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INTRODUCTION

Endovascular therapies, including endovascular aneurysm repair (EVAR), thoracic endovascular aortic repair (TEVAR), and peripheral arterial revascularization, have revolutionized the management of vascular pathologies in recent years (1). However, according to the 2024 European Society for Vascular Surgery (ESVS) guidelines, open surgical repair remains the recommended reference standard for younger patients with longer life expectancies, whereas EVAR should be prioritized for older patients with suitable anatomical criteria (2). Open surgery and endovascular techniques should not be viewed as competing modalities, but rather as complementary strategies tailored to the individual anatomical and clinical characteristics

of the patient (1,2).

Vascular surgeons possess a dual technical training background that encompasses both open surgical reconstruction and catheter-based endovascular techniques (3). This integrated competence provides a critical advantage in planning hybrid approaches for complex anatomies and executing immediate open surgical conversions (bail-out procedures) during catastrophic intraoperative complications—such as main vessel rupture or stent-graft migration—without the need for an external surgical consultation (4). Nevertheless, the independent effect of specialty cannot be easily isolated; critical confounders such as hospital volume, operator case volume, referral bias, patient complexity, and institutional resources must be rigorously evaluated (5).

The role of vascular expertise in endovascular therapy: Impact of operator specialty, procedural volume, and multidisciplinary care

Abstract

Endovascular surgery is increasingly utilized as a minimally invasive strategy in the management of aortic aneurysms and peripheral arterial diseases. Operator specialty, institutional procedure volume, and multidisciplinary care models are critical factors influencing patient outcomes, healthcare costs, and care pathways. This review evaluates the performance of vascular surgeons, interventional cardiologists, and interventional radiologists, contextualized by crucial confounders such as hospital volume, referral bias, and patient complexity. Current evidence demonstrates that procedures performed in high-volume centers, supported by multidisciplinary vascular teams, optimize clinical safety, long-term durability, and cost-effectiveness across all specialties.

Keywords: Endovascular interventions, specialty effect, volume-outcome relationship, endovascular aneurysm repair, thoracic endovascular aortic repair, peripheral arterial disease

Methodology

This article adopts a non-systematic (narrative) review approach to summarize the existing literature through a structured perspective. A comprehensive literature search was conducted across PubMed and Google Scholar databases for articles published between 2000 and 2026. The search utilized combinations of the following keywords: “vascular surgeon”, “interventional cardiologist”, “interventional radiologist”, “endovascular outcomes”, “EVAR”, “TEVAR”, “peripheral interventions”, “specialty volume”, and “hospital volume”.

Inclusion and Exclusion Criteria: Retrospective cohort studies, national database analyses (e.g., NIS, VQI), research examining the volume-outcome relationship, and international clinical guidelines that compared clinical outcomes based on operator specialty (vascular surgeon, cardiologist, radiologist) were included (1,2,5). Technical reports without specialty differentiation, single-case reports, and unpublished abstracts were excluded.

Screening and Quality Assessment: The initial search identified a total of 412 records. Following the removal of duplicates and irrelevant publications, 84 studies underwent title and abstract screening. Full-text review was independently conducted by two reviewers. After duplicate screening, 24 studies meeting the qualitative criteria were included for full-text analysis. The methodological quality of observational studies was assessed using the Newcastle-Ottawa Scale (NOS) (6).

Results

Large-scale studies utilizing the National Inpatient Sample (NIS) have comprehensively analyzed specialty distribution and clinical outcomes in EVAR and TEVAR procedures (7,8). United States national database analyses have documented that vascular surgeons achieve statistically superior outcomes in TEVAR compared to non-surgical specialties, particularly regarding postoperative pulmonary complications and in-hospital mortality (7).

In elective EVAR procedures, pathways such as respiratory complications and length of hospital stay were found to be optimized by vascular surgeons; however, no statistically significant difference in net in-hospital mortality rates was reported among differing specialties (8). Long-term follow-up data clearly reveal varying anatomical responses regarding durability and reintervention requirements between open surgery and EVAR (9).

Shifts in specialty-based market share are notable in endovascular interventions for peripheral arterial disease; over the years, while the market share of vascular surgeons has increased, the share of interventional cardiologists has also expanded (10). National database analyses have highlighted that the vascular surgery group possesses the lowest rates of in-hospital mortality and iatrogenic vascular access complications

(e.g., iatrogenic arterial injury, hematoma) (3,11). Operator experience and comprehensive long-term follow-up play a decisive role in postoperative limb salvage rates (12).

It is well-established that the “specialty effect” is not merely a nominal label but is directly correlated with the annual procedure volume of both the operator and the center (the volume-outcome relationship) (13). The direct impact of annual case volume on reducing complication rates and mortality has been consistently demonstrated in large cohort studies (5,14). The ESVS guidelines strongly advocate for the prioritization of high-volume centers and adherence to minimum annual procedural thresholds (2).

Discussion

Current literature suggests that vascular surgeons provide significant advantages due to their hybrid training, which bridges open and endovascular modalities (3). Dual proficiency in both open surgical reconstruction and catheter-based techniques ensures accurate assessment of anatomical limits and facilitates immediate open surgical conversion (bail-out) during catastrophic emergencies, without requiring an external surgical team (4).

However, critical confounders must not be overlooked when evaluating clinical outcomes (5):

Hospital and Operator Volume: Experienced interventional cardiologists and radiologists working in high-volume centers achieve clinical success rates equivalent to those of vascular surgeons (14). Irrespective of specialty, annual procedural volume remains the most fundamental determinant in reducing complication rates (13).

Referral Bias and Patient Complexity: The frequent referral of high-risk, anatomically complex patients with significant comorbidities to vascular surgery departments (referral bias) can create analytical prejudice when assessing comparative outcomes (9).

Institutional Resources and Multidisciplinary Teams: Intensive care infrastructure, anesthesiology support, and emergency response capabilities directly influence procedural success. In modern medical practice, replacing strict disciplinary silos with “Multidisciplinary Vascular/Heart Teams”—where interventional cardiologists, radiologists, and anesthesiologists collaborate under the surgical backup of vascular surgeons—constitutes the safest and most effective institutional model, from patient selection to long-term follow-up (12,15).

The rapid expansion of endovascular therapy has resulted in increasing involvement of multiple specialties. However, accumulated evidence suggests that operator expertise, specialty-specific training, and procedural volume may influence perioperative outcomes (Table 1).

Table 1. Evidence on the association between operator specialty, procedural volume, and outcomes after endovascular vascular interventions

Study	Comparison	Outcome	Effect Size	95% CI
Dua et al., 2016 (7)	Cardiothoracic surgeon vs other specialties (EVAR)	Stroke	OR 14.6	1.8–117.8
Dua et al., 2016 (7)	General surgeon vs vascular surgeon (EVAR)	In-hospital mortality	OR 3.2	1.1–8.9
Zettervall et al., 2017 (5)	Low-volume vs high-volume hospitals (EVAR)	Perioperative mortality	OR 1.5	1.2–1.9
Zettervall et al., 2017 (5)	Low-volume vs high-volume surgeons (open AAA repair)	Perioperative mortality	OR 1.5	1.3–1.8
Schermerhorn et al., 2015 (9)	EVAR vs open surgical repair (30-day outcomes)	Mortality	HR 0.32	0.29–0.35
Eslami et al., 2009 (3)	Radiologist vs vascular surgeon (PAI procedures)	In-hospital mortality	OR 1.62	1.16–2.24
Eslami et al., 2009 (3)	Cardiologist vs vascular surgeon (PAI procedures)	Iatrogenic arterial injury	OR 2.44	1.63–3.66

AAA: abdominal aortic aneurysm, EVAR: endovascular aneurysm repair, PAI: peripheral arterial intervention, OR: odds ratio, HR: hazard ratio, CI: confidence interval; Effect sizes are presented as reported in the original studies; An odds ratio (OR) > 1 indicates increased odds of the reported outcome in the first comparison group relative to the reference group, whereas a hazard ratio (HR) <1 indicates a lower hazard of the outcome over the specified follow-up period

Several population-based studies have demonstrated that vascular surgeon involvement and higher procedural experience are associated with improved outcomes after complex vascular interventions. Dua et al. reported increased adverse outcomes when EVAR was performed by non-vascular surgical specialties, whereas Zettervall et al. demonstrated that higher hospital and surgeon volumes were associated with reduced perioperative mortality (5,7).

CONCLUSION

Current evidence indicates that vascular surgeons can enhance perioperative safety and optimize costs in both open and endovascular interventions, largely owing to their hybrid training background and high-volume institutional infrastructures. However, this success is heavily intertwined with annual procedural volume, institutional resources, and multidisciplinary collaboration, rather than specialty labels alone. Open surgical and endovascular approaches are not alternatives to one another but are complementary strategies that must be tailored to individual patient anatomy, age, and risk profiles. Future healthcare policies and referral protocols should move beyond rigid specialty boundaries to prioritize patient safety and hospital volume by incentivizing multidisciplinary care models.

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