fitness may be improved by optimization of comorbid disease to the extent that EVAR may then be considered.

We suggest informing high-risk patients of their VQI perioperative mortality risk score for them to make an informed decision to proceed with aneurysm repair.	
Level of recommendation	2 (Weak)
Quality of evidence	C (Low)

OSR

Indications. OSR of an AAA continues to be used for patients who do not meet the anatomic requirements for endovascular repair, including short or angulated landing zones, excessive thrombus, multiple large accessory renal arteries, and small and tortuous access vessels with concomitant occlusive disease. However, fenestrated, branched, and chimney or snorkel grafts have expanded the range of complex aortic anatomy potentially treatable by EVAR. OSR may be required for treatment of a persistent endoleak and aneurysm sac growth after EVAR or for treatment of a mycotic aneurysm or infected graft.

Surgical approach. OSR can be performed using either a transperitoneal or left flank retroperitoneal approach (Table VII). Indications for each type of approach are largely based on the patient's anatomy and comorbidities and the surgeon's preference. The transperitoneal approach is typically performed using a generous midline incision from the xiphoid process to the symphysis pubis. Extension of the incision alongside the xiphoid process releases rectus aponeurosis and facilitates exposure in the obese patient or in those with more proximal aortic disease. A minilaparotomy (15 cm) has been used in select patients. A transperitoneal approach can be performed rapidly and is versatile, allowing assessment of intra-abdominal disease and easy access to the visceral and iliac arteries. Transverse incisions just above the umbilicus also yield excellent exposure to the suprarenal aorta and bilateral iliac bifurcations. Proponents of the retroperitoneal approach claim various physiologic benefits, including significant reduction in fluid losses, cardiac stress, pulmonary complications, and ileus. However, prospective randomized studies have generated conflicting results.[404,405] The measurable benefits attributed to retroperitoneal exposure were primarily a shorter duration of ileus and earlier resumption of oral intake. Sieunarine and colleagues reported no difference in a randomized comparison of transperitoneal and retroperitoneal approaches for infrarenal AAA repair, except for higher rates of incisional pain, bulge, and hernias in the retroperitoneal group.[406]

The retroperitoneal approach may be preferred for repair of a suprarenal aneurysm because exposure can be facilitated by division of the left diaphragmatic crus. However, in a majority of patients, repair of juxtarenal and pararenal aneurysms can be performed using a transperitoneal approach with excellent outcomes.[407,408] Although some surgeons routinely ligate or divide the left renal vein to expose the suprarenal aorta in the course of using a transperitoneal approach, others do not.[407,408] An important indication for the retroperitoneal approach is the presence of a hostile abdomen because of prior intra-abdominal operations, irradiation, incisional hernia, stoma, or enterocutaneous fistula. In addition, a retroperitoneal approach can facilitate repair of an inflammatory aneurysm or aneurysm associated with a horseshoe kidney.[409,410]

We recommend 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.	
Level of recommendation	1 (Strong)
Quality of evidence	C (Low)
We suggest a retroperitoneal exposure or a transperitoneal approach with a transverse abdominal incision for patients with significant pulmonary disease requiring OSR.	
Level of recommendation	2 (Weak)
Quality of evidence	C (Low)

Aortic clamping. Selection of the ideal clamp site and extent of reconstruction is based on analysis of cross-sectional aortic imaging. These features include proximal aneurysm extension; iliac occlusive or aneurysmal disease; concomitant renal and mesenteric disease; anomalous venous anatomy; and presence of calcium, thrombus, or atherosclerotic debris.

The location of the clamp site should take into consideration the proximal extension of the aneurysm as well as the structural integrity of the aortic wall. Ideally, the clamp site should be relatively free of thrombus, atherosclerotic debris, or calcification. Other important considerations include presence of concomitant visceral aortic disease and unusual venous anatomy, such as a retroaortic renal vein or left-sided vena cava. The aortic clamp should be placed in the most caudal position possible to avoid unnecessary renal and visceral ischemia while allowing a safe anastomosis into healthy aortic wall. For repair of an infrarenal aortic aneurysm, the clamp is placed immediately below the level of the lowest renal artery; the graft is anastomosed to a rim of normal aortic wall below the level of the clamp. Performing the proximal anastomosis within healthy aorta is important to minimize the risk of aneurysmal degeneration at or above the graft.

The transperitoneal approach is typically performed using a midline incision from the xiphoid to the symphysis pubis or, in select cases, a minilaparotomy incision. After placement of a self-retaining retractor, the transverse colon is retracted cephalad and the small bowel mesentery to the right side of the abdomen, splaying the retroperitoneum and aortic aneurysm. The retroperitoneum is