

EVAR: Systematic Review with SAIMSARA.

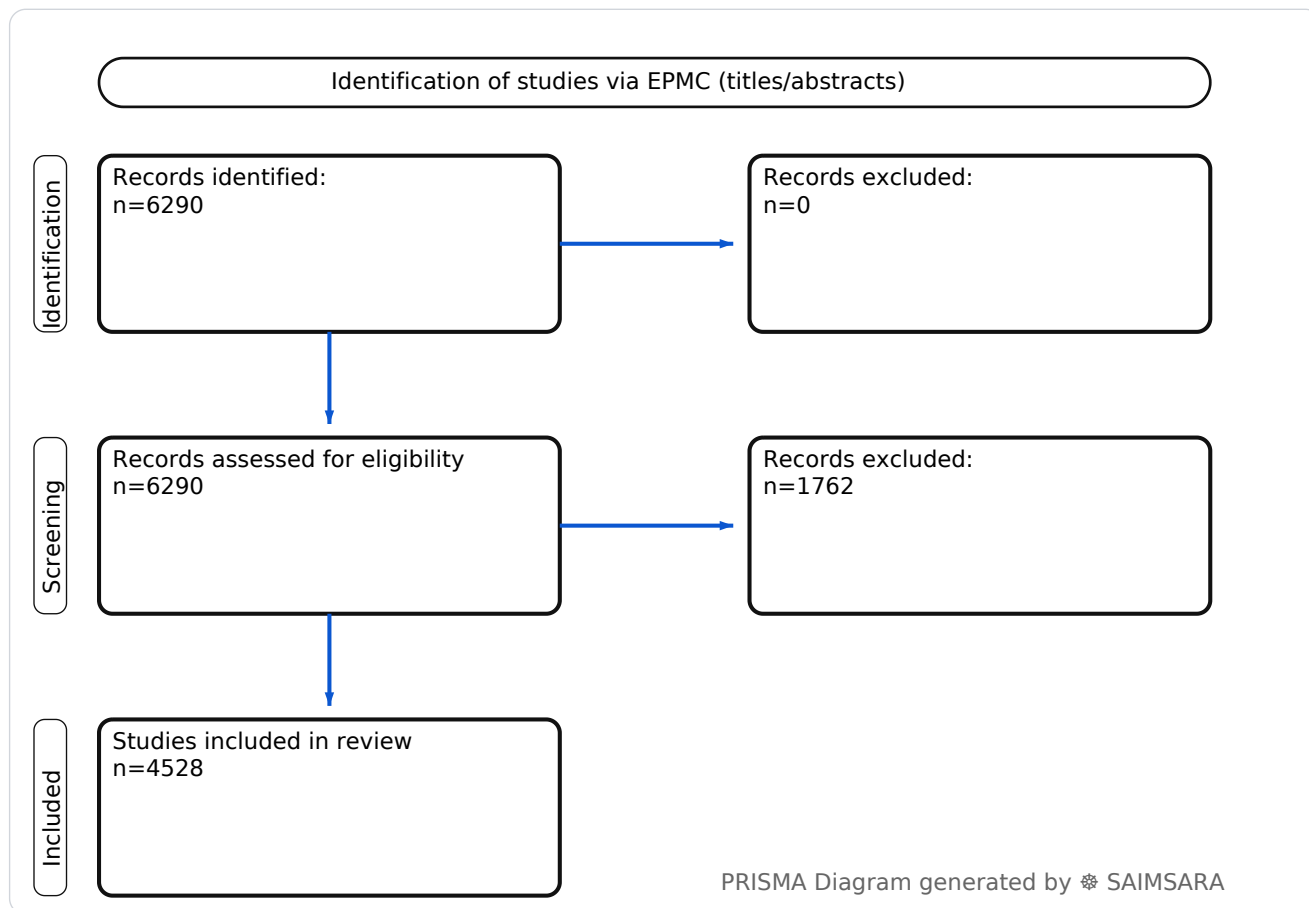
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Abstract: This paper aims to systematically review and synthesize the current evidence regarding Endovascular Aneurysm Repair (EVAR), focusing on its efficacy, safety, complications, diagnostic advancements, and long-term outcomes across a spectrum of clinical scenarios and patient populations. The review utilises 4528 studies with 10002904 total participants (naïve ΣN). The 30-day mortality rate for ruptured abdominal aortic aneurysm (rAAA) treated with EVAR, across various studies and patient cohorts, had a median of 24.3% and ranged from 0.3% to 50.0%. This indicates that while EVAR offers a viable option for rAAA, particularly in select patients and settings, the early mortality risk remains substantial and highly variable. The prevalence of retrospective study designs most affects certainty regarding the generalizability and causality of many reported findings. Clinicians should prioritize patient selection based on detailed anatomical assessment and risk factors, while future research should focus on conducting long-term RCTs to definitively establish the comparative effectiveness and durability of evolving EVAR techniques.

Keywords: Endovascular Aneurysm Repair; Abdominal Aortic Aneurysm; Aneurysm Rupture; Endoleak; Mortality; AI-assisted Planning; Percutaneous Access; Chronic Kidney Disease; Stent Graft; Long-term Surveillance

Review Stats

- Generated: 2026-02-13 21:21:16 CET
- Plan: Pro (expanded craft tokens; source: Europe PMC)
- Source: Europe PMC
- Scope: Titles/Abstracts (tiab)
- Keyword Gate: Fuzzy ($\geq 60\%$ of required terms, minimum 2 terms matched in title/abstract)
- Total Abstracts/Papers: 6290
- Downloaded Abstracts/Papers: 6290
- Included original Abstracts/Papers: 4528
- Total study participants (naïve ΣN): 10002904



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

Frame: Effect-of Predictor → Outcome • *Source:* Europe PMC

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

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

Predictor: EVAR — procedure/intervention. Doses/units seen: 90 ml, 1.7 units, 5 ml, 2 units, 15 ml, 7 ml.... Routes seen: intravenous, po, subcutaneous, oral.... Typical comparator: patients with de novo ruptures, traditional evar, surgical cutdown, open surgical repair....

- **1) Beneficial for patients** — Outcome with EVAR — [18], [26], [32], [33], [43], [46], [52], [53], [54], [55], [62], [64], [71], [72], [73], [75], [76], [79], [80], [82], [83], [86], [88], [99], [104], [109], [115], [116], [120], [124], [144], [149], [182], [183], [202], [205], [208], [241], [242], [246], [253], [256], [266], [267], [272], [288], [297], [299], [300], [304], [307], [308], [313], [317], [320], [323], [324], [331], [334], [335], [337], [347], [352], [353], [358], [371], [382], [387], [400], [410], [418], [433], [452], [456], [458], [464], [465], [467], [468], [469], [474], [477], [478], [479], [480], [489], [503], [519], [527], [540], [548], [563], [579], [606], [616], [639], [645], [646], [648], [664], [665], [667], [669], [671], [676], [677], [678], [680], [686], [688], [689], [695], [697], [700], [702], [712], [721], [722], [733], [738], [742], [744], [749], [759], [764], [765], [767], [768], [769], [774], [776], [777], [786], [804], [815], [818], [835], [837], [838], [841], [842], [846], [855], [856], [861], [866], [867], [868], [869], [877], [901], [903], [909], [912], [914], [917], [925], [926], [930], [931], [934], [966], [968], [970], [1003], [1006], [1013], [1021], [1026], [1028], [1033], [1034], [1044], [1048], [1060], [1061], [1062], [1063], [1064], [1065], [1068], [1072], [1076], [1108], [1157], [1169], [1176], [1180], [1182], [1207], [1231], [1232], [1233], [1235], [1237], [1238], [1247], [1248], [1251], [1252], [1253], [1255], [1257], [1261], [1264], [1265], [1267], [1269], [1271], [1272], [1274], [1275], [1276], [1279], [1280], [1282], [1291], [1296], [1301], [1307], [1308], [1309], [1314], [1317], [1320], [1324], [1325], [1341], [1351], [1368], [1369], [1371], [1377], [1378], [1379], [1382], [1391], [1412], [1413], [1414], [1416], [1418], [1420], [1442], [1445], [1447], [1455], [1459], [1468], [1479], [1485], [1491], [1507], [1516], [1517], [1521], [1523], [1529], [1531], [1537], [1538], [1546], [1558], [1559], [1562], [1580], [1591], [1592], [1594], [1595], [1601], [1602], [1605], [1608], [1609], [1611], [1614], [1615], [1616], [1620], [1635], [1640], [1652], [1653], [1662], [1663], [1664], [1667], [1669], [1676], [1692], [1695], [1696], [1699], [1700], [1704], [1708], [1715], [1731], [1739], [1747], [1749], [1755], [1785], [1797], [1813], [1816], [1833], [1835], [1852], [1859], [1868], [1934], [1951], [1961], [1966], [1967], [1969], [1972], [1973], [1983], [1984], [1985], [1986], [1989], [1990], [1992], [1994], [1996], [1998], [1999], [2005], [2006], [2016], [2025], [2043], [2062], [2065], [2070], [2087], [2089],

[2092], [2101], [2111], [2120], [2124], [2127], [2128], [2136], [2137], [2138], [2144], [2148], [2154], [2155], [2160], [2180], [2187], [2194], [2195], [2197], [2198], [2206], [2207], [2210], [2214], [2249], [2255], [2260], [2265], [2268], [2269], [2280], [2288], [2289], [2293], [2297], [2302], [2304], [2306], [2307], [2314], [2321], [2325], [2333], [2345], [2351], [2361], [2363], [2364], [2365], [2367], [2368], [2369], [2383], [2384], [2389], [2399], [2400], [2406], [2407], [2411], [2416], [2424], [2426], [2429], [2441], [2442], [2455], [2459], [2470], [2475], [2488], [2520], [2522], [2523], [2525], [2529], [2532], [2535], [2537], [2539], [2547], [2548], [2550], [2560], [2563], [2573], [2576], [2577], [2582], [2590], [2603], [2611], [2622], [2626], [2634], [2642], [2643], [2645], [2650], [2651], [2653], [2654], [2656], [2668], [2701], [2702], [2705], [2709], [2714], [2716], [2723], [2726], [2727], [2728], [2761], [2769], [2772], [2780], [2789], [2793], [2801], [2807], [2808], [2809], [2813], [2815], [2827], [2835], [2837], [2838], [2840], [2846], [2856], [2862], [2866], [2908], [2914], [2915], [2916], [2926], [2935], [2936], [2941], [2947], [2951], [2952], [2958], [2966], [2969], [2973], [2977], [2985], [2986], [2988], [2993], [2996], [2999], [3007], [3010], [3013], [3018], [3023], [3026], [3027], [3032], [3035], [3036], [3040], [3043], [3044], [3046], [3047], [3048], [3061], [3062], [3067], [3076], [3080], [3085], [3088], [3089], [3090], [3094], [3098], [3099], [3100], [3102], [3106], [3112], [3115], [3127], [3133], [3135], [3139], [3146], [3156], [3157], [3167], [3195], [3198], [3206], [3211], [3212], [3214], [3217], [3218], [3219], [3222], [3224], [3230], [3235], [3239], [3240], [3242], [3247], [3248], [3250], [3263], [3266], [3267], [3271], [3289], [3303], [3304], [3310], [3315], [3317], [3322], [3326], [3328], [3332], [3336], [3346], [3350], [3354], [3359], [3361], [3364], [3367], [3370], [3377], [3378], [3380], [3384], [3388], [3391], [3393], [3396], [3397], [3408], [3422], [3426], [3430], [3432], [3442], [3455], [3456], [3459], [3469], [3476], [3477], [3478], [3479], [3480], [3488], [3496], [3498], [3499], [3500], [3502], [3508], [3541], [3542], [3545], [3546], [3567], [3568], [3578], [3590], [3591], [3592], [3593], [3595], [3597], [3601], [3606], [3608], [3610], [3618], [3622], [3633], [3636], [3638], [3640], [3641], [3642], [3649], [3650], [3655], [3656], [3658], [3660], [3665], [3667], [3675], [3677], [3678], [3685], [3689], [3722], [3723], [3724], [3725], [3729], [3735], [3737], [3741], [3761], [3763], [3769], [3784], [3785], [3797], [3805], [3806], [3808], [3814], [3822], [3823], [3826], [3827], [3832], [3840], [3841], [3845], [3849], [3850], [3851], [3855], [3862], [3869], [3873], [3878], [3881], [3884], [3886], [3890], [3891], [3893], [3894], [3897], [3904], [3905], [3908], [3910], [3911], [3912], [3914], [3915], [3917], [3919], [3920], [3922], [3923], [3927], [3929], [3938], [3949], [3951], [3952], [3957], [3962], [3970], [3972], [3982], [3989], [3991], [3999], [4010], [4015], [4017], [4018], [4022], [4024], [4030], [4039], [4041], [4044], [4046], [4049], [4050], [4051], [4052], [4057], [4060], [4064], [4065], [4067], [4070], [4071], [4074], [4077], [4082], [4083], [4084], [4085], [4087], [4088], [4093], [4094], [4095], [4096], [4097], [4098], [4100], [4101], [4102],

[4103], [4104], [4105], [4108], [4110], [4112], [4120], [4125], [4131], [4135], [4140], [4143], [4159], [4163], [4165], [4167], [4174], [4179], [4187], [4190], [4198], [4200], [4210], [4211], [4213], [4216], [4219], [4223], [4226], [4228], [4232], [4234], [4237], [4239], [4242], [4244], [4246], [4249], [4251], [4255], [4256], [4258], [4260], [4276], [4298], [4307], [4315], [4317], [4333], [4337], [4340], [4341], [4342], [4343], [4347], [4349], [4365], [4373], [4383], [4411], [4417], [4421], [4422], [4424], [4425], [4427], [4428], [4429], [4430], [4437], [4438], [4474], [4478], [4490], [4496], [4499], [4509], [4515], [4516], [4518], [4519], [4520], [4524] — $\Sigma N=3702112$

- **2) Harmful for patients** — Outcome with EVAR — [31], [44], [49], [57], [66], [94], [101], [117], [121], [129], [141], [185], [197], [248], [249], [252], [259], [262], [263], [264], [265], [271], [325], [336], [339], [422], [423], [426], [439], [441], [443], [444], [448], [449], [471], [504], [538], [569], [572], [581], [602], [604], [608], [609], [612], [613], [614], [618], [626], [627], [630], [675], [683], [703], [705], [711], [737], [751], [752], [754], [756], [762], [772], [778], [780], [811], [812], [813], [816], [817], [825], [826], [827], [828], [829], [830], [832], [833], [840], [851], [858], [893], [918], [942], [950], [992], [999], [1008], [1015], [1046], [1069], [1078], [1089], [1102], [1146], [1171], [1174], [1185], [1191], [1194], [1195], [1196], [1223], [1234], [1239], [1240], [1246], [1254], [1266], [1278], [1321], [1336], [1339], [1340], [1349], [1375], [1398], [1405], [1406], [1422], [1425], [1429], [1438], [1441], [1446], [1448], [1452], [1453], [1456], [1462], [1466], [1467], [1476], [1484], [1486], [1573], [1574], [1593], [1599], [1600], [1603], [1618], [1619], [1625], [1626], [1627], [1628], [1634], [1636], [1637], [1639], [1643], [1645], [1646], [1647], [1736], [1737], [1738], [1807], [1849], [1887], [1968], [1987], [2003], [2004], [2011], [2015], [2035], [2049], [2077], [2100], [2103], [2110], [2113], [2133], [2134], [2135], [2140], [2146], [2149], [2150], [2152], [2163], [2164], [2184], [2186], [2233], [2287], [2290], [2296], [2310], [2318], [2319], [2326], [2334], [2341], [2342], [2343], [2344], [2346], [2347], [2348], [2349], [2353], [2354], [2356], [2357], [2360], [2370], [2376], [2388], [2393], [2404], [2415], [2419], [2432], [2446], [2452], [2454], [2457], [2483], [2521], [2528], [2530], [2538], [2549], [2552], [2553], [2624], [2635], [2637], [2677], [2695], [2699], [2706], [2718], [2721], [2729], [2730], [2770], [2798], [2817], [2869], [2881], [2882], [2886], [2888], [2898], [2902], [2903], [2904], [2905], [2909], [2921], [2922], [2924], [2928], [2939], [2948], [2970], [3002], [3009], [3011], [3020], [3022], [3024], [3029], [3031], [3049], [3053], [3054], [3059], [3060], [3063], [3064], [3072], [3078], [3079], [3081], [3097], [3104], [3109], [3116], [3119], [3122], [3123], [3126], [3128], [3132], [3144], [3160], [3172], [3181], [3183], [3193], [3200], [3207], [3209], [3210], [3215], [3216], [3231], [3254], [3257], [3262], [3264], [3269], [3281], [3282], [3283], [3284], [3292], [3308], [3318], [3320], [3327], [3373], [3374], [3381], [3386], [3401], [3451], [3454], [3460], [3462], [3467], [3473], [3475], [3484], [3494], [3495], [3501], [3529], [3535], [3554], [3580], [3605],

[3607], [3612], [3617], [3619], [3624], [3628], [3630], [3631], [3632], [3652], [3654], [3659], [3662], [3668], [3672], [3676], [3681], [3728], [3730], [3820], [3824], [3931], [4027], [4031], [4063], [4078], [4090], [4099], [4116], [4139], [4146], [4177], [4181], [4201], [4204], [4206], [4208], [4214], [4224], [4297], [4308], [4310], [4311], [4313], [4314], [4316], [4396], [4404], [4418], [4419], [4423], [4433], [4434], [4435], [4436], [4439], [4492], [4493], [4494], [4495], [4497], [4512], [4522], [4528] — $\Sigma N=1393947$

- **3) No clear effect** — Outcome with EVAR — [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [19], [20], [21], [22], [23], [24], [25], [27], [28], [29], [30], [34], [35], [36], [37], [38], [39], [40], [41], [42], [45], [47], [48], [50], [51], [56], [58], [59], [60], [61], [63], [65], [67], [68], [69], [70], [74], [77], [78], [81], [84], [85], [87], [89], [90], [91], [92], [93], [95], [96], [97], [98], [100], [102], [103], [105], [106], [107], [108], [110], [111], [112], [113], [114], [118], [119], [122], [123], [125], [126], [127], [128], [130], [131], [132], [133], [134], [135], [136], [137], [138], [139], [140], [142], [143], [145], [146], [147], [148], [150], [151], [152], [153], [154], [155], [156], [157], [158], [159], [160], [161], [162], [163], [164], [165], [166], [167], [168], [169], [170], [171], [172], [173], [174], [175], [176], [177], [178], [179], [180], [181], [184], [186], [187], [188], [189], [190], [191], [192], [193], [194], [195], [196], [198], [199], [200], [201], [203], [204], [206], [207], [209], [210], [211], [212], [213], [214], [215], [216], [217], [218], [219], [220], [221], [222], [223], [224], [225], [226], [227], [228], [229], [230], [231], [232], [233], [234], [235], [236], [237], [238], [239], [240], [243], [244], [245], [247], [250], [251], [254], [255], [257], [258], [260], [261], [268], [269], [270], [273], [274], [275], [276], [277], [278], [279], [280], [281], [282], [283], [284], [285], [286], [287], [289], [290], [291], [292], [293], [294], [295], [296], [298], [301], [302], [303], [305], [306], [309], [310], [311], [312], [314], [315], [316], [318], [319], [321], [322], [326], [327], [328], [329], [330], [332], [333], [338], [340], [341], [342], [343], [344], [345], [346], [348], [349], [350], [351], [354], [355], [356], [357], [359], [360], [361], [362], [363], [364], [365], [366], [367], [368], [369], [370], [372], [373], [374], [375], [376], [377], [378], [379], [380], [381], [383], [384], [385], [386], [388], [389], [390], [391], [392], [393], [394], [395], [396], [397], [398], [399], [401], [402], [403], [404], [405], [406], [407], [408], [409], [411], [412], [413], [414], [415], [416], [417], [419], [420], [421], [424], [425], [427], [428], [429], [430], [431], [432], [434], [435], [436], [437], [438], [440], [442], [445], [446], [447], [450], [451], [453], [454], [455], [457], [459], [460], [461], [462], [463], [466], [470], [472], [473], [475], [476], [481], [482], [483], [484], [485], [486], [487], [488], [490], [491], [492], [493], [494], [495], [496], [497], [498], [499], [500], [501], [502], [505], [506], [507], [508], [509], [510], [511], [512], [513], [514], [515], [516], [517], [518], [520], [521], [522], [523], [524], [525], [526], [528], [529], [530], [531], [532], [533], [534], [535], [536], [537], [539], [541], [542], [543], [544], [545], [546], [547], [549], [550], [551],

[552], [553], [554], [555], [556], [557], [558], [559], [560], [561], [562], [564], [565], [566], [567], [568], [570], [571], [573], [574], [575], [576], [577], [578], [580], [582], [583], [584], [585], [586], [587], [588], [589], [590], [591], [592], [593], [594], [595], [596], [597], [598], [599], [600], [601], [603], [605], [607], [610], [611], [615], [617], [619], [620], [621], [622], [623], [624], [625], [628], [629], [631], [632], [633], [634], [635], [636], [637], [638], [640], [641], [642], [643], [644], [647], [649], [650], [651], [652], [653], [654], [655], [656], [657], [658], [659], [660], [661], [662], [663], [666], [668], [670], [672], [673], [674], [679], [681], [682], [684], [685], [687], [690], [691], [692], [693], [694], [696], [698], [699], [701], [704], [706], [707], [708], [709], [710], [713], [714], [715], [716], [717], [718], [719], [720], [723], [724], [725], [726], [727], [728], [729], [730], [731], [732], [734], [735], [736], [739], [740], [741], [743], [745], [746], [747], [748], [750], [753], [755], [757], [758], [760], [761], [763], [766], [770], [771], [773], [775], [779], [781], [782], [783], [784], [785], [787], [788], [789], [790], [791], [792], [793], [794], [795], [796], [797], [798], [799], [800], [801], [802], [803], [805], [806], [807], [808], [809], [810], [814], [819], [820], [821], [822], [823], [824], [831], [834], [836], [839], [843], [844], [845], [847], [848], [849], [850], [852], [853], [854], [857], [859], [860], [862], [863], [864], [865], [870], [871], [872], [873], [874], [875], [876], [878], [879], [880], [881], [882], [883], [884], [885], [886], [887], [888], [889], [890], [891], [892], [894], [895], [896], [897], [898], [899], [900], [902], [904], [905], [906], [907], [908], [910], [911], [913], [915], [916], [919], [920], [921], [922], [923], [924], [927], [928], [929], [932], [933], [935], [936], [937], [938], [939], [940], [941], [943], [944], [945], [946], [947], [948], [949], [951], [952], [953], [954], [955], [956], [957], [958], [959], [960], [961], [962], [963], [964], [965], [967], [969], [971], [972], [973], [974], [975], [976], [977], [978], [979], [980], [981], [982], [983], [984], [985], [986], [987], [988], [989], [990], [991], [993], [994], [995], [996], [997], [998], [1000], [1001], [1002], [1004], [1005], [1007], [1009], [1010], [1011], [1012], [1014], [1016], [1017], [1018], [1019], [1020], [1022], [1023], [1024], [1025], [1027], [1029], [1030], [1031], [1032], [1035], [1036], [1037], [1038], [1039], [1040], [1041], [1042], [1043], [1045], [1047], [1049], [1050], [1051], [1052], [1053], [1054], [1055], [1056], [1057], [1058], [1059], [1066], [1067], [1070], [1071], [1073], [1074], [1075], [1077], [1079], [1080], [1081], [1082], [1083], [1084], [1085], [1086], [1087], [1088], [1090], [1091], [1092], [1093], [1094], [1095], [1096], [1097], [1098], [1099], [1100], [1101], [1103], [1104], [1105], [1106], [1107], [1109], [1110], [1111], [1112], [1113], [1114], [1115], [1116], [1117], [1118], [1119], [1120], [1121], [1122], [1123], [1124], [1125], [1126], [1127], [1128], [1129], [1130], [1131], [1132], [1133], [1134], [1135], [1136], [1137], [1138], [1139], [1140], [1141], [1142], [1143], [1144], [1145], [1147], [1148], [1149], [1150], [1151], [1152], [1153], [1154], [1155], [1156], [1158], [1159], [1160], [1161], [1162], [1163], [1164], [1165], [1166], [1167], [1168], [1170], [1172], [1173],

[1175], [1177], [1178], [1179], [1181], [1183], [1184], [1186], [1187], [1188], [1189], [1190], [1192], [1193], [1197], [1198], [1199], [1200], [1201], [1202], [1203], [1204], [1205], [1206], [1208], [1209], [1210], [1211], [1212], [1213], [1214], [1215], [1216], [1217], [1218], [1219], [1220], [1221], [1222], [1224], [1225], [1226], [1227], [1228], [1229], [1230], [1236], [1241], [1242], [1243], [1244], [1245], [1249], [1250], [1256], [1258], [1259], [1260], [1262], [1263], [1268], [1270], [1273], [1277], [1281], [1283], [1284], [1285], [1286], [1287], [1288], [1289], [1290], [1292], [1293], [1294], [1295], [1297], [1298], [1299], [1300], [1302], [1303], [1304], [1305], [1306], [1310], [1311], [1312], [1313], [1315], [1316], [1318], [1319], [1322], [1323], [1326], [1327], [1328], [1329], [1330], [1331], [1332], [1333], [1334], [1335], [1337], [1338], [1342], [1343], [1344], [1345], [1346], [1347], [1348], [1350], [1352], [1353], [1354], [1355], [1356], [1357], [1358], [1359], [1360], [1361], [1362], [1363], [1364], [1365], [1366], [1367], [1370], [1372], [1373], [1374], [1376], [1380], [1381], [1383], [1384], [1385], [1386], [1387], [1388], [1389], [1390], [1392], [1393], [1394], [1395], [1396], [1397], [1399], [1400], [1401], [1402], [1403], [1404], [1407], [1408], [1409], [1410], [1411], [1415], [1417], [1419], [1421], [1423], [1424], [1426], [1427], [1428], [1430], [1431], [1432], [1433], [1434], [1435], [1436], [1437], [1439], [1440], [1443], [1444], [1449], [1450], [1451], [1454], [1457], [1458], [1460], [1461], [1463], [1464], [1465], [1469], [1470], [1471], [1472], [1473], [1474], [1475], [1477], [1478], [1480], [1481], [1482], [1483], [1487], [1488], [1489], [1490], [1492], [1493], [1494], [1495], [1496], [1497], [1498], [1499], [1500], [1501], [1502], [1503], [1504], [1505], [1506], [1508], [1509], [1510], [1511], [1512], [1513], [1514], [1515], [1518], [1519], [1520], [1522], [1524], [1525], [1526], [1527], [1528], [1530], [1532], [1533], [1534], [1535], [1536], [1539], [1540], [1541], [1542], [1543], [1544], [1545], [1547], [1548], [1549], [1550], [1551], [1552], [1553], [1554], [1555], [1556], [1557], [1560], [1561], [1563], [1564], [1565], [1566], [1567], [1568], [1569], [1570], [1571], [1572], [1575], [1576], [1577], [1578], [1579], [1581], [1582], [1583], [1584], [1585], [1586], [1587], [1588], [1589], [1590], [1596], [1597], [1598], [1604], [1606], [1607], [1610], [1612], [1613], [1617], [1621], [1622], [1623], [1624], [1629], [1630], [1631], [1632], [1633], [1638], [1641], [1642], [1644], [1648], [1649], [1650], [1651], [1654], [1655], [1656], [1657], [1658], [1659], [1660], [1661], [1665], [1666], [1668], [1670], [1671], [1672], [1673], [1674], [1675], [1677], [1678], [1679], [1680], [1681], [1682], [1683], [1684], [1685], [1686], [1687], [1688], [1689], [1690], [1691], [1693], [1694], [1697], [1698], [1701], [1702], [1703], [1705], [1706], [1707], [1709], [1710], [1711], [1712], [1713], [1714], [1716], [1717], [1718], [1719], [1720], [1721], [1722], [1723], [1724], [1725], [1726], [1727], [1728], [1729], [1730], [1732], [1733], [1734], [1735], [1740], [1741], [1742], [1743], [1744], [1745], [1746], [1748], [1750], [1751], [1752], [1753], [1754], [1756], [1757], [1758], [1759], [1760], [1761], [1762], [1763], [1764], [1765], [1766], [1767], [1768], [1769], [1770],

[1771], [1772], [1773], [1774], [1775], [1776], [1777], [1778], [1779], [1780], [1781], [1782], [1783], [1784], [1786], [1787], [1788], [1789], [1790], [1791], [1792], [1793], [1794], [1795], [1796], [1798], [1799], [1800], [1801], [1802], [1803], [1804], [1805], [1806], [1808], [1809], [1810], [1811], [1812], [1814], [1815], [1817], [1818], [1819], [1820], [1821], [1822], [1823], [1824], [1825], [1826], [1827], [1828], [1829], [1830], [1831], [1832], [1834], [1836], [1837], [1838], [1839], [1840], [1841], [1842], [1843], [1844], [1845], [1846], [1847], [1848], [1850], [1851], [1853], [1854], [1855], [1856], [1857], [1858], [1860], [1861], [1862], [1863], [1864], [1865], [1866], [1867], [1869], [1870], [1871], [1872], [1873], [1874], [1875], [1876], [1877], [1878], [1879], [1880], [1881], [1882], [1883], [1884], [1885], [1886], [1888], [1889], [1890], [1891], [1892], [1893], [1894], [1895], [1896], [1897], [1898], [1899], [1900], [1901], [1902], [1903], [1904], [1905], [1906], [1907], [1908], [1909], [1910], [1911], [1912], [1913], [1914], [1915], [1916], [1917], [1918], [1919], [1920], [1921], [1922], [1923], [1924], [1925], [1926], [1927], [1928], [1929], [1930], [1931], [1932], [1933], [1935], [1936], [1937], [1938], [1939], [1940], [1941], [1942], [1943], [1944], [1945], [1946], [1947], [1948], [1949], [1950], [1952], [1953], [1954], [1955], [1956], [1957], [1958], [1959], [1960], [1962], [1963], [1964], [1965], [1970], [1971], [1974], [1975], [1976], [1977], [1978], [1979], [1980], [1981], [1982], [1988], [1991], [1993], [1995], [1997], [2000], [2001], [2002], [2007], [2008], [2009], [2010], [2012], [2013], [2014], [2017], [2018], [2019], [2020], [2021], [2022], [2023], [2024], [2026], [2027], [2028], [2029], [2030], [2031], [2032], [2033], [2034], [2036], [2037], [2038], [2039], [2040], [2041], [2042], [2044], [2045], [2046], [2047], [2048], [2050], [2051], [2052], [2053], [2054], [2055], [2056], [2057], [2058], [2059], [2060], [2061], [2063], [2064], [2066], [2067], [2068], [2069], [2071], [2072], [2073], [2074], [2075], [2076], [2078], [2079], [2080], [2081], [2082], [2083], [2084], [2085], [2086], [2088], [2090], [2091], [2093], [2094], [2095], [2096], [2097], [2098], [2099], [2102], [2104], [2105], [2106], [2107], [2108], [2109], [2112], [2114], [2115], [2116], [2117], [2118], [2119], [2121], [2122], [2123], [2125], [2126], [2129], [2130], [2131], [2132], [2139], [2141], [2142], [2143], [2145], [2147], [2151], [2153], [2156], [2157], [2158], [2159], [2161], [2162], [2165], [2166], [2167], [2168], [2169], [2170], [2171], [2172], [2173], [2174], [2175], [2176], [2177], [2178], [2179], [2181], [2182], [2183], [2185], [2188], [2189], [2190], [2191], [2192], [2193], [2196], [2199], [2200], [2201], [2202], [2203], [2204], [2205], [2208], [2209], [2211], [2212], [2213], [2215], [2216], [2217], [2218], [2219], [2220], [2221], [2222], [2223], [2224], [2225], [2226], [2227], [2228], [2229], [2230], [2231], [2232], [2234], [2235], [2236], [2237], [2238], [2239], [2240], [2241], [2242], [2243], [2244], [2245], [2246], [2247], [2248], [2250], [2251], [2252], [2253], [2254], [2256], [2257], [2258], [2259], [2261], [2262], [2263], [2264], [2266], [2267], [2270], [2271], [2272], [2273], [2274], [2275], [2276], [2277], [2278], [2279], [2281], [2282], [2283], [2284], [2285], [2286], [2291],

[2292], [2294], [2295], [2298], [2299], [2300], [2301], [2303], [2305], [2308], [2309], [2311], [2312], [2313], [2315], [2316], [2317], [2320], [2322], [2323], [2324], [2327], [2328], [2329], [2330], [2331], [2332], [2335], [2336], [2337], [2338], [2339], [2340], [2350], [2352], [2355], [2358], [2359], [2362], [2366], [2371], [2372], [2373], [2374], [2375], [2377], [2378], [2379], [2380], [2381], [2382], [2385], [2386], [2387], [2390], [2391], [2392], [2394], [2395], [2396], [2397], [2398], [2401], [2402], [2403], [2405], [2408], [2409], [2410], [2412], [2413], [2414], [2417], [2418], [2420], [2421], [2422], [2423], [2425], [2427], [2428], [2430], [2431], [2433], [2434], [2435], [2436], [2437], [2438], [2439], [2440], [2443], [2444], [2445], [2447], [2448], [2449], [2450], [2451], [2453], [2456], [2458], [2460], [2461], [2462], [2463], [2464], [2465], [2466], [2467], [2468], [2469], [2471], [2472], [2473], [2474], [2476], [2477], [2478], [2479], [2480], [2481], [2482], [2484], [2485], [2486], [2487], [2489], [2490], [2491], [2492], [2493], [2494], [2495], [2496], [2497], [2498], [2499], [2500], [2501], [2502], [2503], [2504], [2505], [2506], [2507], [2508], [2509], [2510], [2511], [2512], [2513], [2514], [2515], [2516], [2517], [2518], [2519], [2524], [2526], [2527], [2531], [2533], [2534], [2536], [2540], [2541], [2542], [2543], [2544], [2545], [2546], [2551], [2554], [2555], [2556], [2557], [2558], [2559], [2561], [2562], [2564], [2565], [2566], [2567], [2568], [2569], [2570], [2571], [2572], [2574], [2575], [2578], [2579], [2580], [2581], [2583], [2584], [2585], [2586], [2587], [2588], [2589], [2591], [2592], [2593], [2594], [2595], [2596], [2597], [2598], [2599], [2600], [2601], [2602], [2604], [2605], [2606], [2607], [2608], [2609], [2610], [2612], [2613], [2614], [2615], [2616], [2617], [2618], [2619], [2620], [2621], [2623], [2625], [2627], [2628], [2629], [2630], [2631], [2632], [2633], [2636], [2638], [2639], [2640], [2641], [2644], [2646], [2647], [2648], [2649], [2652], [2655], [2657], [2658], [2659], [2660], [2661], [2662], [2663], [2664], [2665], [2666], [2667], [2669], [2670], [2671], [2672], [2673], [2674], [2675], [2676], [2678], [2679], [2680], [2681], [2682], [2683], [2684], [2685], [2686], [2687], [2688], [2689], [2690], [2691], [2692], [2693], [2694], [2696], [2697], [2698], [2700], [2703], [2704], [2707], [2708], [2710], [2711], [2712], [2713], [2715], [2717], [2719], [2720], [2722], [2724], [2725], [2731], [2732], [2733], [2734], [2735], [2736], [2737], [2738], [2739], [2740], [2741], [2742], [2743], [2744], [2745], [2746], [2747], [2748], [2749], [2750], [2751], [2752], [2753], [2754], [2755], [2756], [2757], [2758], [2759], [2760], [2762], [2763], [2764], [2765], [2766], [2767], [2768], [2771], [2773], [2774], [2775], [2776], [2777], [2778], [2779], [2781], [2782], [2783], [2784], [2785], [2786], [2787], [2788], [2790], [2791], [2792], [2794], [2795], [2796], [2797], [2799], [2800], [2802], [2803], [2804], [2805], [2806], [2810], [2811], [2812], [2814], [2816], [2818], [2819], [2820], [2821], [2822], [2823], [2824], [2825], [2826], [2828], [2829], [2830], [2831], [2832], [2833], [2834], [2836], [2839], [2841], [2842], [2843], [2844], [2845], [2847], [2848], [2849], [2850], [2851], [2852], [2853], [2854], [2855], [2857], [2858], [2859], [2860], [2861], [2863],

[2864], [2865], [2867], [2868], [2870], [2871], [2872], [2873], [2874], [2875], [2876], [2877], [2878], [2879], [2880], [2883], [2884], [2885], [2887], [2889], [2890], [2891], [2892], [2893], [2894], [2895], [2896], [2897], [2899], [2900], [2901], [2906], [2907], [2910], [2911], [2912], [2913], [2917], [2918], [2919], [2920], [2923], [2925], [2927], [2929], [2930], [2931], [2932], [2933], [2934], [2937], [2938], [2940], [2942], [2943], [2944], [2945], [2946], [2949], [2950], [2953], [2954], [2955], [2956], [2957], [2959], [2960], [2961], [2962], [2963], [2964], [2965], [2967], [2968], [2971], [2972], [2974], [2975], [2976], [2978], [2979], [2980], [2981], [2982], [2983], [2984], [2987], [2989], [2990], [2991], [2992], [2994], [2995], [2997], [2998], [3000], [3001], [3003], [3004], [3005], [3006], [3008], [3012], [3014], [3015], [3016], [3017], [3019], [3021], [3025], [3028], [3030], [3033], [3034], [3037], [3038], [3039], [3041], [3042], [3045], [3050], [3051], [3052], [3055], [3056], [3057], [3058], [3065], [3066], [3068], [3069], [3070], [3071], [3073], [3074], [3075], [3077], [3082], [3083], [3084], [3086], [3087], [3091], [3092], [3093], [3095], [3096], [3101], [3103], [3105], [3107], [3108], [3110], [3111], [3113], [3114], [3117], [3118], [3120], [3121], [3124], [3125], [3129], [3130], [3131], [3134], [3136], [3137], [3138], [3140], [3141], [3142], [3143], [3145], [3147], [3148], [3149], [3150], [3151], [3152], [3153], [3154], [3155], [3158], [3159], [3161], [3162], [3163], [3164], [3165], [3166], [3168], [3169], [3170], [3171], [3173], [3174], [3175], [3176], [3177], [3178], [3179], [3180], [3182], [3184], [3185], [3186], [3187], [3188], [3189], [3190], [3191], [3192], [3194], [3196], [3197], [3199], [3201], [3202], [3203], [3204], [3205], [3208], [3213], [3220], [3221], [3223], [3225], [3226], [3227], [3228], [3229], [3232], [3233], [3234], [3236], [3237], [3238], [3241], [3243], [3244], [3245], [3246], [3249], [3251], [3252], [3253], [3255], [3256], [3258], [3259], [3260], [3261], [3265], [3268], [3270], [3272], [3273], [3274], [3275], [3276], [3277], [3278], [3279], [3280], [3285], [3286], [3287], [3288], [3290], [3291], [3293], [3294], [3295], [3296], [3297], [3298], [3299], [3300], [3301], [3302], [3305], [3306], [3307], [3309], [3311], [3312], [3313], [3314], [3316], [3319], [3321], [3323], [3324], [3325], [3329], [3330], [3331], [3333], [3334], [3335], [3337], [3338], [3339], [3340], [3341], [3342], [3343], [3344], [3345], [3347], [3348], [3349], [3351], [3352], [3353], [3355], [3356], [3357], [3358], [3360], [3362], [3363], [3365], [3366], [3368], [3369], [3371], [3372], [3375], [3376], [3379], [3382], [3383], [3385], [3387], [3389], [3390], [3392], [3394], [3395], [3398], [3399], [3400], [3402], [3403], [3404], [3405], [3406], [3407], [3409], [3410], [3411], [3412], [3413], [3414], [3415], [3416], [3417], [3418], [3419], [3420], [3421], [3423], [3424], [3425], [3427], [3428], [3429], [3431], [3433], [3434], [3435], [3436], [3437], [3438], [3439], [3440], [3441], [3443], [3444], [3445], [3446], [3447], [3448], [3449], [3450], [3452], [3453], [3457], [3458], [3461], [3463], [3464], [3465], [3466], [3468], [3470], [3471], [3472], [3474], [3481], [3482], [3483], [3485], [3486], [3487], [3489], [3490], [3491], [3492], [3493], [3497], [3503], [3504], [3505], [3506], [3507],

[3509], [3510], [3511], [3512], [3513], [3514], [3515], [3516], [3517], [3518], [3519], [3520], [3521], [3522], [3523], [3524], [3525], [3526], [3527], [3528], [3530], [3531], [3532], [3533], [3534], [3536], [3537], [3538], [3539], [3540], [3543], [3544], [3547], [3548], [3549], [3550], [3551], [3552], [3553], [3555], [3556], [3557], [3558], [3559], [3560], [3561], [3562], [3563], [3564], [3565], [3566], [3569], [3570], [3571], [3572], [3573], [3574], [3575], [3576], [3577], [3579], [3581], [3582], [3583], [3584], [3585], [3586], [3587], [3588], [3589], [3594], [3596], [3598], [3599], [3600], [3602], [3603], [3604], [3609], [3611], [3613], [3614], [3615], [3616], [3620], [3621], [3623], [3625], [3626], [3627], [3629], [3634], [3635], [3637], [3639], [3643], [3644], [3645], [3646], [3647], [3648], [3651], [3653], [3657], [3661], [3663], [3664], [3666], [3669], [3670], [3671], [3673], [3674], [3679], [3680], [3682], [3683], [3684], [3686], [3687], [3688], [3690], [3691], [3692], [3693], [3694], [3695], [3696], [3697], [3698], [3699], [3700], [3701], [3702], [3703], [3704], [3705], [3706], [3707], [3708], [3709], [3710], [3711], [3712], [3713], [3714], [3715], [3716], [3717], [3718], [3719], [3720], [3721], [3726], [3727], [3731], [3732], [3733], [3734], [3736], [3738], [3739], [3740], [3742], [3743], [3744], [3745], [3746], [3747], [3748], [3749], [3750], [3751], [3752], [3753], [3754], [3755], [3756], [3757], [3758], [3759], [3760], [3762], [3764], [3765], [3766], [3767], [3768], [3770], [3771], [3772], [3773], [3774], [3775], [3776], [3777], [3778], [3779], [3780], [3781], [3782], [3783], [3786], [3787], [3788], [3789], [3790], [3791], [3792], [3793], [3794], [3795], [3796], [3798], [3799], [3800], [3801], [3802], [3803], [3804], [3807], [3809], [3810], [3811], [3812], [3813], [3815], [3816], [3817], [3818], [3819], [3821], [3825], [3828], [3829], [3830], [3831], [3833], [3834], [3835], [3836], [3837], [3838], [3839], [3842], [3843], [3844], [3846], [3847], [3848], [3852], [3853], [3854], [3856], [3857], [3858], [3859], [3860], [3861], [3863], [3864], [3865], [3866], [3867], [3868], [3870], [3871], [3872], [3874], [3875], [3876], [3877], [3879], [3880], [3882], [3883], [3885], [3887], [3888], [3889], [3892], [3895], [3896], [3898], [3899], [3900], [3901], [3902], [3903], [3906], [3907], [3909], [3913], [3916], [3918], [3921], [3924], [3925], [3926], [3928], [3930], [3932], [3933], [3934], [3935], [3936], [3937], [3939], [3940], [3941], [3942], [3943], [3944], [3945], [3946], [3947], [3948], [3950], [3953], [3954], [3955], [3956], [3958], [3959], [3960], [3961], [3963], [3964], [3965], [3966], [3967], [3968], [3969], [3971], [3973], [3974], [3975], [3976], [3977], [3978], [3979], [3980], [3981], [3983], [3984], [3985], [3986], [3987], [3988], [3990], [3992], [3993], [3994], [3995], [3996], [3997], [3998], [4000], [4001], [4002], [4003], [4004], [4005], [4006], [4007], [4008], [4009], [4011], [4012], [4013], [4014], [4016], [4019], [4020], [4021], [4023], [4025], [4026], [4028], [4029], [4032], [4033], [4034], [4035], [4036], [4037], [4038], [4040], [4042], [4043], [4045], [4047], [4048], [4053], [4054], [4055], [4056], [4058], [4059], [4061], [4062], [4066], [4068], [4069], [4072], [4073], [4075], [4076], [4079], [4080], [4081], [4086], [4089], [4091], [4092], [4106], [4107], [4109],

[4111], [4113], [4114], [4115], [4117], [4118], [4119], [4121], [4122], [4123], [4124], [4126], [4127], [4128], [4129], [4130], [4132], [4133], [4134], [4136], [4137], [4138], [4141], [4142], [4144], [4145], [4147], [4148], [4149], [4150], [4151], [4152], [4153], [4154], [4155], [4156], [4157], [4158], [4160], [4161], [4162], [4164], [4166], [4168], [4169], [4170], [4171], [4172], [4173], [4175], [4176], [4178], [4180], [4182], [4183], [4184], [4185], [4186], [4188], [4189], [4191], [4192], [4193], [4194], [4195], [4196], [4197], [4199], [4202], [4203], [4205], [4207], [4209], [4212], [4215], [4217], [4218], [4220], [4221], [4222], [4225], [4227], [4229], [4230], [4231], [4233], [4235], [4236], [4238], [4240], [4241], [4243], [4245], [4247], [4248], [4250], [4252], [4253], [4254], [4257], [4259], [4261], [4262], [4263], [4264], [4265], [4266], [4267], [4268], [4269], [4270], [4271], [4272], [4273], [4274], [4275], [4277], [4278], [4279], [4280], [4281], [4282], [4283], [4284], [4285], [4286], [4287], [4288], [4289], [4290], [4291], [4292], [4293], [4294], [4295], [4296], [4299], [4300], [4301], [4302], [4303], [4304], [4305], [4306], [4309], [4312], [4318], [4319], [4320], [4321], [4322], [4323], [4324], [4325], [4326], [4327], [4328], [4329], [4330], [4331], [4332], [4334], [4335], [4336], [4338], [4339], [4344], [4345], [4346], [4348], [4350], [4351], [4352], [4353], [4354], [4355], [4356], [4357], [4358], [4359], [4360], [4361], [4362], [4363], [4364], [4366], [4367], [4368], [4369], [4370], [4371], [4372], [4374], [4375], [4376], [4377], [4378], [4379], [4380], [4381], [4382], [4384], [4385], [4386], [4387], [4388], [4389], [4390], [4391], [4392], [4393], [4394], [4395], [4397], [4398], [4399], [4400], [4401], [4402], [4403], [4405], [4406], [4407], [4408], [4409], [4410], [4412], [4413], [4414], [4415], [4416], [4420], [4426], [4431], [4432], [4440], [4441], [4442], [4443], [4444], [4445], [4446], [4447], [4448], [4449], [4450], [4451], [4452], [4453], [4454], [4455], [4456], [4457], [4458], [4459], [4460], [4461], [4462], [4463], [4464], [4465], [4466], [4467], [4468], [4469], [4470], [4471], [4472], [4473], [4475], [4476], [4477], [4479], [4480], [4481], [4482], [4483], [4484], [4485], [4486], [4487], [4488], [4489], [4491], [4498], [4500], [4501], [4502], [4503], [4504], [4505], [4506], [4507], [4508], [4510], [4511], [4513], [4514], [4517], [4521], [4523], [4525], [4526], [4527] — ΣN=4906845

1) Introduction

Endovascular Aneurysm Repair (EVAR) has revolutionized the management of abdominal aortic aneurysms (AAAs), offering a minimally invasive alternative to open surgical repair (OSR). Its increasing adoption is driven by improved short-term morbidity and mortality outcomes, particularly for infrarenal AAAs [2367, 702, 2550]. However, the long-term durability of EVAR, the management of complications, and its applicability across diverse patient anatomies and comorbidities remain areas of active research. This paper synthesizes recent findings on EVAR, encompassing procedural

advancements, outcomes in various patient populations, diagnostic modalities, and challenges such as endoleak management and long-term surveillance.

2) Aim

This paper aims to systematically review and synthesize the current evidence regarding Endovascular Aneurysm Repair (EVAR), focusing on its efficacy, safety, complications, diagnostic advancements, and long-term outcomes across a spectrum of clinical scenarios and patient populations.

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. The majority of included studies are retrospective cohorts or mixed designs, introducing potential selection and reporting biases. Case reports and small case series, while providing detailed insights into rare presentations or novel techniques, inherently carry a high risk of publication bias and limited generalizability. Randomized controlled trials (RCTs) are scarce, limiting the ability to draw definitive causal conclusions for many comparisons. Furthermore, the absence of specified directionality in many studies hinders a clear understanding of outcome attribution.

4) Results

4.1 Study characteristics:

The evidence base primarily consists of retrospective cohort studies and mixed-design investigations, complemented by numerous case reports detailing unique clinical scenarios and novel procedural approaches. Prospective cohort studies and a few randomized controlled trials (RCTs) also contribute. Populations range from single pregnant patients [12] to large registries of over 100,000 Medicare beneficiaries [196], with typical follow-up periods varying from 30 days to over 10 years, depending on the study's focus.

4.2 Main numerical result aligned to the query:

The 30-day mortality rate for ruptured abdominal aortic aneurysm (rAAA) treated with EVAR, across various studies and patient cohorts, had a median of 24.3% [18, 724, 2050, 2062, 4455, 886, 970, 1020, 1027, 1169, 2096, 2352, 2759, 3691, 3710, 4178, 4280] and ranged from 0.3% [1021] to 50.0% [1169]. This wide range reflects significant heterogeneity in patient characteristics, anatomical suitability, and institutional experience.

4.3 Topic synthesis:

- **AI and Digital Twin Technologies:** AI-assisted planning and Digital Twin technology show promise in early clinical experience for infrarenal and complex EVAR, potentially impacting graft selection and predicting complications [5, 35, 186, 440, 617, 644, 717, 1556].
- **Ruptured AAA (rAAA) Outcomes:** EVAR for rAAA is associated with lower mortality (e.g., 5.9% vs 63.3% for OSR [18]; 1.2% vs 4.6% for elective repair [1334]) and reduced complications compared to OSR, particularly in younger patients [702] and octogenarians [2062, 3397, 970]. However, post-EVAR rupture carries similar high mortality rates to de novo ruptures [8].
- **Endoleak Incidence and Management:** Type II endoleaks (T2EL) are the most common complication [614], with incidence ranging from 2.6% (EVAS) to 32.3% (EVAR) [37]. Type Ia endoleaks are predicted by short apposition length (<10mm) [1466] and neck diameter ratio [741]. Transarterial embolization with n-butyl-2-cyanoacrylate (NBCA) is safe and effective for Type I and II endoleaks [80, 3105, 758], while prophylactic embolization reduces T2EL and increases sac regression [359, 621, 769, 2467, 2605, 280, 529, 454, 747, 4255, 2398, 391]. Fenestrated/branched EVAR (F/BEVAR) is effective for Type Ia endoleaks after prior EVAR [48, 97, 112, 217, 479, 501, 605, 912, 1360, 1444, 2526, 2676, 3792].
- **Access and Closure Techniques:** Percutaneous femoral access is associated with lower bleeding, mortality, and shorter hospital stays compared to surgical cutdown [15, 579, 2031, 4022, 4172, 2625, 2438]. Devices like MANTA are effective for percutaneous closure, even in obese patients [62, 530, 3121].
- **Complications and Risk Factors:** Postoperative complications include perioperative myocardial injury (PMI) (21.1% after complex EVAR) [123], acute kidney injury (AKI) (13.7% after ch-EVAR) [1125], and post-implantation syndrome (PIS) (16.8% incidence) [150]. Diabetes mellitus [13, 437], aneurysm size (>7 cm) [13, 210], uncontrolled hypertension [499], sarcopenia [151, 775, 1637, 2397, 3905, 1367], and specific inflammatory markers (NLR > 5, SIRI, CRP) [23, 40, 682, 957, 1392] predict adverse outcomes. Iliac limb occlusion is infrequent (5.0%) but associated with symptomatic aneurysm and longer infrarenal AAA length [798, 556].
- **Long-Term Surveillance and Aneurysm Sac Behavior:** Long-term surveillance is crucial [16, 475, 197, 4195], with sac regression at one year associated with lower long-term mortality and reintervention rates, while sac expansion is linked to higher rates [928, 939, 2744]. EVAS shows higher graft failure and open conversion rates compared to EVAR [37].
- **Special Anatomies and Patient Populations:** EVAR is feasible in challenging anatomies like severe neck angulation ($\geq 60^\circ$) [189, 227, 592, 914, 1023, 1096, 1110, 1196, 4014, 4187, 505, 587], pararenal/juxtarenal aneurysms [53, 225, 409, 913, 1523, 2034, 4238], and giant AAAs [271]. Zero-contrast EVAR is feasible for CKD patients [27, 513, 88, 1325, 3383].

EVAR is used in pregnant patients [12] and for infected aneurysms, often with adjunctive therapy or planned conversion [471, 534, 632, 655, 679, 688, 701, 831, 977, 1155, 1180, 1420, 2063, 2077, 2770, 2776, 3292, 3901, 3938, 2060, 2422, 2435].

- **Anesthesia and Recovery:** Local anesthesia for EVAR is associated with lower mortality and reduced complications in rAAA [120], and shorter hospital stays in elective settings [579, 835, 1774, 1695]. Same-day discharge is safe for select patients [30].
- **Imaging and Diagnostics:** Dynamic CT angiography (dCTA) [247, 284, 1361, 1424] and contrast-enhanced ultrasound (CEUS) [497, 941, 1720, 2080, 2084, 2897, 3301, 3457, 3573, 3648, 3760, 3794, 4319] are superior to standard CTA for endoleak detection and characterization. Dual-energy CT (DECT) reduces radiation exposure while maintaining diagnostic accuracy [507, 1135, 1343, 1449, 3719]. MRI techniques also show promise for endoleak detection [897, 1384, 3427, 3429, 3786, 3789, 3958].
- **Cost-Effectiveness and Healthcare Utilization:** EVAR can be cost-effective, particularly for ruptured AAA [18, 489, 550, 890, 2096, 2028]. However, long-term costs for complex EVAR may exceed OSR due to reinterventions and imaging [890]. Compliance with post-EVAR surveillance decreases over time [177, 197, 2822, 1433].
- **Predictive Modeling and Risk Stratification:** Machine learning models accurately predict 30-day mortality [745] and 1-year outcomes [294] after EVAR, outperforming logistic regression. Preoperative NLR, SIRI, CRP, and D-dimer are biomarkers for complications and mortality [23, 40, 402, 610, 682, 919, 927, 957, 1012, 1016, 1093, 1392].

5) Discussion

5.1 Principal finding:

The 30-day mortality rate for ruptured abdominal aortic aneurysm (rAAA) treated with EVAR, across various studies and patient cohorts, had a median of 24.3% [18, 724, 2050, 2062, 4455, 886, 970, 1020, 1027, 1169, 2096, 2352, 2759, 3691, 3710, 4178, 4280] and ranged from 0.3% [1021] to 50.0% [1169], indicating a highly variable but generally substantial early mortality risk for this critical indication.

5.2 Clinical implications:

- **Patient Selection and Risk Stratification:** Preoperative biomarkers (NLR, SIRI, CRP, D-dimer) [23, 40, 402, 682, 957, 1392] and factors like diabetes [13, 437], aneurysm size [13, 210], and sarcopenia [151, 775, 1637, 2397] are critical for identifying high-risk patients and guiding treatment choice.
- **Procedural Optimization:** Percutaneous femoral access [15, 579, 2031, 4022, 4172, 2625, 2438] and local anesthesia [120, 579, 835, 1774, 1695] can improve short-term outcomes

and reduce hospital stays, supporting their use in appropriate settings.

- **Endoleak Management:** Prophylactic embolization of side branches [359, 621, 769, 2467, 2605, 280, 529, 454, 747, 4255, 2398, 391] and advanced embolization techniques for persistent endoleaks [80, 3105, 758, 638, 1432, 4170] are crucial for preventing sac enlargement and reinterventions.
- **Long-Term Surveillance:** Lifelong surveillance after EVAR is essential due to risks of sac expansion, endoleaks, and reinterventions [16, 475, 197, 4195], with advanced imaging like dCTA [247, 284, 1361, 1424] and CEUS [497, 941, 1720, 2080, 2084, 2897, 3301, 3457, 3573, 3648, 3760, 3794, 4319] improving detection.

5.3 Research implications / key gaps:

- **Standardized Outcome Reporting:** Future studies need consistent definitions and reporting of 30-day mortality and long-term reintervention rates, especially for complex EVAR and rAAA, to enable robust comparisons [218].
- **Comparative Effectiveness of Novel Techniques:** More RCTs are needed to compare novel techniques (e.g., zero-contrast EVAR [27, 513, 88, 1325, 3383], AI-assisted planning [5, 35, 186, 440, 617, 644, 717, 1556]) against standard EVAR, particularly for long-term outcomes and cost-effectiveness.
- **Predictive Model Validation:** Further prospective validation of machine learning models and biomarkers for predicting sac behavior, complications, and mortality is required across diverse patient populations and device types [154, 294, 745, 843, 959, 1556].
- **Optimizing Surveillance Protocols:** Research should investigate adaptive, risk-stratified surveillance protocols that balance cost and patient burden with early detection of complications, potentially leveraging non-invasive imaging (e.g., MRI [897, 1384, 3427, 3429, 3786, 3789, 3958]) and implantable sensors [791].
- **Impact of Hostile Anatomy:** Further investigation into optimal device selection and adjunctive techniques for patients with hostile neck [1110, 1196, 4014, 4187, 505, 587] and iliac artery anatomy [556, 622, 693, 697, 798, 1104, 1119, 114, 2037, 223, 266, 302, 3228, 3339, 3374, 4285, 4331, 4359, 4470] is needed, especially regarding long-term durability.

5.4 Limitations:

- **Retrospective Study Designs** — A large proportion of the evidence comes from retrospective studies, which are susceptible to selection bias and confounding, limiting the certainty of causal inferences.

- **Heterogeneity of Outcomes** — Significant variability in reported outcomes (e.g., mortality, endoleak rates) across studies, often due to differing patient populations, follow-up durations, and procedural techniques, makes direct comparisons challenging.
- **Limited Long-Term Data** — While some studies offer long-term follow-up, many novel techniques and device evaluations still lack robust data beyond 3-5 years, which is critical for assessing EVAR durability.
- **Small Sample Sizes for Rare Events** — Case reports and small series, particularly for rare complications (e.g., angiosarcoma [74, 1402]) or specific patient groups (e.g., pregnant patients [12]), limit the generalizability of findings.
- **Variability in Imaging Protocols** — Diverse imaging modalities and protocols for surveillance (e.g., CTA, CEUS, MRI) can lead to inconsistencies in endoleak detection and classification, affecting reported outcomes.

5.5 Future directions:

- **Conduct Long-Term RCTs** — Evaluate novel EVAR techniques and devices with extended follow-up periods against established methods.
- **Develop Standardized Metrics** — Implement consistent reporting of clinical and imaging outcomes across all EVAR studies to facilitate meta-analysis.
- **Integrate AI for Prediction** — Refine and prospectively validate AI/ML models to predict individual patient outcomes and complications, guiding personalized care.
- **Explore Non-Invasive Surveillance** — Investigate the efficacy and cost-effectiveness of advanced non-contrast imaging (e.g., MRI, CEUS) and implantable sensors for long-term post-EVAR monitoring.
- **Assess Health Equity** — Study EVAR outcomes and access disparities across different demographic and socioeconomic groups to ensure equitable care.

6) Conclusion

The 30-day mortality rate for ruptured abdominal aortic aneurysm (rAAA) treated with EVAR, across various studies and patient cohorts, had a median of 24.3% [18, 724, 2050, 2062, 4455, 886, 970, 1020, 1027, 1169, 2096, 2352, 2759, 3691, 3710, 4178, 4280] and ranged from 0.3% [1021] to 50.0% [1169]. This indicates that while EVAR offers a viable option for rAAA, particularly in select patients and settings, the early mortality risk remains substantial and highly variable. The prevalence of retrospective study designs most affects certainty regarding the generalizability and causality of many reported findings. Clinicians should prioritize patient selection based on detailed anatomical assessment and risk factors, while future research should focus on conducting long-term RCTs to

definitively establish the comparative effectiveness and durability of evolving EVAR techniques.

References

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Figure 1. Publication-year distribution of included originals

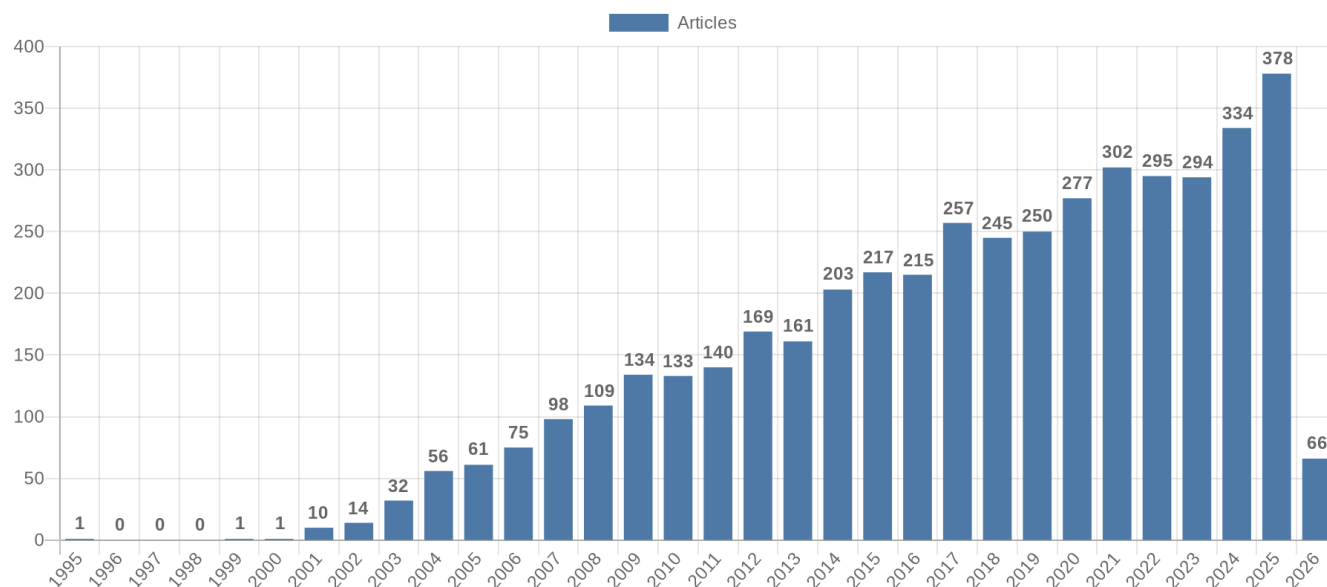


Figure 2. Study-design distribution of included originals

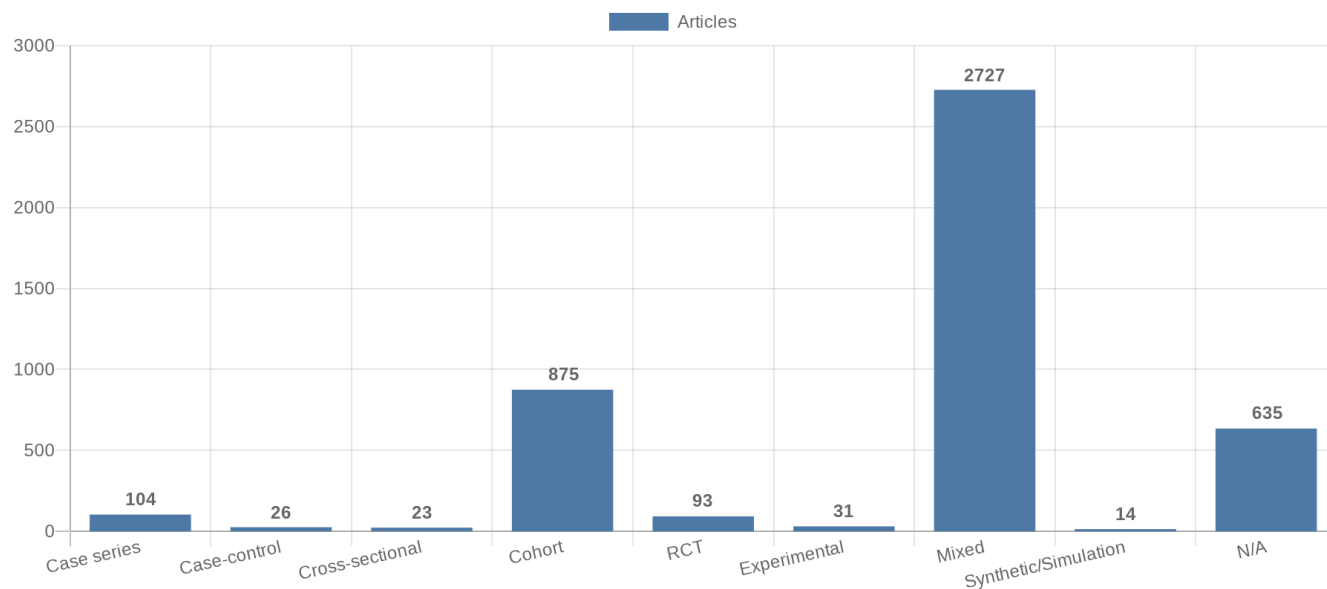


Figure 3. Study-type (directionality) distribution of included originals

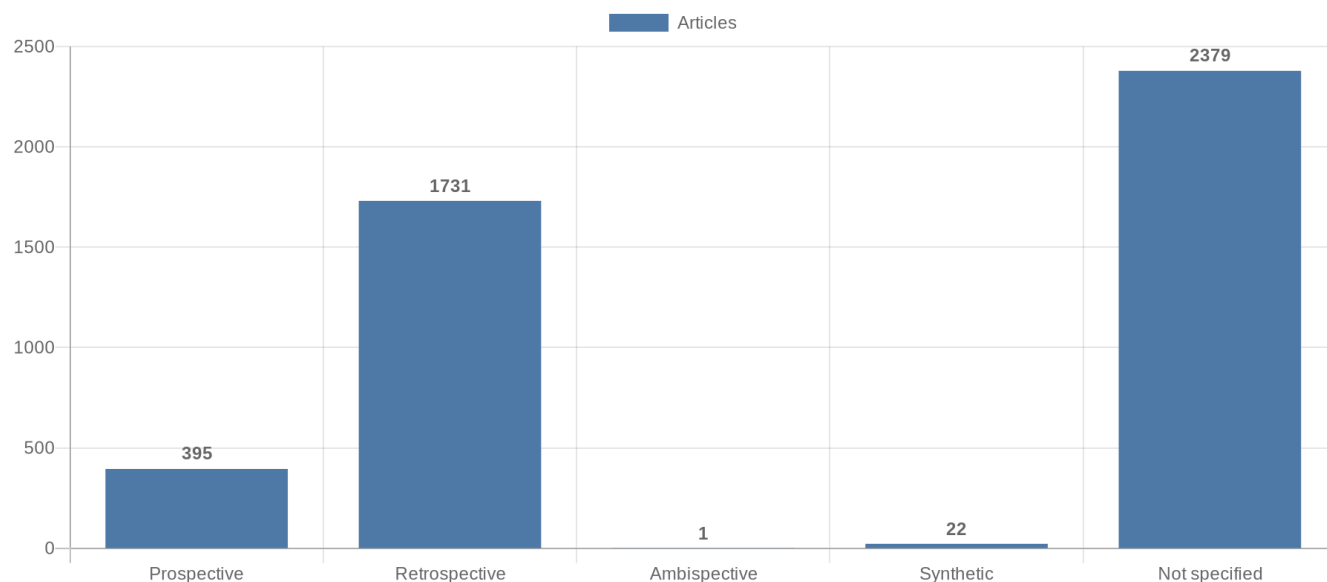


Figure 4. Main extracted research topics

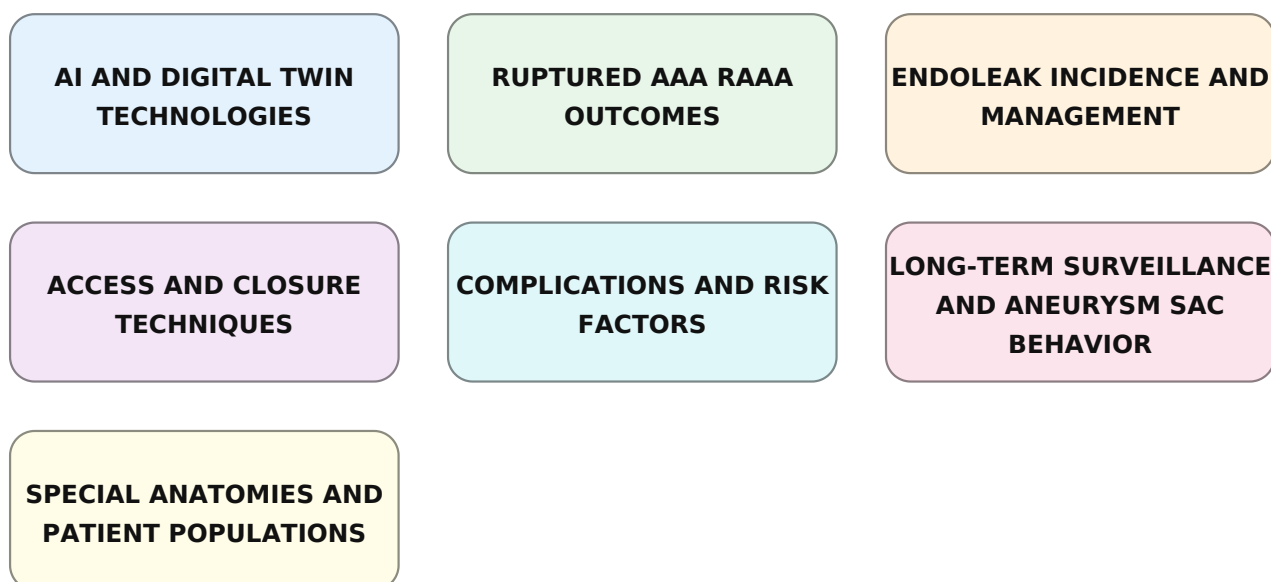


Figure 5. Limitations of current studies (topics)

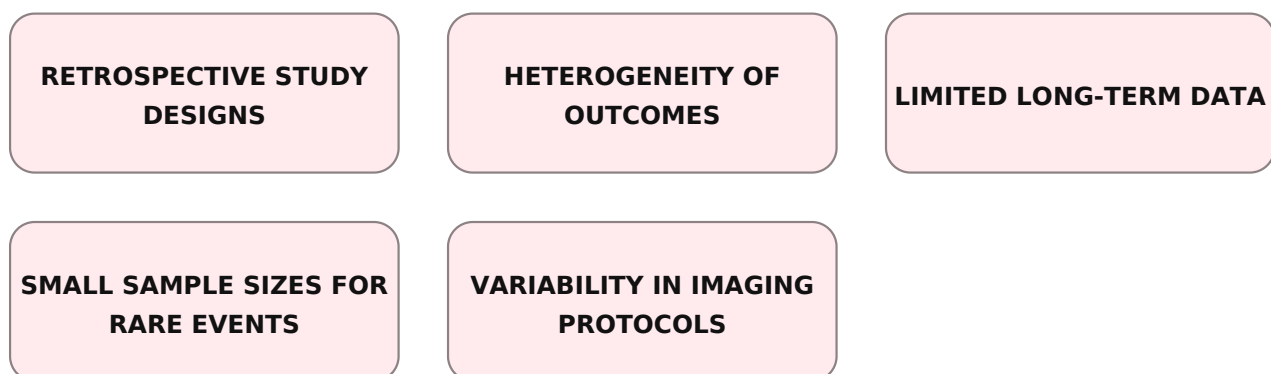


Figure 6. Future research directions (topics)

**STANDARDIZED OUTCOME
REPORTING**

**COMPARATIVE
EFFECTIVENESS OF NOVEL
TECHNIQUES**

**PREDICTIVE MODEL
VALIDATION**

**OPTIMIZING
SURVEILLANCE PROTOCOLS**

**IMPACT OF HOSTILE
ANATOMY**

CONDUCT LONG-TERM RCTS

**DEVELOP STANDARDIZED
METRICS**