



## Evaluation & Management of a Patient Needing Renal Replacement Therapy

<b>Description of the Activity</b>	<p>General surgeons are commonly called to evaluate patients with chronic kidney disease in need of renal replacement therapy (RRT). All surgeons must be able to devise a plan for RRT in adult patients and recognize patient considerations requiring specialty referral.</p>
<b>Functions</b>	<ul style="list-style-type: none"><li>❖ Nonoperative/Preoperative<ul style="list-style-type: none"><li>➤ Synthesize information from a patient’s medical records, history, physical examination, referring providers, nephrologists, and existing diagnostic evaluations to determine the presence and severity of comorbid disease.</li><li>➤ Discuss the indications and options for RRT (hemodialysis catheters, kidney transplant, permanent hemodialysis access, peritoneal dialysis).</li><li>➤ Use a cost-effective preoperative testing strategy when planning the approach to hemodialysis access to limit complications and optimize success (eg, selective use of venography and arteriography, ultrasound vascular mapping).</li><li>➤ Formulate a permanent hemodialysis access operative plan in accordance with patient preference and anatomy, intraoperative findings, alternatives choices (eg, fistula or grafts), and potential postoperative complications in the setting of personal biases and barriers (eg, age, literacy, and cultural differences; cognitive disabilities).</li><li>➤ Obtain informed consent for permanent hemodialysis access with cultural humility. Respectfully describe the indications, risks, benefits, and alternatives of the planned operation, including goals of care. Ensure patient/caregiver comprehension using applicable language services and audio/visual aids. This process should include details of the patient’s lifestyle and RRT life plan, and the consent discussion should be documented.</li><li>➤ Recognize how cardiac, pulmonary, hepatic, and renal comorbidities, as well as age, frailty, and surgical history, contribute to risk for surgery (eg, National Surgical Quality Improvement Program [NSQIP] risk calculator).</li><li>➤ For an anticoagulated patient, understand the significance of the indication, and apply an algorithm for discontinuation and resumption in the perioperative period.</li><li>➤ Recognize the variables that contribute to the proper timing of surgery (eg, coagulopathy, electrolyte abnormalities, poorly controlled diabetes mellitus, recent myocardial infarction or stent).</li></ul></li><li>❖ Intraoperative<ul style="list-style-type: none"><li>➤ Manage the perioperative environment, including room setup, equipment check, preprocedural time-out, specimen processing, counts, wound classification, and debriefing functions.</li><li>➤ Perform the planned hemodialysis procedure, and articulate a plan for managing unusual intraoperative findings. Procedures include:<ul style="list-style-type: none"><li>▪ Arteriovenous fistula (AVF)<ul style="list-style-type: none"><li>• Brachiobasilic AVF with transposition</li><li>• Brachiocephalic AVF</li><li>• Radiocephalic AVF</li></ul></li><li>▪ Arteriovenous graft<ul style="list-style-type: none"><li>• Forearm</li><li>• Upper arm</li></ul></li></ul></li><li>➤ Use surgical skills to execute these standard access creations, including:</li></ul></li></ul>



## Evaluation & Management of a Patient Needing Renal Replacement Therapy

	<ul style="list-style-type: none"><li>▪ Dissection and exposure of relevant upper-extremity vascular structures</li><li>▪ Knowledge of relevant instruments and supplies (sutures, needles, prosthetic graft materials)</li><li>▪ Principles of vascular control (inflow, outflow) and tunneling</li><li>▪ Selective indicated use of pharmacologic adjuncts such as antibiotics, antispasmodic compounds, and antithrombotic agents</li><li>▪ Vascular anastomosis construction</li><li>➤ Communicate with the anesthesiology team to select the optimal anesthetic method for a patient undergoing permanent hemodialysis access creation (eg, use of local, regional, or general anesthesia), taking the patient's condition into account.</li><li>❖ Postoperative<ul style="list-style-type: none"><li>➤ Monitor the patient's postoperative course and disposition, and determine the venue for permanent hemodialysis access care.</li><li>➤ Respectfully communicate a medium- and long-term care strategy with the patient/caregiver(s) and other health care team members, including specific instructions related to proper permanent hemodialysis access use to ensure efficacy and long-term durability.</li><li>➤ Provide postoperative care for a patient with significant comorbid disease, including minimizing cardiac, pulmonary, and renal complications and resuming medications such as anticoagulation.</li><li>➤ Recognize and manage postoperative permanent hemodialysis access complications, such as:<ul style="list-style-type: none"><li>▪ Extremity edema</li><li>▪ Failure to mature</li><li>▪ Hematoma</li><li>▪ Infection</li><li>▪ Postoperative bleeding</li><li>▪ Pseudoaneurysm</li><li>▪ Steal syndrome</li><li>▪ Thrombosis</li></ul></li><li>➤ Diagnose and manage complications after permanent hemodialysis access creation.<ul style="list-style-type: none"><li>▪ Perform a careful physical examination of upper extremity AV fistulas and grafts (inspection, pulsatility, thrill, bruit, augmentation, collapse against gravity).</li><li>▪ Use imaging adjuncts to support a diagnosis in a selective and cost-effective way.</li></ul></li></ul></li></ul>
<b>Scope</b>	<ul style="list-style-type: none"><li>❖ In scope<ul style="list-style-type: none"><li>➤ Hemodialysis access in adult patients needing RRT</li></ul></li><li>❖ Out of scope<ul style="list-style-type: none"><li>➤ Complicated permanent hemodialysis access (eg, chest wall, lower limb)</li><li>➤ Management of central venous stenosis</li><li>➤ Pediatric patients</li><li>➤ Permanent hemodialysis access revision procedures</li><li>➤ Technical execution of endovascular procedures</li></ul></li></ul>



## Evaluation & Management of a Patient Needing Renal Replacement Therapy

Level	Nonoperative/Preoperative	Intraoperative	Postoperative
<p><b>1</b></p> <p><b><u>Limited Participation</u></b></p> <p>Demonstrates understanding of information and has very basic skills</p> <p><b><u>Framework:</u></b> 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"> <li>• Articulates etiologies of renal disease and the 3 general types of renal replacement therapies</li> <li>• Performs a basic arterial exam in an access patient</li> <li>• Respectfully communicates basic facts about the condition to a patient/caregiver(s) but inconsistently uses applicable language services and audio/visual aids</li> <li>• Communicates the elements of an informed consent discussion but omits some elements when documenting the discussion</li> <li>• Receives consultation for placement of permanent hemodialysis access and obtains a focused history but requires guidance to articulate a plan</li> <li>• Identifies some indications for consultation and requests a consult from other services (nephrology, cardiology, anesthesiology)</li> <li>• Enumerates basic health payment systems in the U.S.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires prompting to articulate operative steps of direct autogenous fistula creation</li> <li>• Names but requires prompting to intraoperatively identify nervous, musculoskeletal, and subfascial vascular structures</li> <li>• Requires assistance to describe anesthetic considerations and approaches for permanent hemodialysis access creation in the arm</li> <li>• Assists with positioning and preparation of a patient and retraction for exposure</li> <li>• Maintains a sterile field and performs superficial wound closure</li> <li>• Handles instruments safely but tentatively; follows intraoperative directions; displays coordinated hand movements for simple maneuvers under direct instruction, though inefficiently</li> <li>• Demonstrates respect for and engages in culturally sensitive communication with all members of the OR team</li> <li>• Demonstrates uncertainty about the necessary equipment for the operation</li> </ul>	<ul style="list-style-type: none"> <li>• Manages a routine postop course with guidance after direct AV fistula construction</li> <li>• Evaluates vascular construction patency and basic postop problems (eg, bleeding, hypotension, HTN), requiring assistance to recognize some signs or symptoms of complications</li> <li>• Requires prompting to generate criteria for access maturation</li> <li>• Clearly and respectfully communicates basic aspects of the operative procedure along with routine discharge instructions and wound care details to a patient/caregiver(s)</li> <li>• Describes basic elements of documentation for billing/coding</li> </ul>
<p><b>2</b></p> <p><b><u>Direct Supervision</u></b></p> <p>Demonstrates understanding of the steps of the operation but requires direction through</p>	<ul style="list-style-type: none"> <li>• Identifies utility of and interprets preop imaging (duplex, venography, arteriography) to recognize anatomic variants and diagnose arterial inflow disease</li> </ul>	<ul style="list-style-type: none"> <li>• Articulates basic operative steps of direct autogenous fistula creation and identifies optimal skin incision location</li> <li>• Identifies arm nerves and musculoskeletal and subfascial</li> </ul>	<ul style="list-style-type: none"> <li>• Manages a routine postop course without guidance after direct AV fistula construction</li> <li>• Performs a basic permanent hemodialysis access physical exam but misses some abnormal</li> </ul>



## Evaluation & Management of a Patient Needing Renal Replacement Therapy

Level	Nonoperative/Preoperative	Intraoperative	Postoperative
<p>principles and does not know the nuances of a basic case</p> <p><b>Framework:</b> 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"><li>• Articulates the 3 general types of hemodialysis access</li><li>• Performs a complete extremity vascular exam (arterial and venous exam, qualitative assessment of skin/soft tissue) in a first-time access patient</li><li>• Articulates a plan for hemodialysis access creation but may omit consideration of comorbidities that confound surgical timing and outcomes</li><li>• Respectfully communicates basic facts about the diagnosis to a patient/caregiver(s), customizing communication to overcome barriers and cultural differences and using applicable language services and audio/visual aids</li><li>• Communicates the elements of an informed consent discussion in a straightforward case and completely documents the discussion</li><li>• Identifies general indications for consultation and respectfully requests a consult from other services</li><li>• Completes a full consultation for straightforward placement of permanent hemodialysis access; communicates urgency to supervisors and surgical recommendation to the consulting service</li><li>• Demonstrates basic understanding of financing structures for renal health in the U.S. health care system</li></ul>	<p>vascular structures under normal conditions</p> <ul style="list-style-type: none"><li>• Anticipates some next steps in the operation and necessary instruments but requires assistance to coordinate with perioperative staff to ensure these are available</li><li>• Performs basic vascular surgery skills (eg, dissects and ligates subcutaneous veins, performs suture ligation, closes incisions) without oversight</li><li>• Requires active direction to move the operation forward, including obtaining vascular control and constructing an anastomosis</li><li>• Identifies common positioning options but cannot name factors to select one over another; recognizes the importance of protecting against nerve and pressure injuries but cannot describe resulting morbidity</li><li>• Maintains the plane of dissection if identified for them but frequently deviates from the correct plane</li><li>• Requires assistance to control bleeding</li><li>• Clearly communicates with all members of the OR team</li></ul>	<p>findings (eg, thinning skin, distal pulse augmentation with access occlusion, outflow thrill)</p> <ul style="list-style-type: none"><li>• Recognizes and manages early standard surgical complications (eg, bleeding, cellulitis)</li><li>• Recognizes early access-specific complications (eg, bleeding, thrombosis, steal syndrome), requiring assistance to manage them</li><li>• Generates most criteria for access maturation without prompting</li><li>• Completes documentation with few omissions of needed elements for billing/coding</li></ul>



## Evaluation & Management of a Patient Needing Renal Replacement Therapy

Level	Nonoperative/Preoperative	Intraoperative	Postoperative
<p><b>3</b></p> <p><b><u>Indirect Supervision</u></b></p> <p>Can do a basic operation but will not recognize abnormalities and does not understand the nuances of an advanced case</p> <p><b><u>Framework:</u></b> 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"><li>• Recognizes comorbidities that may confound surgical timing and outcomes</li><li>• Performs a complete extremity vascular exam in a redo access patient</li><li>• Develops a plan for a straightforward patient requiring hemodialysis access that incorporates preop imaging findings; identifies medical history (eg, failed permanent access attempts, central venous occlusion) that prompts involvement of specialized providers (eg, vascular surgeons)</li><li>• Communicates a straightforward patient's medical condition across barriers and cultural differences to elicit a personalized care plan in a shared decision-making process</li><li>• Conducts an informed consent discussion for a straightforward procedure with cultural humility; completely documents the discussion</li><li>• Completes consultation for complicated placement of permanent hemodialysis access, including assessment of urgency, and communicates the surgical recommendation clearly to others</li><li>• Discusses how different types of renal replacement therapies impact patients, their caregivers, and the health care system</li></ul>	<ul style="list-style-type: none"><li>• Performs operative steps of direct autogenous fistula creation in a straightforward case, including obtaining vascular control and constructing technically sound vascular anastomoses</li><li>• Performs more advanced vascular surgery skills (eg, dissects and exposes subfascial arteries and veins)</li><li>• Positions the patient to prevent iatrogenic injury</li><li>• Identifies optimal skin incision location for arm prosthetic straight or loop grafts</li><li>• Identifies but cannot adapt to abnormal anatomy discovered intraoperatively (eg, high brachial artery bifurcation, poor quality arterial inflow, smaller than expected vein)</li><li>• Identifies arm tissue planes and musculoskeletal and subfascial vascular structures in the setting of inflammation or scarring and adapts tissue handling based on tissue quality</li><li>• Formulates an anesthetic approach in partnership with the operative team</li></ul>	<ul style="list-style-type: none"><li>• Manages the routine postop course of a patient with a complex construction or a complicated course after a routine construction</li><li>• Recognizes and manages early access-related complications (eg, bleeding, thrombosis, steal syndrome)</li><li>• Identifies standard criteria for access maturation</li><li>• Completes documentation, including all needed elements for billing/coding</li></ul>



## Evaluation & Management of a Patient Needing Renal Replacement Therapy

Level	Nonoperative/Preoperative	Intraoperative	Postoperative
<p><b>4</b></p> <p><u>Practice Ready</u></p> <p>Can manage more complex patient presentations and operations and take care of most cases</p> <p><u>Framework:</u></p> <p>The learner can treat all straightforward kidney disease 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"><li>• Synthesizes all relevant data and generates an informed renal replacement therapy life plan (short-, medium-, and long-term strategy for dialysis/transplant) for standard hemodialysis scenarios</li><li>• Integrates preoperative imaging with aberrant anatomy (duplex, venography, arteriography) and initial choice of access (eg, autogenous fistula, graft, catheter) to recognize venous outflow issues that require alteration of the plan</li><li>• Manages comorbidities that may confound surgical timing and outcomes</li><li>• Customizes communication based on individual patient characteristics and preferences across barriers and cultural differences in a difficult kidney disease discussion; negotiates and manages conflict between a patient, caregivers, and the health care team</li><li>• Conducts an informed consent discussion for a complex hemodialysis access procedure with cultural humility, eliciting patient preferences and documenting risks and benefits individualized to the patient</li><li>• Completes a full consultation for all permanent hemodialysis access placements or their resultant complications and communicates the recommendations clearly to others</li><li>• Uses shared decision-making in treatment planning, taking into consideration costs to the patient</li></ul>	<ul style="list-style-type: none"><li>• Identifies optimal incision location for complex access constructions (eg, basilic vein transposition)</li><li>• Formulates an anesthetic approach accounting for complex comorbidities in partnership with the anesthesia team</li><li>• Identifies additional instruments and equipment necessary for performing complex access creation and coordinates with the OR team for their availability</li><li>• Performs operative steps of complex autogenous fistula and AV graft access creations, including obtaining vascular control and constructing technically sound vascular anastomoses</li><li>• Adapts to abnormal anatomy discovered intraoperatively (eg, high brachial artery bifurcation, poor quality arterial inflow, smaller than expected vein)</li><li>• Devises and implements a plan when deviation from the initial operative plan is required</li><li>• Identifies intraoperative challenges (eg, dissections, access inflow and outflow lesions, hand ischemia) that prompt involvement of specialized providers (eg, vascular surgeons)</li></ul>	<ul style="list-style-type: none"><li>• Manages a complicated postop course</li><li>• Recognizes and coordinates management of complex short-term complications (eg, ischemic mononeuropathy) and long-term complications (eg, pseudoaneurysm, infection, arm edema, failure to mature)</li><li>• Confirms that a permanent hemodialysis access is ready for attempted use</li><li>• Communicates an access use timetable/plan to a patient/caregiver(s) and dialysis center/nephrologist in an understandable and respectful way</li><li>• Customizes and streamlines documentation, including all needed elements for billing/coding</li></ul>