

Title: Surgeon Experience Matters Most: Volume–Outcome Relationships in Ruptured Open Abdominal Aortic Aneurysm Repair

Authors: Ahmad Aljobeh¹, Tahsin Kurc², Shreef Said¹, Rabih Chaer¹, Apostolos Tassiopoulos¹

¹Department of Surgery, Stony Brook Medicine

²Department of Biomedical Informatics, Stony Brook Medicine

Objective: The volume–outcome relationship in abdominal aortic aneurysm (AAA) repair remains incompletely defined, particularly regarding surgeon versus hospital volume and differences between open and endovascular repair (EVAR). We evaluated the independent and joint associations of surgeon and hospital volume with 1-year mortality after AAA repair using a national real-world registry.

Methods: We conducted a retrospective cohort study of 104,932 patients undergoing open repair (n=17,017) or EVAR (n=87,915) for AAA in the SVS VQI (2010–2024). Ruptured cases included 2,858 open and 5,552 EVAR repairs; elective cases included 12,025 open and 73,937 EVAR repairs. Annual surgeon and hospital volumes were categorized using patient-weighted quartiles. The primary outcome was 1-year mortality. Multivariable Cox proportional hazards models with robust variance estimation generated adjusted survival probabilities and hazard ratios (HRs). Joint models assessed independent effects of surgeon and hospital volume.

Results: For ruptured open AAA repair, higher surgeon volume was strongly associated with improved 1-year survival (55.0% lowest vs 69.5% highest quartile; adjusted HR Q4 vs Q1, 0.58 [95% CI, 0.49–0.70]; global p<0.001). Hospital volume showed a similar unadjusted association; however, in joint modeling, surgeon volume remained independently significant (global p=0.003), while hospital volume attenuated (global p=0.078). No consistent volume–outcome relationship was observed for ruptured EVAR (surgeon p=0.06; hospital p=0.21). For elective open and EVAR procedures, 1-year survival exceeded 91% without clinically meaningful volume associations.

Conclusions: The volume–outcome relationship in AAA repair is procedure- and acuity-specific. Surgeon experience independently predicts survival in ruptured open repair, whereas no consistent volume effect was observed for EVAR or elective repair.