



Evaluation and Management of a Patient with Chronic Limb-Threatening Ischemia

Description of the Activity	Vascular surgeons evaluate and treat patients with CLTI in outpatient and urgent/inpatient settings. These surgeons should have a comprehensive understanding of the evaluation and management of CLTI, including diagnostic techniques, medical management, and open and endovascular surgical interventions. Additionally, vascular surgeons should understand perioperative management, including recognition and treatment of complications of surgical intervention, needed follow-up, and surveillance strategies.
Functions	<ul style="list-style-type: none">❖ Nonoperative/Preoperative<ul style="list-style-type: none">➤ Synthesize essential information from a patient’s referring providers, records, history (including relevant risk factors), physical examination, and initial diagnostic evaluation to establish a diagnosis.➤ Perform an evidence-based, cost-effective diagnostic evaluation.➤ Synthesize an optimal risk factor modification and medical management plan.➤ Determine whether intervention is indicated. For patients who are not indicated for intervention, establish a surveillance plan.➤ Recognize complications of CLTI requiring emergency operative intervention.➤ Perform cardiopulmonary risk stratification for at-risk patients, consider frailty assessments, and recognize when a specialist referral is necessary.➤ Select a surgical approach consistent with a patient’s anatomy, comorbidities, and acuity of presentation.➤ Counsel a patient regarding the durability of potential revascularization procedures as well as the prognosis for limb salvage versus the likelihood of amputation.➤ Obtain informed consent. Describe the indications, risks, benefits, alternatives, and potential complications of the planned operation, and ensure patient/caregiver understanding.➤ Synthesize an operative plan that demonstrates understanding of the operative anatomy, physiology, indications, contraindications, risks, benefits, alternatives, and potential complications of:<ul style="list-style-type: none">▪ Lower extremity endovascular revascularization▪ Lower extremity open revascularization❖ Intraoperative<ul style="list-style-type: none">➤ Perform the procedures required to manage lower extremity peripheral arterial occlusive disease in the setting of CLTI.<ul style="list-style-type: none">▪ Execute endovascular revascularization of the lower extremity.▪ Execute open surgical operative revascularization of the lower extremity.➤ Integrate new information discovered intraoperatively that requires modification of the surgical plan or technique.➤ Work with anesthesia staff, nursing staff, and other perioperative health care professionals to create and maintain an intraoperative environment that promotes patient-centered care.



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	<ul style="list-style-type: none">❖ Postoperative<ul style="list-style-type: none">➤ Initiate and oversee postoperative care, including monitoring lower extremity pulses, prescribing evidence-based medical therapy, and determining follow-up imaging and care.➤ Communicate with the patient/caregiver(s) and members of the health care team to ensure understanding of post-procedure 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 following lower extremity intervention.<ul style="list-style-type: none">▪ Access site complications or other bleeding complications▪ Early and late bypass graft failure▪ Infectious complication (access/surgical site and prosthetic material), anastomotic pseudoaneurysm▪ Target lesion restenosis/occlusion with the potential need for reintervention and need for surveillance➤ Identify a surveillance plan and indications for reintervention.
Scope	<ul style="list-style-type: none">❖ In scope<ul style="list-style-type: none">➤ Aortoiliac occlusive disease➤ Infrainguinal occlusive disease❖ Out of scope<ul style="list-style-type: none">➤ Amputation➤ Patients with:<ul style="list-style-type: none">▪ Acute limb ischemia▪ Claudication▪ Upper extremity CLTI



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<p style="text-align: center;">1</p> <p>Limited Participation</p> <p style="text-align: center;">Demonstrates understanding of information and has very basic skills</p> <p>Framework: What a learner directly out of medical school should know</p> <p style="text-align: center;">The attending can show and tell.</p>	<ul style="list-style-type: none"> Elicits a history and performs a vascular exam (Doppler pulses, tissue loss, elevation pallor, dependent rubor) Identifies a basic preop problem (DM, smoking) and initiates management with supervision Identifies options for diagnostic imaging (arterial Doppler, duplex, CTA) Identifies the need for revascularization in a patient with CLTI Identifies the indications for intervention (eg, risk of limb loss without intervention) Classifies the degree of CLTI and communicates operative urgency using an evidence-based scoring system Communicates basic facts about the condition to a patient/caregiver(s) in a respectful way and identifies the elements of an informed consent discussion 	<ul style="list-style-type: none"> Demonstrates understanding of sharps safety, safe use of devices, and surgical field sterility Performs basic surgical tasks efficiently, including suturing and knot-tying Demonstrates basic surgical skills, including making an incision and closure Identifies the planned procedure and alternative options (endo or open) for the treatment of CLTI Identifies potential crises that could occur during an open approach to CLTI (bleeding, dissection, venous injury) Recognizes the importance of the preop time-out for prevention of wrong-site, wrong-side surgery 	<ul style="list-style-type: none"> Uses US to visualize access vessels Recognizes the importance of maintaining wire access Identifies potential crises that could occur during endo treatment of CLTI (loss of access, ruptured artery, dissection) 	<ul style="list-style-type: none"> Identifies a basic postop problem (hematoma, bleeding, fever, wound infection, pain) and initiates management with supervision Identifies the ethical and professional importance of patient-centered discussions on postop complications and limb salvage in CLTI Respectfully communicates the expected postop course and the health care team's care plan to a patient/caregiver(s) Recognizes a basic postop complication (MI, change in vascular exam, compartment syndrome) and relays it to the team



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<p style="text-align: center; font-weight: bold; font-size: 1.2em;">2</p> <p style="text-align: center; font-weight: bold; font-size: 1.1em;"><u>Direct Supervision</u></p> <p style="text-align: center;">Demonstrates understanding of the steps of the operation but requires direction through principles and does not know the nuances of a basic case</p> <p style="text-align: center; font-weight: bold; font-size: 1.1em;"><u>Framework:</u></p> <p style="text-align: center;">The learner can use the tools but may not know exactly what, where, or how to do it.</p> <p style="text-align: center;">The attending gives active help throughout the case to maintain forward progression.</p>	<ul style="list-style-type: none"> Orders imaging studies (ABI, duplex, axial) and interprets findings to confirm multilevel arterial disease; needs assistance to formulate an operative plan Manages a common periop problem (DM, MI), including ordering additional workup Uses imaging to support operative planning of CLTI Identifies patient factors that influence the imaging modality (eg, renal insufficiency) Synthesizes clinical data (anatomy, level of disease, runoff, medical comorbidities) to choose open vs endo intervention Demonstrates limited familiarity with literature on the management of CLTI and discusses this information with a patient Customizes communication about the condition to a 	<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 an anastomosis with frequent prompting and assistance Identifies most steps of the procedure (exposure, inflow/outflow control, endarterectomy or bypass) and the equipment required (clamps, tunneller), requiring prompting to advance the procedure Describes most potential operative errors and intraop findings; needs assistance to demonstrate how to avoid them Describes findings with arterial injury, venous injury, and dissection that can be encountered during open treatment for CLTI Participates in the preop time-out for prevention of wrong-site, wrong-side surgery 	<ul style="list-style-type: none"> Uses US to obtain vascular access; demonstrates basic catheter and wire-handling techniques Describes radiographic and clinical findings with arterial rupture and dissection that can occur during endo treatment of CLTI Participates in the preop time-out for prevention of wrong-site, wrong-side surgery 	<ul style="list-style-type: none"> Manages a common postop problem (hematoma, anemia, change in pulse exam), including ordering and interpreting additional testing Applies ethical principles regarding limb salvage to a patient with CLTI and their caregiver(s) Communicates standard postop instructions and updates to a patient/caregiver(s) Recognizes and coordinates complex postop discharge needs, including PT, wound care, anticoagulation management, and follow-up



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	<p>patient/caregiver(s) in a respectful way; answers a patient’s questions about the management of CLTI, including patency rates of intervention and risk of limb loss; conducts an informed consent discussion for a straightforward, elective CLTI case</p>			
<p>3</p> <p><u>Indirect Supervision</u></p> <p>Can do a basic operation but will not recognize abnormalities and does not understand the nuances of an advanced case</p> <p><u>Framework:</u> The learner can perform the operation in straightforward circumstances.</p>	<ul style="list-style-type: none"> Manages complex comorbidities (anticoagulation reversal, cardiac optimization, palliative care) Develops a specific open surgical plan for a clinical situation and demonstrates understanding of alternative treatment options Develops an endo treatment plan for a clinical situation and recognizes device limitations based on patient anatomy Demonstrates familiarity with literature regarding 	<ul style="list-style-type: none"> Performs the steps of the operation for femoral, popliteal, and tibial exposures and makes straightforward intraop decisions, including incision placement; identifies suitable inflow/outflow vessels and the adequacy of conduit vs an appropriate alternative Demonstrates efficient instrument handling and safe exposure, dissection, and control of vessels Performs a complete endarterectomy, anastomosis, and patch with minimal prompting and passive assistance 	<ul style="list-style-type: none"> Describes the procedural sequence (access, crossing lesion, plan for treatment) and equipment needs; identifies the critical decision points of an intermediate endo procedure for CLTI Describes the appropriate response to loss of arterial access, dissection, or arterial rupture during endo intervention for CLTI 	<ul style="list-style-type: none"> Recognizes and manages a postop complication (target lesion/graft occlusion, bleeding, cardiopulmonary complications), including identifying the need to return to the OR Applies ethical principles to complex patient physiology regarding limb salvage Communicates tailored postop instructions to a patient/(caregiver(s) in a caring way, including anticipatory guidance for common postop issues such as limb swelling, reperfusion pain, and wound complications Communicates with and listens to team members



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<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>	<p>management and outcomes of intervention for CLTI and applies it independently</p> <ul style="list-style-type: none"> • Customizes communication about the condition to a patient/caregiver(s) based on individual characteristics; anticipates logistical problems in optimizing the patient for surgery • Clearly conducts an informed consent discussion for a complex or urgent limb revascularization, including individualizing risks and benefits for the patient and discussing patency rates and risk of limb loss, though incorporation of patient preferences may be limited 	<ul style="list-style-type: none"> • Describes the procedural sequence (arterial exposure, bypass, or endarterectomy) and equipment needs; identifies the critical decision points of an intermediate open procedure for CLTI • Describes the appropriate response to bleeding, venous injury, and dissection during an open intervention for CLTI • Leads the OR staff in a surgical time-out to reduce the risk of wrong-site surgery 		<p>and allied health care staff regarding the in-hospital and discharge needs of a patient/caregiver(s)</p> <ul style="list-style-type: none"> •
<p style="text-align: center;">4</p> <p style="text-align: center;"><u>Practice Ready</u></p> <p>Can manage more complex patient</p>	<ul style="list-style-type: none"> • Performs a focused, efficient, and accurate H&P that includes pertinent positive and negative symptoms and preoperatively manages 	<ul style="list-style-type: none"> • Proficiently handles instruments and equipment, uses assistants, and guides the conduct of the operation; makes independent 	<ul style="list-style-type: none"> • Identifies all critical steps of the procedure and the equipment required and advances the procedure without 	<ul style="list-style-type: none"> • Leads the team and provides supervision in the management of a complex complication (target lesion/graft occlusion, bleeding)



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<p>presentations and operations and take care of most cases</p> <p>Framework: The learner can treat all straightforward appendicitis 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>	<p>a patient with complex CLTI, considering all classifications of ischemia</p> <ul style="list-style-type: none"> Leads and supervises the team in managing complex comorbidities, critical care, and palliative care Conducts an informed consent discussion for a patient undergoing complex revascularization Independently initiates cross-sectional and duplex imaging and 3D reformatting to identify abnormal findings and plan an intervention Demonstrates adequate background knowledge based on a patient-specific H&P and interprets appropriate imaging studies to develop an operative plan for CLTI, including consideration of open and endo approaches Describes multiple approaches to open revascularization for CLTI and adapts the plan for a 	<p>intraop decisions; anticipates when assistance is needed</p> <ul style="list-style-type: none"> Identifies all critical steps of the procedure and the equipment required and advances the procedure without prompting in a complex case Describes potential errors at critical portions of the procedure and the steps to avoid them Anticipates patient-specific complications during an open intervention for CLTI (potential arterial and venous injury from redo operative fields, difficulty establishing inflow control due to calcification) and describes appropriate management of these situations, including incorporation of an endo technique Serves as a role model for other providers in the OR, advocating for patient safety 	<p>prompting in a complex case</p> <ul style="list-style-type: none"> Describes potential errors at critical portions of the procedure and the steps to avoid them Anticipates patient-specific complications during an endo intervention for CLTI (potential arterial injury from small access, heavily calcified lesions, difficult iliac bifurcations, long lesions) and describes appropriate management of these situations, including conversion to an open procedure Serves as a role model for other providers in the OR, advocating for patient safety 	<ul style="list-style-type: none"> Initiates discussion and resolves complex issues regarding reintervention and limb salvage in a patient with CLTI Communicates with a patient/caregiver(s) in a caring and nonjudgmental way in a difficult situation, such as a complication or intervention failure; provides anticipatory guidance regarding risks/likelihood of limb loss and implications of amputation Leads the multidisciplinary team to facilitate in-hospital and posthospital care and follow-up



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	<p>changing clinical situation (eg, development of wet gangrene, acute-on-chronic ischemia)</p> <ul style="list-style-type: none">• Adapts the management plan based on a change in a patient's anatomy, including from endo to open• Independently initiates and interprets the expected cost-effective workup for an advanced or unusual CLTI presentation; determines the optimal personalized operative approach for the patient• Demonstrates familiarity with the most current literature and guidelines regarding management of CLTI• Customizes communication about the condition to a patient/caregiver(s) based on individual characteristics; anticipates logistical problems in optimizing the patient for surgery			