the abdomen, including the aorta, celiac artery, inferior vena cava, and superior mesenteric artery➤ Penetrating and blunt injury to the pelvis, including the iliac arteries and veins➤ Penetrating and blunt trauma to the chest, including the aorta and great vessels➤ Penetrating and blunt trauma to the neck, including vertebral injuries➤ Penetrating or blunt injury to the extremities, such as traumatic pseudoaneurysm, dissection, and transection, including the mangled or nonsalvageable extremity➤ Periprocedural consultations for iatrogenic vascular injuries (eg, following vascular access for endovascular interventions)❖ Out of scope<ul style="list-style-type: none">➤ Cardiac injuries



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- Intracranial vascular injuries
- Retrohepatic inferior vena cava injuries
- ❖ Special Population
 - Older adult patients
 - Pediatric patients
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Evaluation & Management of a Patient with Vascular Trauma/Iatrogenic Vascular Injury

Level	Preoperative/Nonoperative	Intraoperative Open	Intraoperative Endovascular	Postoperative
<p>1</p> <p><u>Limited Participation</u></p> <p>Demonstrates understanding of information and has very basic skills</p> <p><u>Framework:</u> What a learner directly out of medical school should know</p> <p>The attending can show and tell.</p>	<ul style="list-style-type: none"> Respectfully and professionally discusses a patient's care plan with other team members/consultants Accurately documents all patient information relevant to the vascular injury and in a timely fashion Elicits a history (mechanism of trauma, time course) and performs a relevant vascular exam Communicates findings to the trauma/primary team and provides a hand-off of patient care 	<ul style="list-style-type: none"> Demonstrates basic surgical skills, including recognition of arterial and venous anatomy Identifies open surgical options to treat a patient's injury and indications for the selected procedure Identifies potential crises that could occur during the procedure 	<ul style="list-style-type: none"> Uses US to demonstrate anatomy for vascular access; recognizes the importance of maintaining wire position during wire and catheter exchanges Identifies endo options to treat a patient's injury and indications for the selected procedure 	<ul style="list-style-type: none"> Communicates with health care teams in a respectful way Accurately and efficiently documents all patient information relevant to a vascular injury and the intervention performed Identifies critical data points for a postop hand-off (pulse/signal exam, anticoagulation plan)
<p>2</p> <p><u>Direct Supervision</u></p> <p>Demonstrates understanding of the steps of the operation but requires direction through principles and</p>	<ul style="list-style-type: none"> Clearly communicates basic facts about a patient's vascular injury to other health care teams Orders and interprets diagnostic imaging (vascular lab, CTA) based on H&P findings; needs assistance to formulate an operative plan 	<ul style="list-style-type: none"> Demonstrates respect for tissues (gentle handling of vessels) and developing skill in instrument handling (using a Castroviejo needle driver) Performs parts of vessel 	<ul style="list-style-type: none"> Uses US to obtain vascular access; demonstrates basic catheter and wire-handling techniques Identifies most steps of the procedure and the equipment required; requires prompting to advance the procedure 	<ul style="list-style-type: none"> Communicates recommendations to primary, consulting, and palliative care teams during a patient care discussion Coordinates the care of a trauma patient with the interprofessional team (trauma, nursing,

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<p>does not know the nuances of a basic case</p> <p>Framework: The learner can use the tools but may not know exactly what, where, or how to do it.</p> <p>The attending gives active help throughout the case to maintain forward progression.</p>	<ul style="list-style-type: none"> Promptly communicates test/imaging results and treatment plan options to a patient/caregiver(s) and the consulting team Coordinates a plan of care with other teams managing the patient (need for anticoagulation, additional imaging) 	<p>repair/anastomosis with frequent prompting and assistance</p> <ul style="list-style-type: none"> Identifies most steps of the procedure (inflow/outflow control) and the equipment required; requires prompting to advance the procedure Identifies intraop findings that could indicate an impending or transpiring crisis 		<p>pharmacy, PT, ICU) in a routine situation</p>
<p>3</p> <p>Indirect Supervision</p> <p>Can do a basic operation but will not recognize abnormalities and does not understand the nuances of an advanced case</p>	<ul style="list-style-type: none"> Tailors communication regarding a treatment plan to other health care teams based on their level of expertise Uses the EHR to communicate with a patient's health care team Synthesizes a workup to determine a treatment plan (operative/nonoperative, endo/open) for a basic vascular trauma/injury 	<ul style="list-style-type: none"> Demonstrates safe and efficient instrument handling, exposure, dissection, and control of vessels Performs a complete vessel repair/anastomosis with minimal prompting and passive assistance Identifies all critical steps of the procedure 	<ul style="list-style-type: none"> Identifies all critical steps of the procedure and the equipment required; advances the procedure with minimal prompting Performs and interprets a diagnostic angiogram; efficiently traverses an occlusion; delivers a stent/balloon/embolization material to the appropriate location 	<ul style="list-style-type: none"> Uses the EHR to communicate with a patient's health care team Communicates with the team efficiently and adapts to different team members' styles; provides feedback to the team, peers, and learners Coordinates the care of a trauma patient with multiple services in a

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<p>Framework: The learner can perform the operation in straightforward circumstances.</p> <p>The attending gives passive help. This help may be given while scrubbed for more complex cases or during a check-in for more routine cases.</p>	<ul style="list-style-type: none"> Coordinates a plan of care with other teams managing a patient in a complex situation (timing and order of interventions for a critically ill polytrauma patient) 	<p>and the equipment required; advances the procedure with minimal prompting</p> <ul style="list-style-type: none"> Responds to a crisis (regains manual inflow control) and identifies possible next steps with guidance Identifies all critical steps of the procedure (eg, need for increased exposure and vessel control) and the equipment required; advances the procedure with minimal prompting 		<p>complex situation (need for take-back, polytrauma)</p>
<p>4</p> <p>Practice Ready</p> <p>Can manage more complex patient presentations and operations and take care of most cases</p> <p>Framework: The learner can treat all straightforward</p>	<ul style="list-style-type: none"> Coordinates recommendations from all services to tailor a treatment plan for a patient; facilitates regular discussion with these services to optimize communication and patient care Uses the EHR to obtain detailed information about a patient's history and test results from prior encounters and outside systems 	<ul style="list-style-type: none"> Proficiently handles instruments and equipment, uses assistants, guides the conduct of the operation, and makes independent intraoperative decisions; anticipates when assistance is needed Identifies all critical steps of the procedure and the equipment 	<ul style="list-style-type: none"> Responds to a crisis (regains manual inflow control); identifies next steps; determines the course of action (balloon occlusion, angiography, conversion from endo to open) Plans and performs an intervention, including control of hemorrhage, endo device selection and sizing, and alternate access 	<ul style="list-style-type: none"> Coordinates input from primary and consulting teams to optimize patient care Ensures safe transition of care with other disciplines and specialties in a complex situation (undomiciled patient), including a long-term follow-up plan and surveillance imaging

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<p>vascular trauma/iatrogenic vascular injury cases and has a strong understanding of surgical options and techniques for less common scenarios.</p> <p>The attending is available at the request of the learner but is not routinely needed for common presentations, though input may be needed for more complex presentations.</p>	<ul style="list-style-type: none">• Synthesizes the workup to determine an optimal treatment plan, including open or endo approaches• Leads the coordination of patient-centered care among different disciplines and specialties in a complex situation	<p>required; advances the procedure without prompting; recognizes critical decision points</p> <ul style="list-style-type: none">• Plans and performs repair, including proximal and distal control and repair/patch/bypass	<ul style="list-style-type: none">• Identifies all critical steps of the procedure and the equipment required; advances the procedure without prompting; recognizes critical decision points	