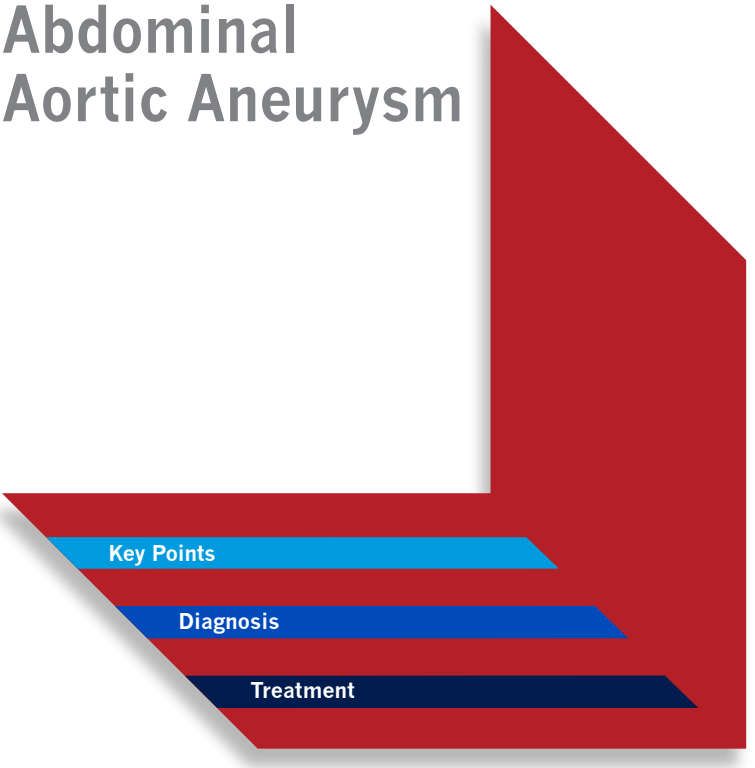
SVS | Society for Vascular Surgery

Abdominal Aortic Aneurysm



Key Points

- **Aneurysms present with varying risks of rupture, and patient-specific factors influence anticipated life expectancy, operative risk, and need to intervene. Careful attention to the choice of operative strategy along with optimal treatment of medical comorbidities is critical to achieving excellent outcomes.**
- **The SVS recommends endovascular repair as the preferred method of treatment for ruptured aneurysms.**
- **The SVS suggests that the Vascular Quality Initiative mortality risk score** (https://qxmd.com/calculate/calculator_322/vascular-quality-initiative-vqi-cardiac-risk-index-cri-evar) **be used for mutual decision-making with patients considering aneurysm repair.**
- **The SVS also suggest that elective endovascular aneurysm repair (EVAR) be limited to hospitals with a documented mortality and conversion rate to open surgical repair of ≤2% and that perform ≥10 EVAR cases each year. The SVS also suggests that elective open aneurysm repair be limited to hospitals with a documented mortality of ≤5% and that perform ≥10 open aortic operations of any type each year.**
- **The SVS suggests a door-to-intervention time of <90 minutes, based on a framework of 30-30-30 minutes, for the management of the patient with a ruptured aneurysm.**
- **The SVS recommends treatment of type I and III endoleaks as well as of type II endoleaks with aneurysm expansion but recommend continued surveillance of type II endoleaks not associated with aneurysm expansion.**
- **Whereas antibiotic prophylaxis is recommended for patients with an aortic prosthesis before any dental procedure involving the manipulation of the gingival or periapical region of teeth or perforation of the oral mucosa, antibiotic prophylaxis is not recommended before respiratory tract procedures, gastrointestinal or genitourinary procedures, and dermatologic or musculoskeletal procedures unless the potential for infection exists or the patient is immunocompromised.**
- **Increased utilization of color duplex ultrasound is suggested for postoperative surveillance after EVAR in the absence of endoleak or aneurysm expansion.**

Physical Examination

- In patients with a suspected or known abdominal aortic aneurysm (AAA), the SVS recommends performing physical examination that includes an assessment of femoral and popliteal arteries. (1-A)
- In patients with a popliteal or femoral artery aneurysm, the SVS recommends evaluation for an AAA. (1-A)

Assessment of Medical Comorbidities

- In patients with active cardiac conditions, including unstable angina, decompensated heart failure, severe valvular disease, and significant arrhythmia, the SVS recommends cardiology consultation before EVAR or open surgical repair (OSR). (1-B)
- In patients with significant clinical risk factors, such as coronary artery disease, congestive heart failure, cerebrovascular disease, diabetes mellitus, chronic renal insufficiency, and unknown or poor functional capacity (metabolic equivalent [MET] <4), who are to undergo OSR or EVAR, the SVS suggests noninvasive stress testing. (2-B)
- The SVS recommends a preoperative resting 12-lead electrocardiogram (ECG) in all patients undergoing EVAR or OSR within 30 days of planned treatment. (1-B)
- The SVS recommends echocardiography before planned operative repair in patients with dyspnea of unknown origin or worsening dyspnea. (1-A)
- The SVS suggests coronary revascularization before aneurysm repair in patients with acute ST-segment or non-ST–segment elevation myocardial infarction (MI), unstable angina, or stable angina with left main coronary artery or three-vessel disease. (2-B)
- The SVS suggests coronary revascularization before aneurysm repair in patients with stable angina and two-vessel disease that includes the proximal left descending artery and either ischemia on noninvasive stress testing or reduced left ventricular function (ejection fraction <50%). (2-B)
- In patients who may need aneurysm repair in the subsequent 12 months and in whom percutaneous coronary intervention is indicated, the SVS suggests a strategy of balloon angioplasty or bare-metal stent placement, followed by 4–6 weeks of dual antiplatelet therapy. (2-B)

- **The SVS suggests deferring elective aneurysm repair for 30 days after bare-metal stent placement or coronary artery bypass surgery if clinical circumstances permit. As an alternative, EVAR may be performed with uninterrupted continuation of dual antiplatelet therapy. (2-B)**
- **The SVS suggests deferring open aneurysm repair for ≥6 months after drug-eluting coronary stent placement or, alternatively, performing EVAR with continuation of dual antiplatelet therapy. (2-B)**
- **In patients with a drug-eluting coronary stent requiring open aneurysm repair, the SVS recommends discontinuation of P2Y12 platelet receptor inhibitor therapy 10 days preoperatively with continuation of aspirin. The P2Y12 inhibitor should be restarted as soon as possible after surgery. The relative risks and benefits of perioperative bleeding and stent thrombosis should be discussed with the patient. (1-B)**
- **The SVS suggests continuation of beta blocker therapy during the perioperative period if it is part of an established medical regimen. (2-B)**
- **If a decision was made to start beta blocker therapy (because of the presence of multiple risk factors, such as coronary artery disease, renal insufficiency, and diabetes), the SVS suggests initiation well in advance of surgery to allow sufficient time to assess safety and tolerability. (2-B)**
- **The SVS suggests preoperative pulmonary function studies, including room air arterial blood gas determinations, in patients with a history of symptomatic chronic obstructive pulmonary disease (COPD), long-standing tobacco use, or inability to climb one flight of stairs. (2-C)**
- **The SVS recommends smoking cessation for ≥2 weeks before aneurysm repair. (1-C)**
- **The SVS suggests administration of pulmonary bronchodilators for at least 2 weeks before aneurysm repair in patients with a history of COPD or abnormal results of pulmonary function testing. (2-C)**
- **The SVS suggests holding angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor antagonists on the morning of surgery and restarting these agents after the procedure once euvolemia has been achieved. (2-C)**
- **The SVS recommends preoperative hydration in non-dialysis–dependent patients with renal insufficiency before aneurysm repair. (1-A)**

- **The SVS recommends preprocedure and postprocedure hydration with normal saline or 5% dextrose/sodium bicarbonate for patients at increased risk of contrast-induced nephropathy (CIN) undergoing EVAR. (1-A)**
- **The SVS recommends holding metformin at the time of administration of contrast material among patients with an estimated glomerular filtration rate (eGFR) of <60 mL/min or ≤48 hours before administration of contrast material if the eGFR is <45 mL/min. (1-C)**
- **The SVS recommends restarting metformin no sooner than 48 hours after administration of contrast material as long as renal function has remained stable (<25% increase in creatinine concentration above baseline). (1-C)**
- **The SVS recommends perioperative transfusion of packed red blood cells if the hemoglobin level is <7 g/dL. (1-B)**
- **The SVS suggests hematologic assessment if the preoperative platelet count is <150,000/mL. (2-C)**

Table 1. Preoperative Cardiac Evaluation for the Patient Undergoing Aneurysm Repair

1. Is there an active cardiac condition?	• Unstable coronary syndrome • Unstable or severe angina • Recent myocardial infarction (MI) (<1 month) • Decompensated congestive heart failure (CHF) • Significant arrhythmias • Severe valvular disease
	Presence cancels or delays aneurysm repair until conditions are treated. Implement medical management and consider coronary angiography.
2. Does the patient have good functional capacity without symptoms?	• MET ≥4 (Table 2) • Clinical risk factors • Mild angina pectoris • Prior MI • Compensated or prior CHF • Diabetes mellitus • Renal insufficiency
	May proceed with aneurysm repair. In patients with known cardiovascular disease or at least one clinical risk factor, beta blockade is appropriate.
3. Is functional capacity poor or unknown?	• MET <4 (Table 2) • Clinical risk factors • Mild angina pectoris • Prior MI • Compensated or prior CHF • Diabetes mellitus • Renal insufficiency
	In patients with three or more clinical risk factors, preoperative noninvasive testing is appropriate if it will change management.

From: Chaikof EL, Brewster DC, Dalman RL, Makaroun MS, Illig KA, Sicard GA, et al. The care of patients with an abdominal aortic aneurysm: the Society for Vascular Surgery practice guidelines. *J Vasc Surg.* 2009;50(Suppl):S2-49; originally adapted from Fleisher LA, Beckman JA, Brown KA, Calkins H, Chaikof E, Fleischmann KE, et al. ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery: executive summary. *Circulation* 2007;116:1971-96.

Table 2. Functional Capacity Estimation From an Assessment of Physical Activity

Activity level	Examples of activity level
Poor (1–3 METs)	Eating, walking at 2–3 mph, getting dressed, light housework (washing dishes)
Moderate (4–7 METs)	Climbing a flight of stairs or walking up a hill, running a short distance, heavy housework (scrubbing floors or moving furniture)
Good (7–10 METs)	Doubles tennis, calisthenics without weights, golfing without cart
Excellent (>10 METs)	Strenuous sports such as football, basketball, singles tennis, karate, jogging 10-minute mile or more, chopping wood

From Chaikof EL, Brewster DC, Dalman RL, Makaroun MS, Illig KA, Sicard GA, et al. The care of patients with an abdominal aortic aneurysm: the Society for Vascular Surgery practice guidelines. *J Vasc Surg.* 2009;50(Suppl):S2-49; originally adapted from Hlatky MA, Boineau RE, Higginbotham MB, Lee KL, Mark DB, Califf RM, et al. A brief self-administered questionnaire to determine functional capacity (the Duke Activity Status Index). *Am J Cardiol.* 1989;64:651-4.

Aneurysm Imaging

- **The SVS recommends using ultrasound, when feasible, as the preferred imaging modality for aneurysm screening and surveillance. (1-A)**
- **The SVS suggests that the maximum aneurysm diameter derived from computed tomography (CT) imaging should be based on an outer wall to outer wall measurement perpendicular to the path of the aorta. (G-U)**
- **The SVS recommends a one-time ultrasound screening for AAAs in men or women 65–75 years of age with a history of tobacco use. (1-A)**
- **The SVS suggests ultrasound screening for AAA in first degree relatives of patients who present with an AAA. Screening should be performed in first-degree relatives who are 65–75 years of age or in those >75 years and in good health. (2-C)**
- **The SVS suggests a one-time ultrasound screening for AAAs in men or women ≥75 years with a history of tobacco use and in otherwise good health who have not previously received a screening ultrasound examination. (2-C)**
- **If initial ultrasound screening identified an aortic diameter >2.5 cm but <3 cm, the SVS suggests rescreening after 10 years. (2-C)**
- **The SVS suggests surveillance imaging at 3-year intervals for patients with an AAA 3.0–3.9 cm. (2-C)**
- **The SVS suggests surveillance imaging at 12-month intervals for patients with an AAA of 4.0–4.9 cm in diameter. (2-C)**
- **The SVS suggests surveillance imaging at 6-month intervals for patients with an AAA 5.0–5.4 cm in diameter. (2-C)**
- **The SVS recommends a CT scan to evaluate patients thought to have AAA presenting with recent-onset abdominal or back pain, particularly in the presence of a pulsatile epigastric mass or significant risk factors for AAA. (1-B)**

The Decision to Treat

- **The SVS suggests referral to a vascular surgeon at the time of initial diagnosis of an aortic aneurysm. (G-U)**
- **The SVS recommends repair for the patient who presents with an AAA and abdominal or back pain that is likely to be attributed to the aneurysm. (1-C)**
- **The SVS recommends elective repair for the patient at low or acceptable surgical risk with a fusiform AAA that is ≥5.5 cm. (1-A)**
- **The SVS suggests elective repair for the patient who presents with a saccular aneurysm. (2-C)**
- **The SVS suggests repair in women with AAA 5.0–5.4 cm in maximum diameter. (2-B)**
- **In patients with a small aneurysm (4.0–5.4 cm) who will require chemotherapy, radiation therapy, or solid organ transplantation, the SVS suggests a shared decision-making approach to decide about treatment options. (2-C)**

Medical Management During the Period of AAA Surveillance

- **The SVS recommends smoking cessation to reduce the risk of AAA growth and rupture. (1-B)**
- **The SVS suggests *NOT* administering statins, doxycycline, roxithromycin, ACE inhibitors, or angiotensin receptor blockers for the sole purpose of reducing the risk of AAA expansion and rupture. (2-C)**
- **The SVS suggests *NOT* administering beta blocker therapy for the sole purpose of reducing the risk of AAA expansion and rupture. (1-B)**

Timing for Intervention

- **The SVS recommends immediate repair for patients who present with a ruptured aneurysm. (1-A)**
- **Should repair of a symptomatic AAA be delayed to optimize coexisting medical conditions, the SVS recommends that the patient be monitored in an intensive care unit (ICU) setting with blood products available. (1-C)**

Assessment of Operative Risk and Life Expectancy

- **The SVS suggests informing patients contemplating open repair or EVAR of their Vascular Quality Initiative (VQI) perioperative mortality risk score** (https://qxmd.com/calculate/calculator_324/vascular-quality-initiative-vqi-cardiac-risk-index-cri-open-aaa-repair & https://qxmd.com/calculate/calculator_284/vsgne-ruptured-abdominal-aortic-aneurysm-raaa-risk-score)**. (2-C)**

Table 3a. Mortality Risk Scoring Scheme for Patients Undergoing Repair of an AAA

Parameter	Points
Treatment	
EVAR	0
Open aneurysm repair (OAR) (infrarenal)	2
OAR (suprarenal)	4
Aneurysm size, mm	
<65	0
≥65	2
Age, years	
≤75	0
>75	1
Gender	
Male	0
Female	1
Comorbidities	
Myocardial disease	1
Cerebrovascular disease	1
Chronic obstructive pulmonary disease	2
Laboratory value	
Creatinine, mg/dL	
<1.5	0
1.5 to <2	2
≥2	2

From Eslami MH, Rybin D, Doros G, Kalish JA, Farber A; Vascular Study Group of New England. Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. *J Vasc Surg.* 2015;62:1125-33.e2.

Table 3b. Risk Categorization Based on Mortality Risk Scoring Scheme (Table 3a) for Patients Undergoing Repair of an AAA

Points	Probability of mortality, %	Proposed risk designation
0	0.12	Low-risk group
1	0.2	
2	0.34	
3	0.59	
4	1	
5	1.71	Medium-risk group
6	2.91	
7	4.9	
8	8.14	High-risk group
9	13.2	
10	20.75	
11	31.05	Prohibitive high-risk group
12	43.63	
13	57.1	
14	69.59	

From Eslami MH, Rybin D, Doros G, Kalish JA, Farber A; Vascular Study Group of New England. Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. *J Vasc Surg*. 2015;62:1125-33.e2.

EVAR

- The SVS recommends preservation of flow to at least one internal iliac artery. (1-A)
- The SVS recommends using Food and Drug Administration (FDA)-approved branch endograft devices in anatomically suitable patients to maintain perfusion to at least one internal iliac artery. (1-A)
- The SVS recommends staging bilateral internal iliac artery occlusion by ≥1–2 weeks if required for EVAR. (1-A)
- The SVS suggests renal artery or superior mesenteric artery (SMA) angioplasty and stenting for selected patients with symptomatic disease before EVAR or OSR. (2-C)
- The SVS suggests prophylactic treatment of an asymptomatic, high-grade stenosis of the SMA in the presence of a meandering mesenteric artery based off of a large inferior mesenteric artery (IMA), which will be sacrificed during the course of treatment. (2-C)
- The SVS suggests preservation of accessory renal arteries at the time of EVAR or OSR if the artery is ≥3 mm in diameter or supplies more than one-third of the renal parenchyma. (2-C)

Perioperative Outcomes of Elective EVAR

- The SVS suggests that elective EVAR be performed at centers with a volume of ≥10 EVAR cases each year and a documented perioperative mortality and conversion rate to OSR of ≤2%. (2-C)

Role of Elective EVAR in the High-Risk and Unfit Patient

- The SVS suggests informing high-risk patients of their VQI perioperative mortality risk score to make an informed decision to proceed with aneurysm repair. (2-C)

OSR

- The SVS recommends a retroperitoneal approach for patients requiring OSR of an inflammatory aneurysm, a horseshoe kidney, or an aortic aneurysm in the presence of a hostile abdomen. (1-C)
- The SVS suggests a retroperitoneal exposure or a transperitoneal approach with a transverse abdominal incision for patients with significant pulmonary disease requiring OSR. (2-C)
- The SVS recommends a thrombin inhibitor, such as bivalirudin or argatroban, as an alternative to heparin for patients with a history of heparin-induced thrombocytopenia. (1-B)

- **The SVS recommends straight tube grafts for OSR of AAA in the absence of significant disease of the iliac arteries. (1-A)**
- **The SVS recommends performing the proximal aortic anastomosis as close to the renal arteries as possible. (1-A)**
- **The SVS recommends that all portions of an aortic graft be excluded from direct contact with the intestinal contents of the peritoneal cavity. (1-A)**
- **The SVS recommends reimplantation of a patent IMA under circumstances that suggest an increased risk of colonic ischemia. (1-A)**
- **The SVS recommends preserving blood flow to at least one hypogastric artery in the course of OSR. (1-A)**
- **The SVS suggests concomitant surgical treatment of other visceral arterial disease at the time of OSR in symptomatic patients who are not candidates for catheter-based intervention. (2-B)**
- **The SVS suggests concomitant surgical repair of an AAA and coexistent cholecystitis or an intra-abdominal tumor in patients who are not candidates for EVAR or staged intervention. (2-C)**

Table 4. Surgical Approaches for Open Aneurysm Repair

	Transperitoneal	Retroperitoneal
Advantages	• Most rapid, greatest versatility • Provides widest access • Enables evaluation and treatment of concomitant intra-abdominal disease	• Avoids hostile abdomen • Facilitates suprarenal exposure and control • Potential reduction of postoperative ileus • Obesity • Inflammatory AAA • Horseshoe kidney
Disadvantages	• Longer postoperative ileus • Potential for greater fluid losses • Difficulty with exposure and control for suprarenal aneurysms • Higher incidence of incisional hernia	• Poor access to right renal and iliac arteries • Cannot evaluate intra-abdominal disease • Flank bulge

Adapted from Chaikof EL, Brewster DC, Dalman RL, Makaroun MS, Illig KA, Sicard GA, et al. The care of patients with an abdominal aortic aneurysm: the Society for Vascular Surgery practice guidelines. *J Vasc Surg*. 2009;50(Suppl):S2-49.

Perioperative Outcomes of Open AAA Repair

➤ **The SVS suggests that elective OSR for AAA be performed at centers with an annual volume of ≥10 open aortic operations of any type and a documented perioperative mortality of ≤5%. (2-C)**

Table 5. Estimated Perioperative Complications After Elective Open Surgery for AAA

Complication	Frequency, %
All cardiac	15
Myocardial infarction	2–8
All pulmonary	8–12
Pneumonia	5
Renal insufficiency	5–12
Dialysis	1–6
Bleeding	2–5
Wound infection	<5
Leg ischemia	1–4
Deep venous thrombosis	5–8
Colon ischemia	1–2
Stroke	1–2
Graft thrombosis	<1
Graft infection	<1
Ureteral injury	<1

From Schermerhorn ML, Cronenwett JL. Abdominal aortic and iliac aneurysms. In: Rutherford RB, editor. Vascular surgery. 6th ed. Philadelphia: Elsevier Saunders; 2005. p. 1431.

The Patient with a Ruptured Aneurysm

- **The SVS suggests a door-to-intervention time of <90 minutes, based on a framework of 30-30-30 minutes, for the management of the patient with a ruptured aneurysm. (G-U)**
- **An established protocol for the management of ruptured AAA is essential for optimal outcomes. (G-U)**
- **The SVS recommends implementing hypotensive hemostasis with restriction of fluid resuscitation in the conscious patient. (1-B)**
- **The SVS suggests that patients with ruptured AAA who require transfer for repair be referred to a facility with an established rupture protocol and suitable endovascular resources. (G-U)**
- **If it is anatomically feasible, the SVS recommends EVAR over open repair for treatment of a ruptured AAA. (1-C)**

Figure 1. Suspected Ruptured Abdominal Aortic Aneurysm (rAAA) Algorithm

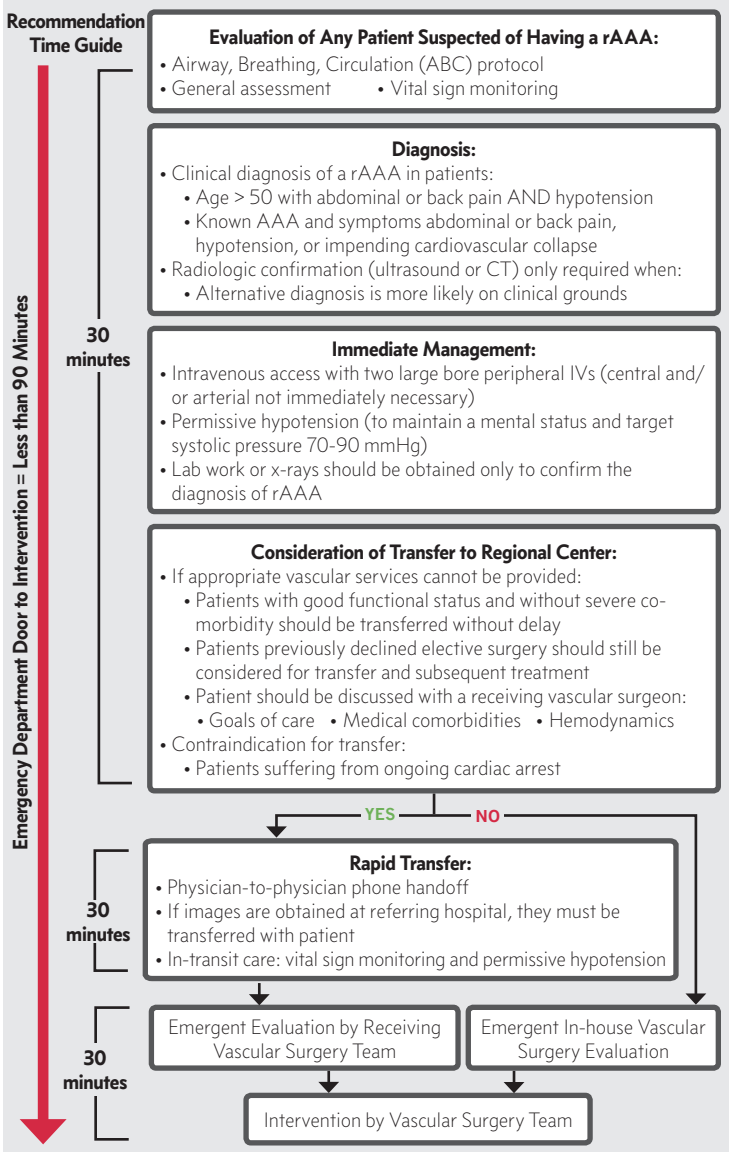


Table 6. Referring Hospital Checklist for the Patient With a Suspected or Confirmed Ruptured Aneurysm

Referring Hospital Emergency Department Checklist	
❑	Physician-to-physician phone handoff
❑	Intravenous peripheral access
❑	Continuous vital sign monitoring
❑	Permissive hypotension (to maintain a mental status and target systolic pressure of 70–90 mmHg)
❑	Transfer of obtained images (either by upload or CD/DVD)

Table 7. Receiving Hospital Personnel Alert Checklist for Management of the Patient With a Suspected or Confirmed Ruptured Aneurysm

Receiving Hospital Personnel Alert Checklist	
❑	Emergency department attending physician
❑	Emergency department nursing
❑	Vascular surgery attending physician and team (including vascular technologist)
❑	Anesthesiology team
❑	Operating room charge nurse
❑	Vascular technologist
❑	Admitting/bed control
❑	Chaplaincy

Choice Of Anesthetic Technique And Agent

- **The SVS recommends general endotracheal anesthesia for patients undergoing open aneurysm repair. (1-A)**

Antibiotic Prophylaxis

- **The SVS recommends intravenous administration of a first-generation cephalosporin or, in the event of penicillin allergy, vancomycin within 30 minutes before OSR or EVAR. Prophylactic antibiotics should be continued for ≤24 hours. (1-A)**

- **The SVS recommends that any potential sources of dental sepsis be eliminated ≥2 weeks before implantation of an aortic prosthesis. (G-U)**

Intraoperative Fluid Resuscitation And Blood Conservation

- **The SVS recommends using cell salvage or an ultrafiltration device if large blood loss is anticipated. (1-B)**

- **If the intraoperative hemoglobin level is <10 g/dL and blood loss is ongoing, the SVS recommends transfusion of packed blood cells along with fresh frozen plasma and platelets in a ratio of 1:1:1. (1-B)**

Cardiovascular Monitoring

- **The SVS suggests using pulmonary artery catheters only if the likelihood of a major hemodynamic disturbance is high. (1-B)**

- **The SVS recommends central venous access and arterial line monitoring in all patients undergoing open aneurysm repair. (1-B)**

- **The SVS recommends postoperative ST-segment monitoring for all patients undergoing open aneurysm repair and for those patients undergoing EVAR who are at high cardiac risk. (1-B)**

- **The SVS recommends postoperative troponin measurement for all patients with electrocardiographic changes or chest pain after aneurysm repair. (1-A)**

Maintenance of Body Temperature

- **The SVS recommends maintaining core body temperature ≥36°C during aneurysm repair. (1-A)**

Role of the ICU

- The SVS recommends postoperative management in an ICU for the patient with significant cardiac, pulmonary, or renal disease as well as for those requiring postoperative mechanical ventilation or who developed a significant arrhythmia or hemodynamic instability during operative treatment. (1-A)

Nasogastric Decompression And Perioperative Nutrition

- The SVS recommends optimization of preoperative nutritional status before elective open aneurysm repair if repair will not be unduly delayed. (1-A)
- The SVS recommends using nasogastric decompression intraoperatively for all patients undergoing open aneurysm repair but postoperatively only for those patients with nausea and abdominal distention. (1-A)
- The SVS recommends parenteral nutrition if a patient is unable to tolerate enteral support 7 days after aneurysm repair. (1-A)

Prophylaxis For Deep Venous Thrombosis

- The SVS recommends thromboprophylaxis that includes intermittent pneumatic compression and early ambulation for all patients undergoing OSR or EVAR. (1-A)
- The SVS suggests thromboprophylaxis with unfractionated or low-molecular-weight heparin for patients undergoing aneurysm repair at moderate to high risk for venous thromboembolism and low risk for bleeding. (2-C)

Postoperative Blood Transfusion

- In the absence of ongoing blood loss, the SVS suggests a threshold for blood transfusion during or after aneurysm repair at a hemoglobin concentration of ≤7 g/dL. (2-C)

Perioperative Pain Management

- The SVS recommends multimodality treatment, including epidural analgesia, for postoperative pain control after OSR of an AAA. (1-A)

Late Outcomes

- **The SVS recommends treatment of type I endoleaks. (See Table 8) (1-B)**
- **The SVS suggests treatment of type II endoleaks associated with aneurysm expansion. (2-C)**
- **The SVS recommends surveillance of type II endoleaks not associated with aneurysm expansion. (1-B)**
- **The SVS recommends treatment of type III endoleaks. (1-B)**
- **The SVS suggests no treatment of type IV endoleaks. (2-C)**
- **The SVS recommends open repair if endovascular intervention fails to treat a type I or type III endoleak with ongoing aneurysm enlargement. (1-B)**
- **The SVS suggests open repair if endovascular intervention fails to treat a type II endoleak with ongoing aneurysm enlargement. (2-C)**
- **The SVS suggests treatment for ongoing aneurysm expansion, even in the absence of a visible endoleak. (2-C)**
- **The SVS recommends that follow-up of patients after aneurysm repair include a thorough lower extremity pulse examination or ankle-brachial index (ABI). (1-B)**
- **The SVS recommends a prompt evaluation for possible graft limb occlusion if patients develop new-onset lower extremity claudication, ischemia, or reduction in ABI after aneurysm repair. (1-A)**
- **The SVS recommends antibiotic prophylaxis to prevent graft infection before any dental procedure involving the manipulation of the gingival or periapical region of teeth or perforation of the oral mucosa, including scaling and root canal procedures, for any patient with an aortic prosthesis, whether placed by OSR or EVAR. (1-B)**
- **The SVS suggests antibiotic prophylaxis before respiratory tract procedures, gastrointestinal or genitourinary procedures, and dermatologic or musculoskeletal procedures for any patient with an aortic prosthesis if the potential for infection exists or the patient is immunocompromised. (2-C)**
- **After aneurysm repair, the SVS recommends prompt evaluation for possible graft infection if a patient presents with generalized sepsis, groin drainage, pseudoaneurysm formation, or ill-defined pain. (1-A)**
- **The SVS recommends prompt evaluation for possible aortoenteric fistula in a patient presenting with gastrointestinal bleeding after aneurysm repair. (1-A)**

- **In patients presenting with an infected graft in the presence of extensive contamination with gross purulence, the SVS recommends extra-anatomic reconstruction followed by excision of all graft material along with aortic stump closure covered by an omental flap. (1-B)**
- **In patients presenting with an infected graft with minimal contamination, the SVS suggests in situ reconstruction with cryopreserved allograft. (2-B)**
- **In a stable patient presenting with an infected graft, the SVS suggests in situ reconstruction with femoral vein after graft excision and débridement. (2-B)**
- **In unstable patients with infected graft, the SVS recommends in situ reconstruction with a silver or antibiotic-impregnated graft, cryopreserved allograft, or polytetra-fluoroethylene (PTFE) graft. (1-B)**

Recommendation For Postoperative Surveillance

- **The SVS recommends baseline imaging in the first month after EVAR with contrast-enhanced CT and color duplex ultrasound imaging. In the absence of an endoleak or sac enlargement, imaging should be repeated in 12 months using contrast-enhanced CT or color duplex ultrasound imaging. (1-B)**
- **If a type II endoleak is observed 1 month after EVAR, the SVS suggests postoperative surveillance with contrast-enhanced CT and color duplex ultrasound imaging at 6 months. (2-B)**
- **If neither endoleak nor AAA enlargement is observed 1 year after EVAR, the SVS suggests color duplex ultrasound when feasible, or CT imaging if ultrasound is not possible, for annual surveillance. (2-C)**
- **If a type II endoleak is associated with an aneurysm sac that is shrinking or stable in size, the SVS suggests color duplex ultrasound for continued surveillance at 6-month intervals for 24 months and then annually thereafter. (2-C)**
- **If a new endoleak is detected, the SVS suggests evaluation for a type I or type III endoleak. (2-C)**
- **The SVS suggests non-contrast-enhanced CT imaging of the entire aorta at 5-year intervals after open repair or EVAR. (2-C)**

Table 8. Endoleaks

Type	Description
I	An incomplete seal at the proximal aortic attachment site (type Ia) or at the distal iliac attachment site (Ib)
II	Persistent filling of the aneurysm sac from patent lumbar arteries or the IMA
III	Incomplete seal between components or component separation and, less frequently, fabric erosion
IV	Fabric porosity

Recommendation Grading			
Strength of Recommendation		**Level of Evidence**	
1 – Strong	Benefit clearly outweighs risk	A	High
2 – Weak	Benefits and risks are more closely matched and are more dependent on specific clinical scenarios	B	Moderate
		C	Low
G-U	Good Practice Statement – Ungraded		

Abbreviations

AAA, Abdominal aortic aneurysm; **CHF**, congestive heart failure; **CT**, computed tomography; **EVAR**, endovascular aneurysm repair; **IVs**, intravenous lines; **METs**, metabolic equivalent (1 MET = 3.5 mL/kg/min oxygen uptake); **MI**, myocardial infarction; **OAR**, open aneurysm repair; **OSR**, open surgical reduction; **SVS**, Society for Vascular Surgery; **VQI**, Vascular Quality Initiative

Source

Chaikof EL, Dalman RL, Eskandari MK et al. The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. *J Vasc Surg.* 2018;76(1):2-77.e2.

Disclaimer

This Guideline attempts to define principles of practice that should produce high-quality patient care. It focuses on the needs of primary care practice, but also is applicable to providers at all levels. This Guideline should not be considered exclusive of other methods of care reasonably directed at obtaining the same results. The ultimate judgment concerning the propriety of any course of conduct must be made by the clinician after consideration of each individual patient situation.

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