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

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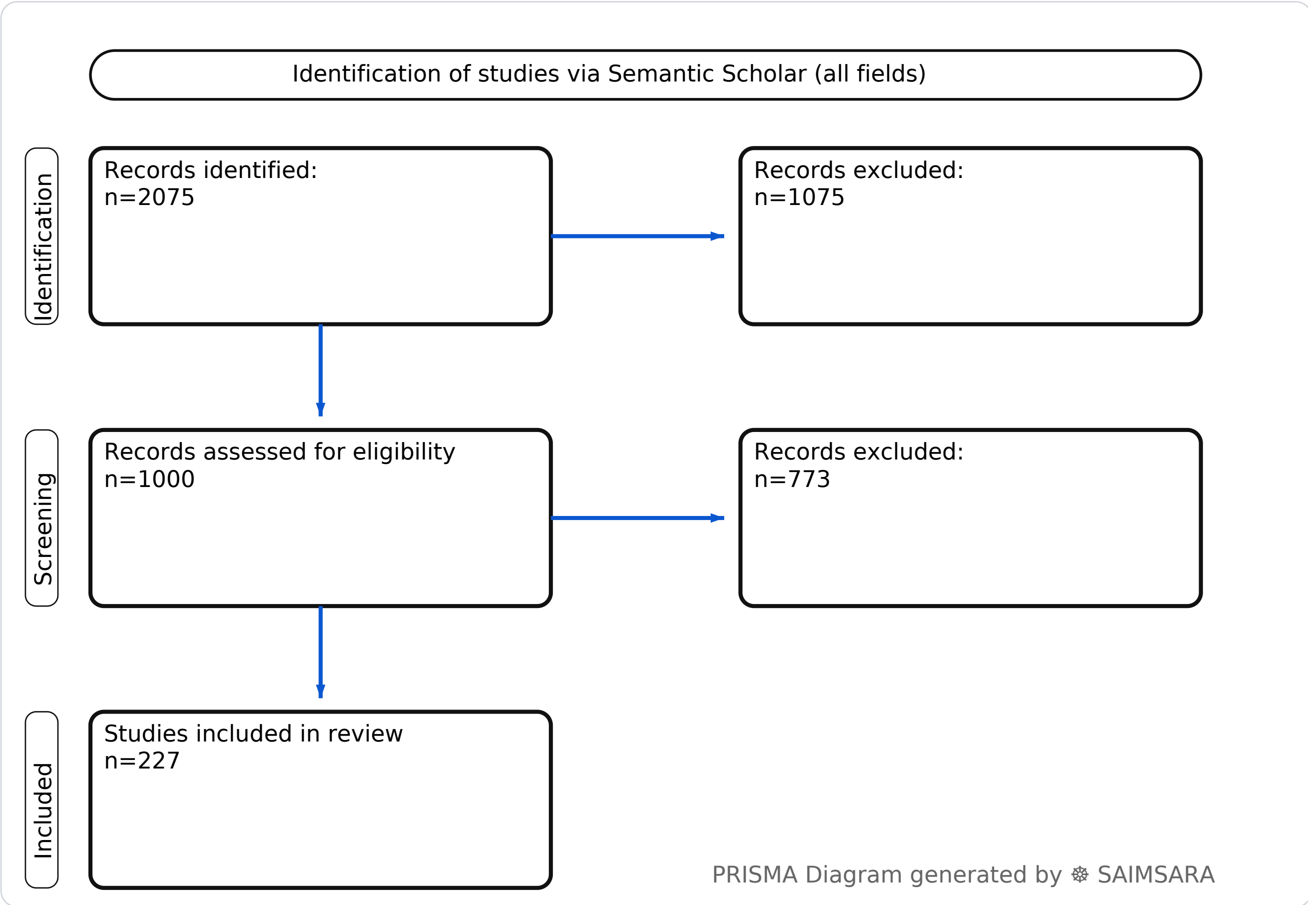
Abstract: To compare EVAR versus OSR for aortic aneurysm repair regarding mortality, reinterventions, complications, and durability, synthesizing key themes from extracted studies. The review utilises 227 studies with 607960 total participants (naïve ΣN). EVAR demonstrates lower short-term 30-day mortality (median 1.9%, range 0-7.3%) compared to OSR (median 5.9%, range 2.3-17%) in elective AAA repair. Findings generalize to high-volume centers treating infrarenal/ruptured AAA but less to complex anatomies or low-resource settings. Retrospective dominance most affects certainty. Clinicians should prioritize EVAR for ruptured cases while ensuring rigorous long-term surveillance.

Keywords: EVAR; open repair; abdominal aortic aneurysm; perioperative mortality; reintervention rates; long-term survival; randomized controlled trial; ruptured AAA; cost-effectiveness; acute kidney injury

Review Stats

- Generated: 2026-02-13 10:18:46 CET
- Plan: Pro (expanded craft tokens; source: Semantic Scholar)
- Source: Semantic Scholar
- Scope: All fields
- Keyword Gate: Fuzzy (≥60% of required terms, minimum 2 terms matched in title/abstract)
- Total Abstracts/Papers: 2075
- Downloaded Abstracts/Papers: 1000
- Included original Abstracts/Papers: 227
- Total study participants (naïve ΣN): 607960



Identification of studies via Semantic Scholar (all fields)
Identification
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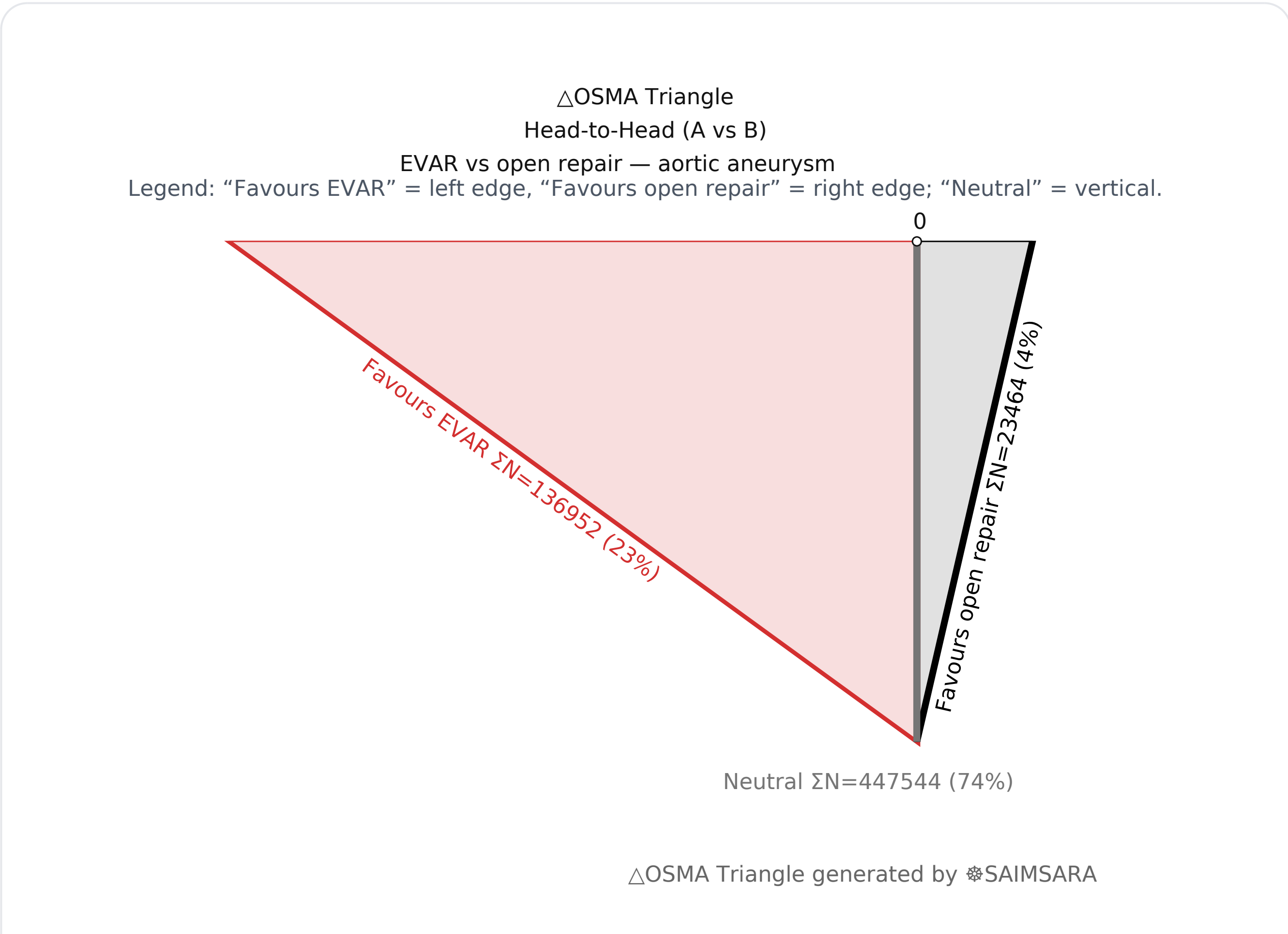
Records excluded:
n=1075
Screening
Records assessed for eligibility
n=1000
Records excluded:
n=773
Included
Studies included in review
n=227
PRISMA Diagram generated by ☸ SAIMSARA



△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=136952 (23%)
Favours open repair ΣN=23464 (4%)
Neutral ΣN=447544 (74%)
△OSMA Triangle generated by ☸SAIMSARA

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

Frame: Head-to-Head (A vs B) • *Source*: Semantic Scholar

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.

- **1) A favored (EVAR)** — aortic aneurysm with EVAR vs open repair — [7], [10], [16], [19], [21], [22], [23], [24], [34], [36], [37], [47], [48], [71], [74], [75], [111], [118], [119], [120], [121], [122], [138], [142], [145], [147], [151], [153], [159], [160], [161], [169], [174], [179], [180], [193], [208], [209], [212], [213], [223], [225], [226], [227] — ΣN=136952
- **2) B favored (open repair)** — aortic aneurysm with EVAR vs open repair — [28], [29], [33], [35], [43], [123], [141], [170], [175] — ΣN=23464
- **3) Neutral (no difference)** — aortic aneurysm with EVAR vs open repair — [1], [2], [3], [4], [5], [6], [8], [9], [11], [12], [13], [14], [15], [17], [18], [20], [25], [26], [27], [30], [31], [32], [38], [39], [40], [41], [42], [44], [45], [46], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [72], [73], [76], [77], [78], [79], [80], [81], [82], [83], [84], [85], [86], [87], [88], [89], [90], [91], [92], [93], [94], [95], [96], [97], [98], [99], [100], [101], [102], [103], [104], [105], [106], [107], [108], [109], [110], [112], [113], [114], [115], [116], [117], [124], [125], [126], [127], [128], [129], [130], [131], [132], [133], [134], [135], [136], [137], [139], [140], [143], [144], [146], [148], [149], [150], [152], [154], [155], [156], [157], [158], [162], [163], [164], [165], [166], [167], [168], [171], [172], [173], [176], [177], [178], [181], [182], [183], [184], [185], [186], [187], [188], [189], [190], [191], [192], [194], [195], [196], [197], [198], [199], [200], [201], [202], [203], [204], [205], [206], [207], [210], [211], [214], [215], [216], [217], [218], [219], [220], [221], [222], [224] — ΣN=447544

1) Introduction**

Abdominal aortic aneurysm (AAA) repair aims to prevent rupture, with endovascular aneurysm repair (EVAR) emerging as a minimally invasive alternative to open surgical repair (OSR). Early randomized controlled trials (RCTs) like EVAR Trial 1 demonstrated short-term survival advantages for EVAR, but long-term data raised concerns over durability, reinterventions, and aneurysm-related mortality [1,2,6]. This review

synthesizes evidence from diverse studies comparing EVAR and OSR across elective, ruptured, and complex anatomies, addressing evolving outcomes, complications, and patient subgroups.

2) **Aim**

To compare EVAR versus OSR for aortic aneurysm repair regarding mortality, reinterventions, complications, and durability, synthesizing key themes from extracted studies.

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 involved patients with infrarenal or juxtarenal abdominal aortic aneurysms (AAA), including elective intact, ruptured, and high-risk cases; designs spanned RCTs (e.g., EVAR Trial 1 [1,2,6,8]), retrospective cohorts, and mixed methods. Follow-up ranged from 30 days to 15 years, with short-term (perioperative/30-day) and midterm (1-5 years) outcomes most common.

4.2 **Main numerical result aligned to the query**

Comparable 30-day/operative mortality rates for elective/intact AAA showed lower values for EVAR versus OSR, with median EVAR 1.9% (range 0-7.3%) [4,10,29] versus median OSR 5.9% (range 2.3-17%) [4,10,29]; p-values ranged from <0.001 to 0.140, indicating consistent short-term benefit with some heterogeneity. For ruptured AAA, EVAR 30-day mortality median was 25% (range 5.9-50%) versus OSR median 50% (range 35-63.3%) [19,23,24]. No uniform long-term all-cause mortality metric existed due to varying follow-up and adjustments, but multiple reports noted equivalence after 3-5 years [10,15,20].

4.3 **Topic synthesis**

- Short-term mortality advantage EVAR**: 1.9% EVAR vs 5.9% OSR (P<.001) [10]; 7.3% EVAR vs 17% OSR (p=0.085) [4]; 0% EVAR vs 2.3% OSR (p=0.140) [29].**
- Ruptured AAA survival benefit EVAR**: 5.9% EVAR vs 50-63.3% OSR 30-day (P=.001) [23]; 25% eEVAR vs 50% OSR in-hospital [19]; HR 0.52 in-hospital (95% CI 0.4-0.7) [111].**
- Higher EVAR reintervention rates**: 17.4% EVAR vs 7.1% OSR (P≤.001) [10]; 53.5% PG vs 70.2%**

OSR freedom from reintervention (p=.007) [3]; HR 2.52 secondary aortic interventions (95% CI 2.06-3.07) [150].

- Long-term survival equivalence**: Survival similar after 3 years [10,15]; 5-year 75.3% OSR vs 50% EVAR (p=0.002) [29]; HR 1.02-1.21 long-term [205].**
- Renal outcomes mixed**: Higher AKI OSR 36.11% vs EVAR 17.46% (P=0.037) short-term, but greater long-term creatinine rise EVAR [16]; no RFI difference in CKD [39].**
- Cost-effectiveness variability**: EVAR more expensive, ICER 53M IRR/QALY [7]; OSR better in young patients, $4038 vs $10137/QALY [28].**
- Quality of life comparable long-term**: No HRQoL advantage EVAR [14,15]; OSR better physical/vitality at 60 months (p=0.01-0.032) [43].**
- Subgroup benefits EVAR**: Lower mortality obese [32], elderly ruptured [24], unfit patients [12]; women higher risk both [26,60].**
- Complications lower early EVAR**: Sarcopenia mortality impact EVAR not OSR [5]; POMI higher OSR OR 2.7% 30-day [22].**

5) **Discussion**

5.1 **Principal finding**

EVAR demonstrates lower short-term 30-day mortality (median 1.9%, range 0-7.3%) compared to OSR (median 5.9%, range 2.3-17%) in elective AAA repair [4,10,29], with similar patterns in ruptured cases. Long-term survival converges, but EVAR incurs higher reintervention rates [10,150].

5.2 **Clinical implications**

- **Favor EVAR for ruptured/high-risk AAA (e.g., elderly, unfit) due to 30-day mortality reduction (5.9-50% vs 35-63%) [19,23,24].**
- **Monitor EVAR patients lifelong for reinterventions (17.4% vs 7.1% OSR), especially endoleaks [3,10].**
- **Prefer OSR in young/juxtarenal patients for durability, lower reintervention (10.2% vs 26.6% fEVAR) [3,210].**
- **Assess renal function pre/post; EVAR protective short-term AKI but monitor long-term creatinine [16,39].**
- **Consider costs; EVAR higher initial but offset by reduced complications in some settings [7,48].**

5.3 **Research implications / key gaps**

- **Long-term RCTs in young patients comparing all-cause mortality beyond 10 years post-EVAR vs OSR [29,205].**
- **Prospective studies on reintervention thresholds in ruptured AAA, standardizing endoleak management [10,111].**
- **Subgroup trials for women/obese, evaluating sex-specific anatomy/mortality HRs [26,32,60].**
- **Cost-effectiveness models incorporating real-world surveillance adherence across regions [7,28].**
- **Biomarkers for durability (e.g., sac expansion predictors) in high-risk EVAR anatomies [63,98].**

5.4 **Limitations**

- Retrospective Dominance **— Most studies retrospective [3-5,9,10], introducing selection bias as higher-risk patients often selected for EVAR.**
- Heterogeneous Follow-up **— Ranges 30 days-15 years [1,2,10] limit direct long-term comparisons.**
- Ruptured vs Intact Mix **— Outcomes conflate elective (lower mortality) and ruptured (higher) AAA [19,23,111].**
- Missing Sample Sizes/Stats **— N/A in RCTs [1,2,6] hinders precise risk estimation.**
- Regional Variability **— Iran [7], Korea [27,174], Australia [30] may not generalize globally.**

5.5 **Future directions**

- Multicenter RCT Young Patients **— Randomize <70 years intact AAA to EVAR vs OSR, endpoint 10-year reintervention-free survival.**
- Standardized Surveillance Protocol **— Prospective cohort tracking endoleak resolution rates post-EVAR with CEUS/CT.**
- Sex-Stratified Registry **— Analyze VQI data for female-specific HRs in EVAR/OSR complications.**
- Economic Markov Model **— Update QALY costs incorporating modern devices/surveillance adherence.**
- Biomarker Validation Trial **— Test sarcopenia/CONUT scores predicting EVAR mortality in phase III RCT.**

6) **Conclusion**

EVAR demonstrates lower short-term 30-day mortality (median 1.9%, range 0-7.3%)

compared to OSR (median 5.9%, range 2.3-17%) in elective AAA repair [4,10,29]. Findings generalize to high-volume centers treating infrarenal/ruptured AAA but less to complex anatomies or low-resource settings. Retrospective dominance most affects certainty. Clinicians should prioritize EVAR for ruptured cases while ensuring rigorous long-term surveillance.

References

SAIMSARA Session Index — [session.json]

Figure 1. Publication-year distribution of included originals

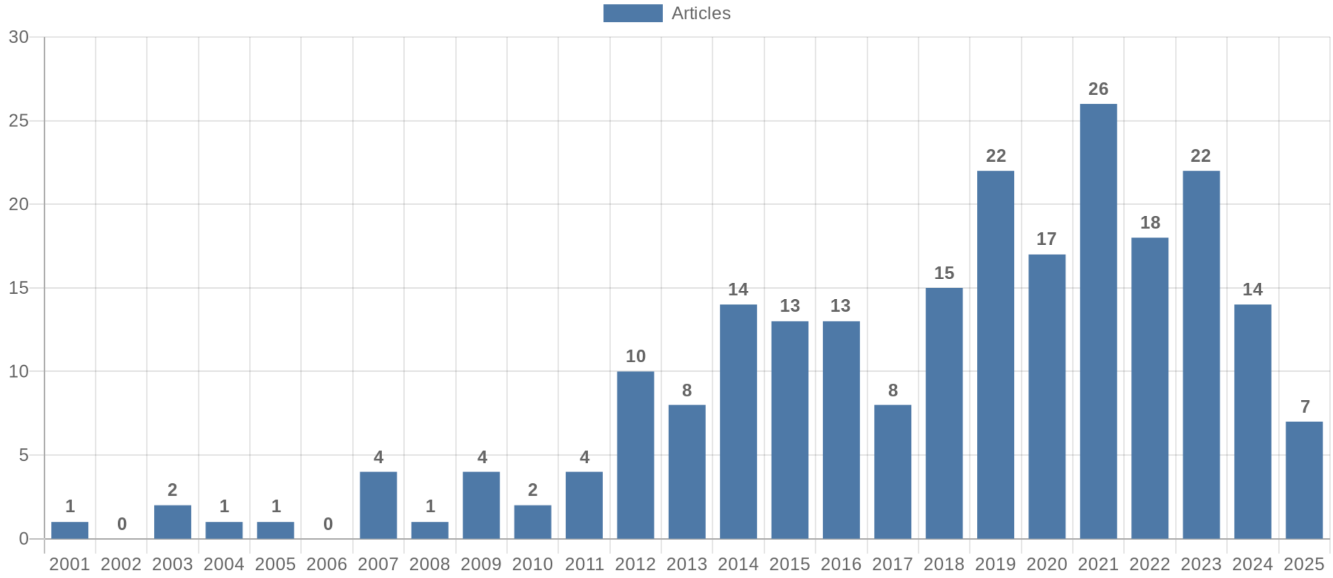


Figure 2. Study-design distribution of included originals

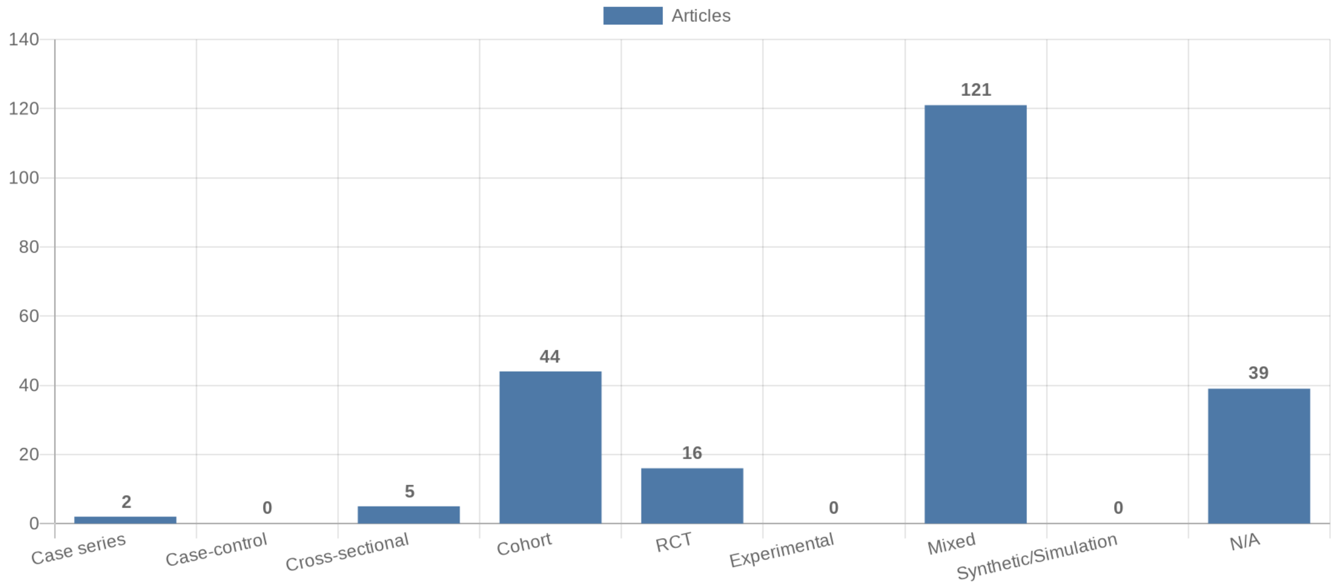


Figure 3. Study-type (directionality) distribution of included originals

Figure 4. Main extracted research topics

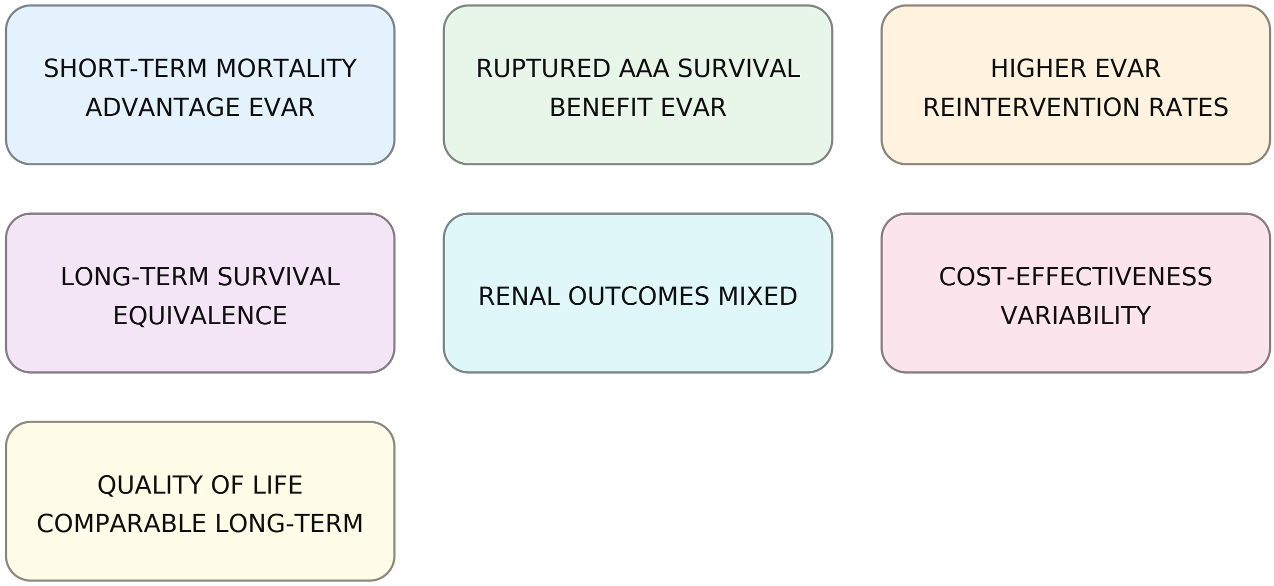


Figure 5. Limitations of current studies (topics)

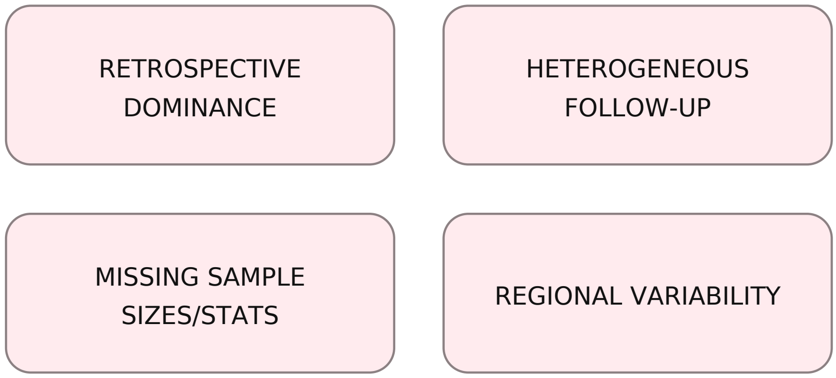


Figure 6. Future research directions (topics)**

LONG-TERM RCTS IN YOUNG PATIENTS COMPARING ALL-CAUSE

PROSPECTIVE STUDIES ON REINTERVENTION THRESHOLDS IN RUPTURED

SUBGROUP TRIALS FOR WOMEN/OBESE EVALUATING SEX-SPECIFIC ANATOMY/MORTALITY

COST-EFFECTIVENESS MODELS INCORPORATING REAL-WORLD SURVEILLANCE ADHERENCE ACROSS

BIOMARKERS FOR DURABILITY E.G. SAC EXPANSION PREDICTORS

MULTICENTER RCT YOUNG PATIENTS

STANDARDIZED SURVEILLANCE PROTOCOL