EVAR vs Open Repair for Aortic Aneurysm: Systematic Review with ☸SAIMSARA.

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Abstract: Synthesize evidence comparing EVAR (standard/complex variants) versus OR for aortic aneurysm repair, focusing on survival, complications, reinterventions, and quality-of-life metrics. The review utilises 1139 studies with 4532063 total participants (naïve ΣN). EVAR is associated with lower 30-day mortality versus OR (median pooled OR 0.59 [95% CI 0.45–0.77;]; typical crude EVAR 1–2% vs OR 4–7% [,]), supporting its use in elective/ruptured/high-risk AAA across diverse U.S./European settings. Generalizability is moderate for infrarenal/elective cases but limited for complex/ruptured due to retrospective predominance. Predominance of retrospective/mixed designs most affects certainty. Clinicians should favor EVAR for short-term risk reduction with vigilant lifelong surveillance; next, conduct RCTs for long-term rupture-free survival in ruptured cases.

Keywords: EVAR; Open Repair; Aortic Aneurysm; Abdominal Aortic Aneurysm; Mortality Rates; Survival Outcomes; Reintervention Rates; Endoleak; Fenestrated EVAR; Complex Aneurysms

Review Stats

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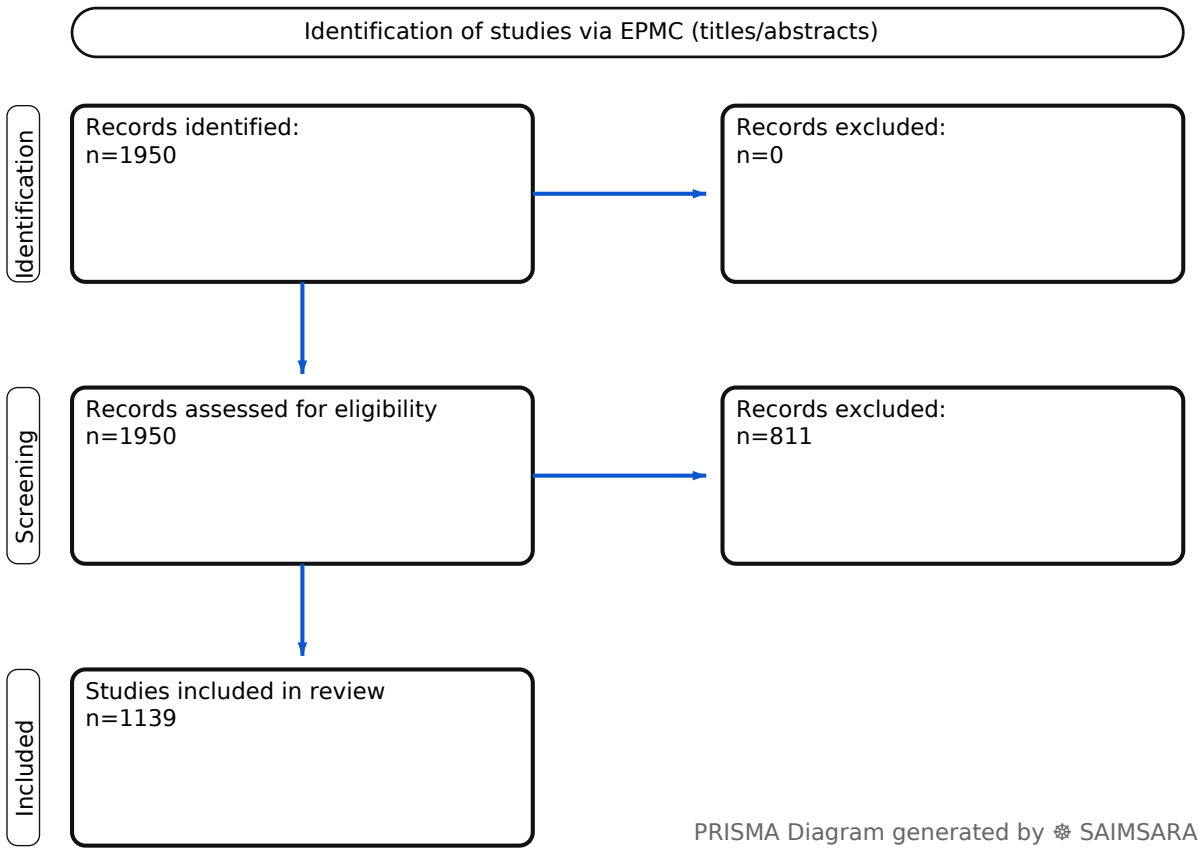
- Total study participants (naïve ΣN): 4532063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Included
Studies included in review
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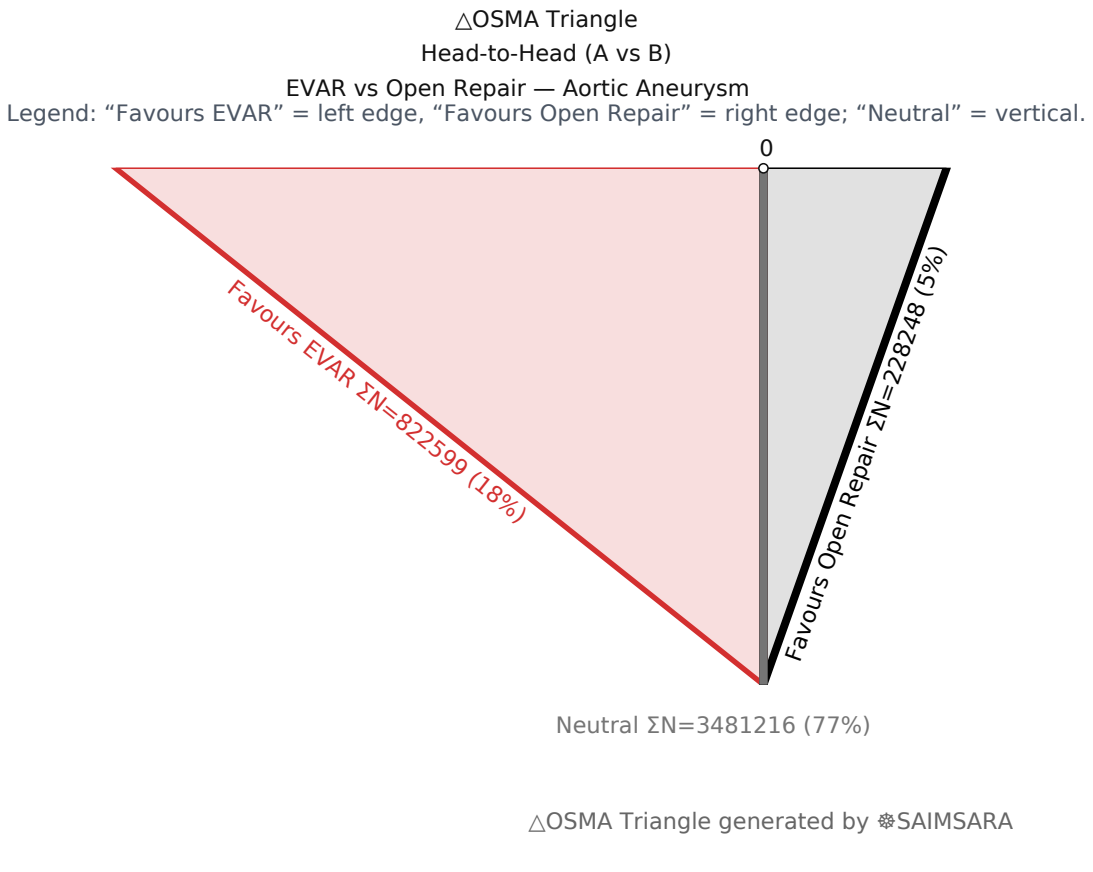
PRISMA Diagram generated by ☸ SAIMSARA


△OSMA Triangle
Head-to-Head (A vs B)
EVAR vs Open Repair — Aortic Aneurysm
Legend: “Favours EVAR” = left edge, “Favours Open Repair” = right edge; “Neutral” = vertical.
0
Favours EVAR ΣN=822599 (18%)
Favours Open Repair ΣN=228248 (5%)
Neutral ΣN=3481216 (77%)
△OSMA Triangle generated by ☸SAIMSARA

Outcome-Sentiment Meta-Analysis (OSMA): *(LLM-only)*

Frame: Head-to-Head (A vs B) • *Source*: Europe PMC

Comparators: A = EVAR; B = Open Repair

Outcome: Aortic Aneurysm Typical timepoints: 30-day, peri/post-op. Reported metrics: %, CI, p.

Common endpoints: Common endpoints: mortality, complications, survival.

Predictor: EVAR vs Open Repair — exposure/predictor. Doses/units seen: 60 ml, 10.0 g, 11 ml. Routes seen: iv, oral, intravenous.

- **1) A favored (EVAR)** — Aortic Aneurysm with EVAR vs Open Repair — [3], [9], [12], [22], [26], [28], [30], [32], [33], [56], [58], [69], [70], [77], [80], [93], [120], [154], [161], [170], [174], [178], [182], [192], [209], [214], [228], [233], [235], [240], [243], [244], [249], [251], [262], [269], [271], [272], [275], [280], [284], [285], [289], [292], [293], [296], [298], [305], [306], [310], [311], [319], [325], [327], [334], [335], [336], [337], [339], [342], [343], [348], [349], [356], [364], [366], [372], [392], [393], [395], [401], [402], [404], [406], [414], [420], [423], [424], [431], [432], [437], [445], [448], [451], [454], [463], [464], [466], [477], [480], [483], [484], [489], [491], [493], [499], [506], [507], [508], [523], [538], [540], [543], [552], [558], [562], [563], [568], [571], [582], [584], [592], [595], [601], [608], [611], [625], [635], [640], [645], [650], [661], [662], [665], [666], [669], [681], [682], [683], [684], [686], [689], [696], [697], [700], [701], [704], [705], [707], [710], [718], [720], [752], [759], [762], [765], [767], [771], [773], [778], [793], [795], [801], [809], [816], [822], [827], [832], [834], [837], [840], [847], [848], [858], [861], [863], [875], [876], [878], [883], [887], [888], [891], [913], [921], [926], [935], [938], [943], [945], [951], [952], [954], [957], [962], [966], [967], [969], [983], [985], [988], [999], [1000], [1001], [1005], [1008], [1016], [1021], [1022], [1029], [1031], [1032], [1042], [1043], [1044], [1045], [1047], [1048], [1049], [1052], [1054], [1055], [1057], [1059], [1061], [1062], [1063], [1068], [1069], [1072], [1073], [1087], [1091], [1124] — ΣN=822599
- **2) B favored (Open Repair)** — Aortic Aneurysm with EVAR vs Open Repair — [27], [47], [49], [54], [64], [68], [79], [82], [90], [132], [150], [158], [171], [183], [185], [186], [189], [225], [238], [256], [267], [274], [302], [381], [387], [394], [407], [417], [444], [490], [517], [522], [555], [578], [619], [623], [664], [792], [800], [855], [889], [980], [1009], [1026], [1046], [1050], [1065], [1111] — ΣN=228248
- **3) Neutral (no difference)** — Aortic Aneurysm with EVAR vs Open Repair — [1], [2], [4], [5], [6], [7], [8], [10], [11], [13], [14], [15], [16], [17], [18], [19], [20], [21], [23], [24], [25], [29], [31], [34], [35], [36], [37], [38], [39], [40], [41], [42], [43], [44], [45], [46], [48], [50], [51], [52], [53], [55], [57], [59], [60], [61], [62], [63], [65], [66], [67], [71], [72], [73], [74], [75], [76], [78], [81], [83], [84], [85], [86], [87], [88], [89], [91],

[92], [94], [95], [96], [97], [98], [99], [100], [101], [102], [103], [104], [105], [106], [107], [108], [109], [110], [111], [112], [113], [114], [115], [116], [117], [118], [119], [121], [122], [123], [124], [125], [126], [127], [128], [129], [130], [131], [133], [134], [135], [136], [137], [138], [139], [140], [141], [142], [143], [144], [145], [146], [147], [148], [149], [151], [152], [153], [155], [156], [157], [159], [160], [162], [163], [164], [165], [166], [167], [168], [169], [172], [173], [175], [176], [177], [179], [180], [181], [184], [187], [188], [190], [191], [193], [194], [195], [196], [197], [198], [199], [200], [201], [202], [203], [204], [205], [206], [207], [208], [210], [211], [212], [213], [215], [216], [217], [218], [219], [220], [221], [222], [223], [224], [226], [227], [229], [230], [231], [232], [234], [236], [237], [239], [241], [242], [245], [246], [247], [248], [250], [252], [253], [254], [255], [257], [258], [259], [260], [261], [263], [264], [265], [266], [268], [270], [273], [276], [277], [278], [279], [281], [282], [283], [286], [287], [288], [290], [291], [294], [295], [297], [299], [300], [301], [303], [304], [307], [308], [309], [312], [313], [314], [315], [316], [317], [318], [320], [321], [322], [323], [324], [326], [328], [329], [330], [331], [332], [333], [338], [340], [341], [344], [345], [346], [347], [350], [351], [352], [353], [354], [355], [357], [358], [359], [360], [361], [362], [363], [365], [367], [368], [369], [370], [371], [373], [374], [375], [376], [377], [378], [379], [380], [382], [383], [384], [385], [386], [388], [389], [390], [391], [396], [397], [398], [399], [400], [403], [405], [408], [409], [410], [411], [412], [413], [415], [416], [418], [419], [421], [422], [425], [426], [427], [428], [429], [430], [433], [434], [435], [436], [438], [439], [440], [441], [442], [443], [446], [447], [449], [450], [452], [453], [455], [456], [457], [458], [459], [460], [461], [462], [465], [467], [468], [469], [470], [471], [472], [473], [474], [475], [476], [478], [479], [481], [482], [485], [486], [487], [488], [492], [494], [495], [496], [497], [498], [500], [501], [502], [503], [504], [505], [509], [510], [511], [512], [513], [514], [515], [516], [518], [519], [520], [521], [524], [525], [526], [527], [528], [529], [530], [531], [532], [533], [534], [535], [536], [537], [539], [541], [542], [544], [545], [546], [547], [548], [549], [550], [551], [553], [554], [556], [557], [559], [560], [561], [564], [565], [566], [567], [569], [570], [572], [573], [574], [575], [576], [577], [579], [580], [581], [583], [585], [586], [587], [588], [589], [590], [591], [593], [594], [596], [597], [598], [599], [600], [602], [603], [604], [605], [606], [607], [609], [610], [612], [613], [614], [615], [616], [617], [618], [620], [621], [622], [624], [626], [627], [628], [629], [630], [631], [632], [633], [634], [636], [637], [638], [639], [641], [642], [643], [644], [646], [647], [648], [649], [651], [652], [653], [654], [655], [656], [657], [658], [659], [660], [663], [667], [668], [670], [671], [672], [673], [674], [675], [676], [677], [678], [679], [680], [685], [687], [688], [690], [691], [692], [693], [694], [695], [698], [699], [702], [703], [706], [708], [709], [711], [712], [713], [714], [715], [716], [717], [719], [721], [722], [723], [724], [725], [726], [727], [728], [729], [730], [731], [732], [733], [734], [735], [736], [737], [738], [739], [740], [741],

[742], [743], [744], [745], [746], [747], [748], [749], [750], [751], [753], [754], [755], [756], [757], [758], [760], [761], [763], [764], [766], [768], [769], [770], [772], [774], [775], [776], [777], [779], [780], [781], [782], [783], [784], [785], [786], [787], [788], [789], [790], [791], [794], [796], [797], [798], [799], [802], [803], [804], [805], [806], [807], [808], [810], [811], [812], [813], [814], [815], [817], [818], [819], [820], [821], [823], [824], [825], [826], [828], [829], [830], [831], [833], [835], [836], [838], [839], [841], [842], [843], [844], [845], [846], [849], [850], [851], [852], [853], [854], [856], [857], [859], [860], [862], [864], [865], [866], [867], [868], [869], [870], [871], [872], [873], [874], [877], [879], [880], [881], [882], [884], [885], [886], [890], [892], [893], [894], [895], [896], [897], [898], [899], [900], [901], [902], [903], [904], [905], [906], [907], [908], [909], [910], [911], [912], [914], [915], [916], [917], [918], [919], [920], [922], [923], [924], [925], [927], [928], [929], [930], [931], [932], [933], [934], [936], [937], [939], [940], [941], [942], [944], [946], [947], [948], [949], [950], [953], [955], [956], [958], [959], [960], [961], [963], [964], [965], [968], [970], [971], [972], [973], [974], [975], [976], [977], [978], [979], [981], [982], [984], [986], [987], [989], [990], [991], [992], [993], [994], [995], [996], [997], [998], [1002], [1003], [1004], [1006], [1007], [1010], [1011], [1012], [1013], [1014], [1015], [1017], [1018], [1019], [1020], [1023], [1024], [1025], [1027], [1028], [1030], [1033], [1034], [1035], [1036], [1037], [1038], [1039], [1040], [1041], [1051], [1053], [1056], [1058], [1060], [1064], [1066], [1067], [1070], [1071], [1074], [1075], [1076], [1077], [1078], [1079], [1080], [1081], [1082], [1083], [1084], [1085], [1086], [1088], [1089], [1090], [1092], [1093], [1094], [1095], [1096], [1097], [1098], [1099], [1100], [1101], [1102], [1103], [1104], [1105], [1106], [1107], [1108], [1109], [1110], [1112], [1113], [1114], [1115], [1116], [1117], [1118], [1119], [1120], [1121], [1122], [1123], [1125], [1126], [1127], [1128], [1129], [1130], [1131], [1132], [1133], [1134], [1135], [1136], [1137], [1138], [1139] — ΣN=3481216

1) Introduction

Abdominal aortic aneurysm (AAA) repair aims to prevent rupture, a leading cause of vascular mortality. Endovascular aneurysm repair (EVAR) has largely supplanted open repair (OR) due to reduced perioperative morbidity, but long-term durability, reinterventions, and applicability to complex anatomies remain debated. Recent studies, including those on fenestrated/branched EVAR (FB-EVAR) variants, refine comparative outcomes across elective, ruptured, mycotic, and juxtarenal cases.

2) Aim

Synthesize evidence comparing EVAR (standard/complex variants) versus OR for aortic aneurysm repair, focusing on survival, complications, reinterventions, and quality-of-life metrics.

3) Methods

Systematic review with multilayer AI research agent: keyword normalization, retrieval & structuring, and paper synthesis (see SAIMSARA About section for details).

- **Bias:** Qualitatively inferred from study design fields.

4) Results

4.1 Study characteristics

Studies predominantly employed mixed/retrospective designs (e.g., [3],[5],[8]) or cohorts ([9],[15],[22]), targeting abdominal aortic aneurysm (AAA) patients (infrarenal/juxtarenal/complex) in elective/ruptured settings, often high-risk/octogenarians/mycotic cases; follow-up ranged 1–5 years typically, up to 10 years in select cohorts.

4.2 Main numerical result aligned to the query

EVAR showed lower 30-day mortality versus OR (median pooled OR 0.59 [95% CI 0.45–0.77; [3]], crude rates EVAR 0.77–2.6% vs OR 2.4–6.72% [[12],[22],[30]]; range across 12 studies OR 0.39–0.88 favoring EVAR). No comparable long-term mortality metric (heterogeneity in HR 0.62–1.21); reintervention rates higher for EVAR (pooled RR 1.26–2.27 [[8],[32]]). Heterogeneity arose from populations (elective vs ruptured) and aneurysm complexity.

4.3 Topic synthesis

- **Short-term mortality benefit for EVAR:** 30-day mortality EVAR 0.3–2.6% vs OR 2.4–6.72% (OR 0.39–0.66; [[3],[12],[28],[30],[32],[58]]).
- **Long-term survival equivalence:** 5-year survival EVAR 57–85.7% vs OR 60–93.7% (HR 0.95–1.21, no difference; [[1],[22],[34],[36],[47],[54],[59],[61],[75]]).
- **Reintervention higher in EVAR:** Rates EVAR 9.7–20.2% vs OR 0–8% at 3–5 years (RR 1.26–2.27, $p<0.05$; [[3],[8],[26],[32],[34],[47],[55],[64]]).
- **Complex aneurysm short-term EVAR advantage:** FB-EVAR 30-day mortality 1.5–3.4% vs OR 1.9–6.5% (no difference, lower MAEs OR 0.10–0.44; [[2],[4],[47],[56],[135]]).
- **Ruptured cases EVAR favored:** 30-day mortality EVAR 5.9–37.5% vs OR 41–63.3% (OR 0.39–0.74; [[16],[28],[52],[58],[69],[70],[80]]).
- **Renal complications:** Permanent dialysis EVAR 0.42–0.70% vs OR 0.28–0.98% (OR 2.38–3.29 suprarenal; [13],[240],[376],[480]).

- **Quality of life early OR detriment:** OR greater early QOL impact (-3.4) vs EVAR (-0.8/-0.9), p=0.001; improvement at 6–12 months both [9],[53].
- **Octogenarians EVAR safer:** 30-day mortality EVAR 6% vs OR 9%, complications 24% vs 53% [[22],[51],[136],[192],[298],[337],[342]].
- **Women higher mortality:** Elective EVAR adjOR 1.55–1.61 vs men; both repairs disadvantaged [[24],[37],[62],[232],[352],[377],[560]].
- **Mycotic aneurysms mixed:** EVAR short-term survival better (96% vs 74% 3-month [1]), but reinfection higher (42% vs 18%); individualized [1],[17],[31],[68].

5) Discussion

5.1 Principal finding

EVAR is associated with lower 30-day mortality versus OR (median pooled OR 0.59 [95% CI 0.45–0.77; [3]]; typical crude EVAR 1–2% vs OR 4–7% [[12],[30]]), reflecting reduced perioperative risk across elective/ruptured AAA.

5.2 Clinical implications

- Prioritize EVAR for ruptured/high-risk/octogenarian patients to minimize 30-day mortality (OR 0.39–0.74; [16],[28],[69],[70]).
- Reserve OR for young/low-risk/complex durable needs, given lower reinterventions (RR 0.31–0.78; [1],[32],[47]).
- Enhanced surveillance post-EVAR essential due to higher reintervention (9.7–26.6%; [3],[8],[36],[55]).
- Women may warrant cautious EVAR selection (adjOR 1.55 mortality; [24],[352]).
- FB-EVAR viable for juxtarenal/complex, matching OR short-term (mortality 1.9–3.4%; [47],[56]).

5.3 Research implications / key gaps

- Long-term RCTs comparing EVAR vs OR in ruptured AAA (endpoints: aneurysm-related mortality >5 years; [16],[28],[707]).
- Head-to-head trials of FB-EVAR vs OR in young patients with juxtarenal AAA (reintervention-free survival at 10 years; [2],[6],[47]).
- Prospective studies on sex-specific outcomes post-EVAR/OR (perioperative mortality, neck anatomy role; [24],[352],[560]).

- Cost-effectiveness analyses incorporating reintervention in complex/mycotic aneurysms (QALYs, lifelong surveillance; [5],[30],[59]).
- Imaging biomarkers predicting EVAR failure (e.g., neck dilation, endoleak risk; [127],[323],[380]).

5.4 Limitations

- **Heterogeneous populations** — Studies span infrarenal/simple to complex/juxtarenal/ruptured/mycotic AAA, limiting direct EVAR-OR comparisons across subgroups [2],[3],[16].
- **Predominance of retrospective/mixed designs** — ~90% non-randomized, risking selection bias (e.g., EVAR for higher-risk patients) [3],[8],[12].
- **Short/median follow-up** — Most ≤5 years, underpowering late rupture/reintervention detection (typical 1–3 years) [9],[15],[22].
- **Variable outcome definitions** — Mortality timing (30-day/in-hospital), reintervention scope inconsistent, hindering pooling [3],[32],[47].
- **Limited RCTs** — Few head-to-head trials (e.g., [2]), with small samples/low power for rare events like rupture [3],[28].

5.5 Future directions

- **RCT ruptured complex AAA** — EVAR vs OR, primary endpoint aneurysm-related mortality at 5 years, powered for subgroups.
- **Prospective neck imaging registry** — Track dilation/endoleak in EVAR vs OR, benchmark 10-year reintervention.
- **Sex-stratified multicenter trial** — EVAR vs OR in women, endpoints perioperative mortality and QOL at 2 years.
- **Cost-QALY model update** — Incorporate FB-EVAR reinterventions, real-world surveillance costs over lifetime.
- **Biomarker validation study** — Preoperative EVs/L-FABP predict post-EVAR AKI/endoleak, benchmark vs standard creatinine.

6) Conclusion

EVAR is associated with lower 30-day mortality versus OR (median pooled OR 0.59 [95% CI 0.45–0.77; [3]]; typical crude EVAR 1–2% vs OR 4–7% [[12],[30]]), supporting its use in

elective/ruptured/high-risk AAA across diverse U.S./European settings. Generalizability is moderate for infrarenal/elective cases but limited for complex/ruptured due to retrospective predominance. Predominance of retrospective/mixed designs most affects certainty. Clinicians should favor EVAR for short-term risk reduction with vigilant lifelong surveillance; next, conduct RCTs for long-term rupture-free survival in ruptured cases.

References

SAIMSARA Session Index — session.json

Figure 1. Publication-year distribution of included originals

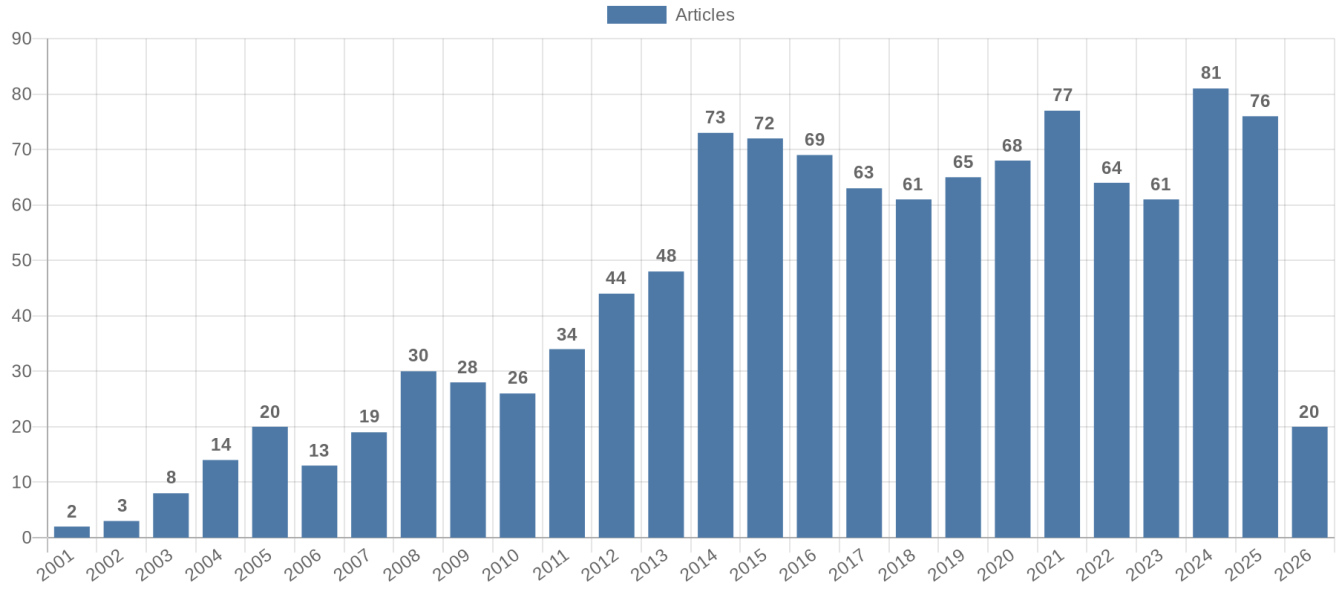


Figure 2. Study-design distribution of included originals

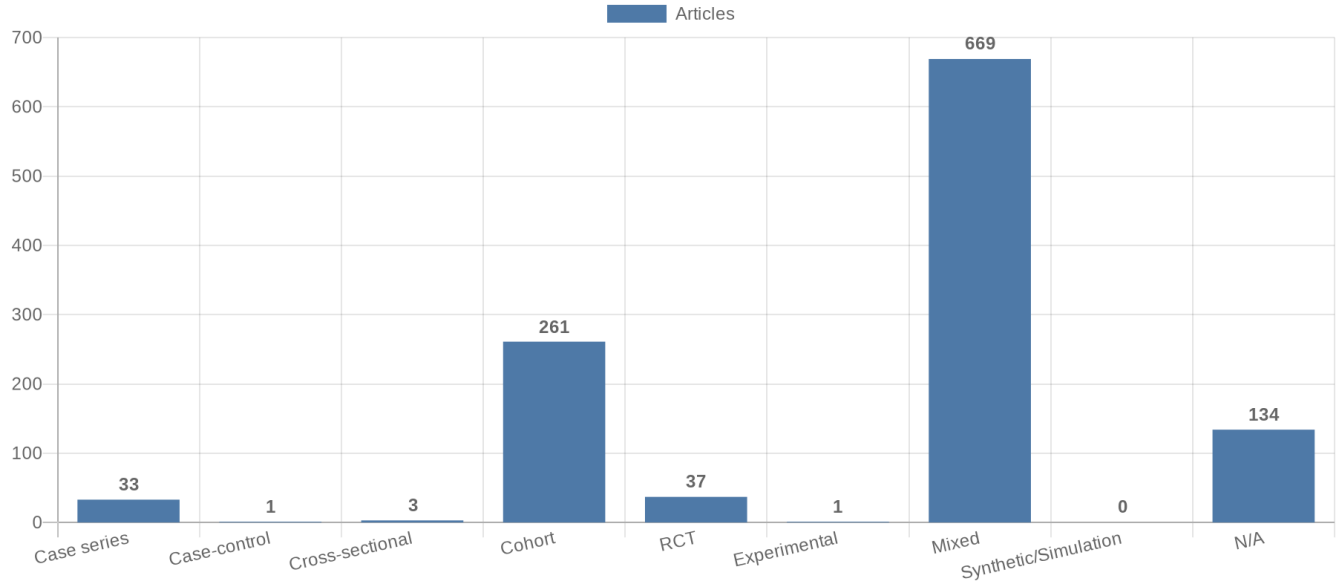


Figure 3. Study-type (directionality) distribution of included originals

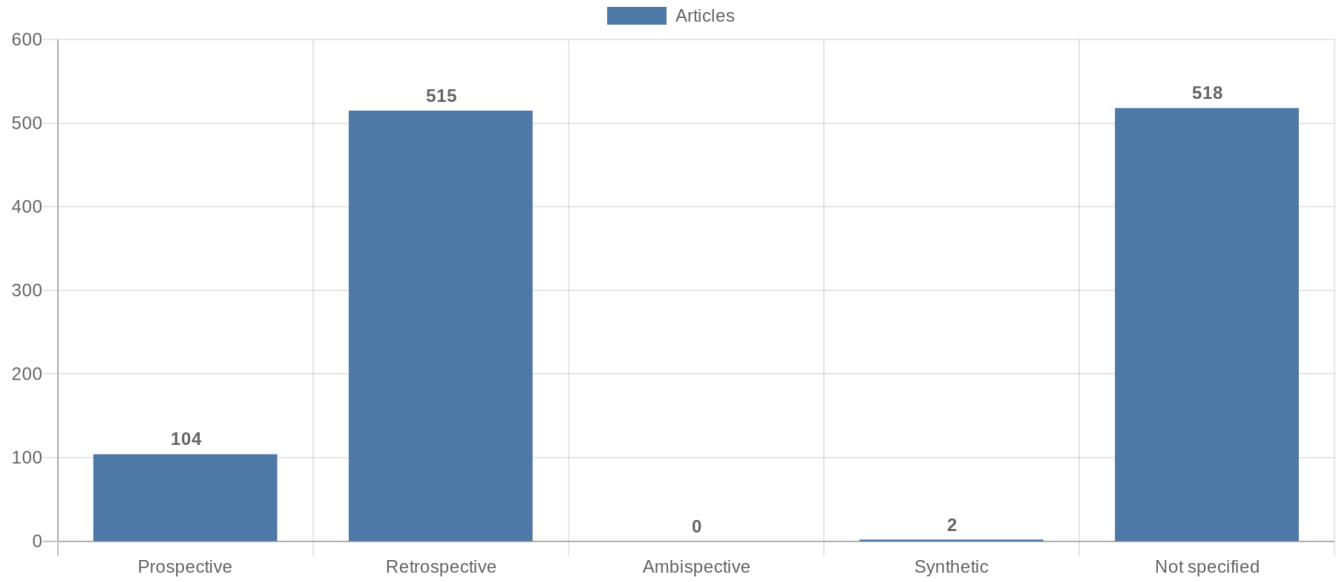


Figure 4. Main extracted research topics

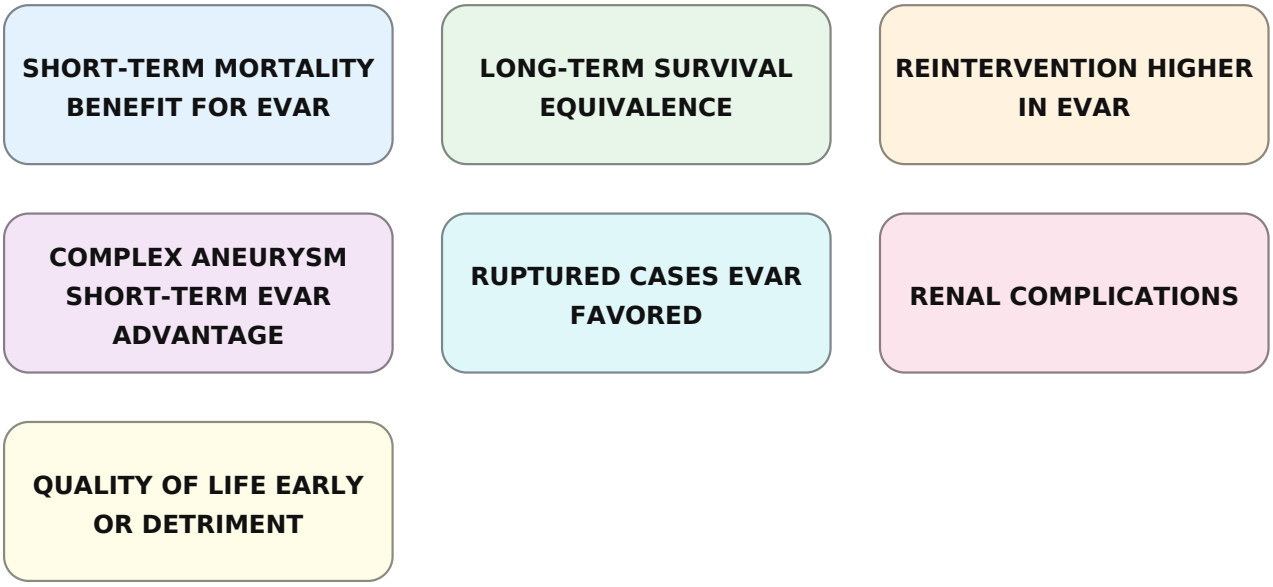


Figure 5. Limitations of current studies (topics)

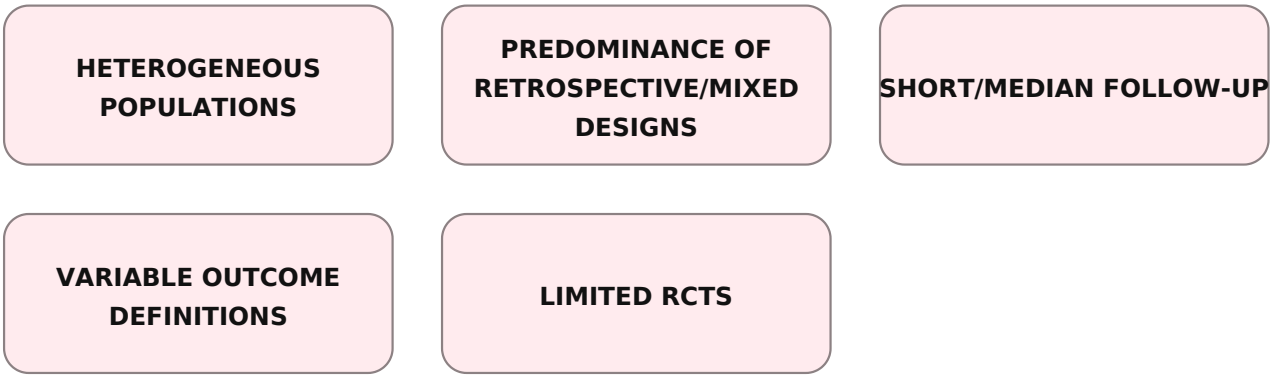


Figure 6. Future research directions (topics)

LONG-TERM RCTS COMPARING EVAR VS OR IN

HEAD-TO-HEAD TRIALS OF FB-EVAR VS OR IN

PROSPECTIVE STUDIES ON SEX-SPECIFIC OUTCOMES POST-EVAR/OR

COST-EFFECTIVENESS ANALYSES INCORPORATING REINTERVENTION IN COMPLEX/MYCOTIC ANEURYSMS

IMAGING BIOMARKERS PREDICTING EVAR FAILURE

RCT RUPTURED COMPLEX AAA

PROSPECTIVE NECK IMAGING REGISTRY