

Abdominal Aortic Aneurysm Treatment: Systematic Review with SAIMSARA.

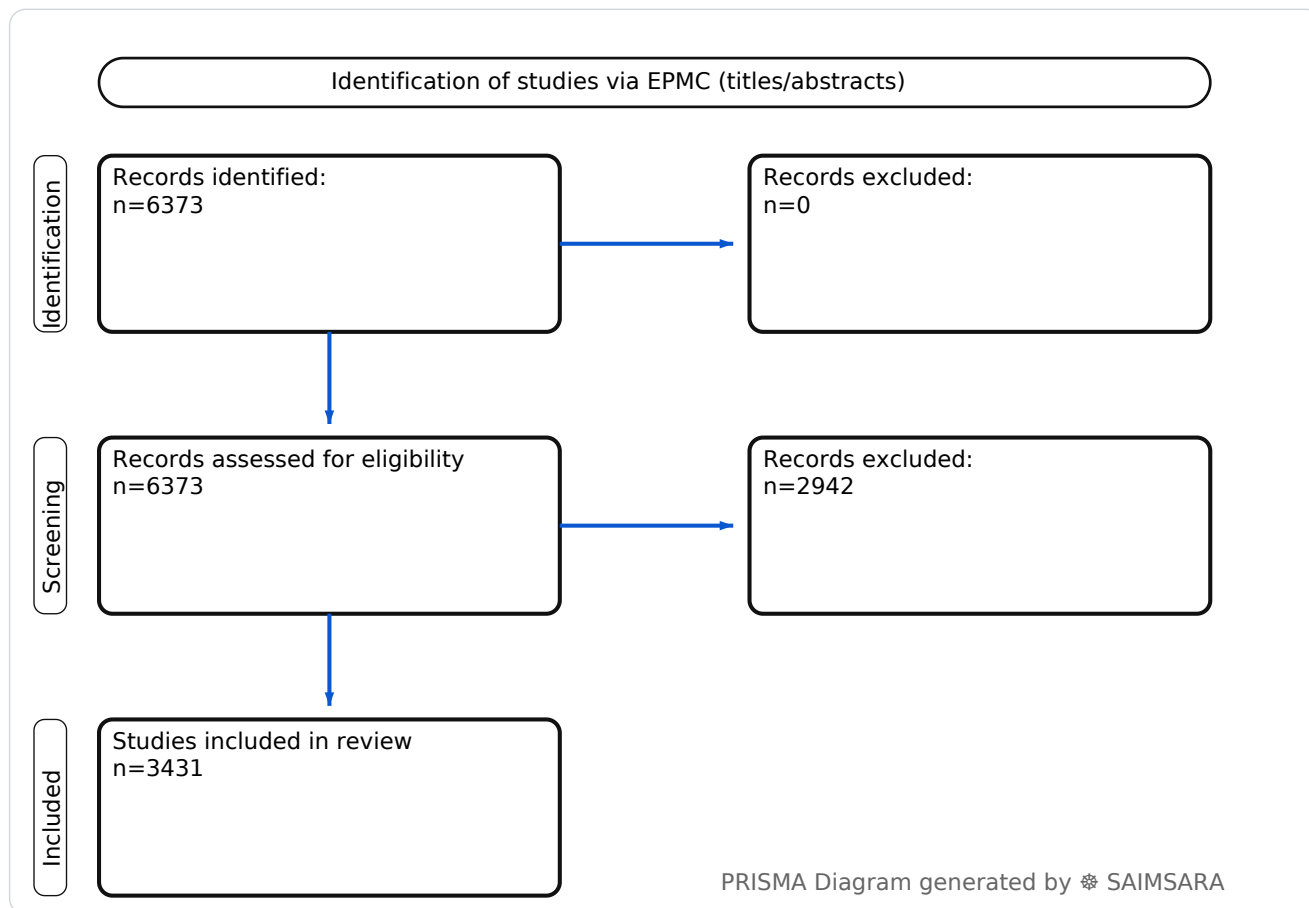
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Abstract: The aim of this paper is to systematically review and synthesize current research on abdominal aortic aneurysm treatment, identifying key trends, outcomes, and emerging therapeutic strategies. The review utilises 3431 studies with 3988382 total participants (naïve ΣN). For ruptured abdominal aortic aneurysms (rAAA), the median 30-day mortality rate for endovascular aneurysm repair (EVAR) was 23% (range: 13.5% to 30%), significantly lower than the median 30-day mortality rate of 38.5% (range: 26% to 50%) for open surgical repair (OSR). This suggests EVAR offers a perioperative survival advantage for rAAA patients. The generalizability of these findings is somewhat limited by the Heterogeneity of Study Designs, particularly the reliance on retrospective data and case reports for many complex scenarios. Clinicians should prioritize EVAR for anatomically suitable rAAA patients, while researchers should focus on conducting large-scale randomized controlled trials to validate emerging non-invasive therapies and standardize outcome reporting for complex endovascular procedures.

Keywords: Abdominal Aortic Aneurysm; Endovascular Aneurysm Repair; Fenestrated EVAR; Ruptured AAA; Exosomes; Nanomedicine; Aortic Inflammation; Stent Graft; Open Surgical Repair; Macrophage Polarization

Review Stats

- Generated: 2026-02-13 08:34:59 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: 6373
- Downloaded Abstracts/Papers: 6373
- Included original Abstracts/Papers: 3431
- Total study participants (naïve ΣN): 3988382



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: abdominal aortic aneurysm treatment — exposure/predictor. Doses/units seen: 60 ml, 10.0 g, 30 kg, 64 µg, 1.8 mg, 5 mg.... Routes seen: intravenous, iv, oral, subcutaneous.

Typical comparator: endosuture aneurysm repair, open surgical treatment in, graft replacement for type 2, cta for aortic measurements....

- **1) Beneficial for patients** — Outcome with abdominal aortic aneurysm treatment — [26], [27], [28], [29], [32], [33], [35], [37], [38], [39], [42], [43], [46], [48], [50], [57], [63], [76], [81], [82], [85], [88], [94], [127], [130], [134], [145], [149], [153], [155], [156], [159], [163], [167], [169], [173], [179], [182], [183], [184], [189], [190], [192], [194], [195], [199], [203], [211], [213], [214], [217], [219], [222], [224], [225], [259], [269], [275], [276], [283], [288], [289], [291], [298], [339], [348], [383], [392], [398], [400], [406], [407], [412], [418], [425], [430], [453], [471], [473], [474], [478], [480], [481], [482], [483], [484], [485], [487], [488], [495], [496], [497], [498], [500], [536], [537], [541], [545], [546], [547], [549], [565], [601], [602], [603], [604], [607], [608], [611], [612], [613], [621], [625], [626], [627], [629], [630], [631], [632], [633], [634], [638], [640], [641], [643], [644], [648], [655], [663], [666], [723], [724], [725], [739], [742], [744], [748], [853], [856], [857], [863], [865], [872], [875], [901], [904], [905], [911], [917], [920], [924], [925], [926], [927], [929], [935], [940], [942], [944], [946], [948], [954], [957], [966], [967], [970], [980], [985], [999], [1008], [1011], [1014], [1032], [1076], [1089], [1090], [1093], [1104], [1116], [1125], [1133], [1140], [1142], [1148], [1184], [1185], [1190], [1194], [1196], [1229], [1233], [1250], [1251], [1253], [1255], [1259], [1302], [1304], [1306], [1312], [1313], [1314], [1318], [1322], [1377], [1383], [1385], [1388], [1389], [1391], [1392], [1393], [1395], [1397], [1400], [1402], [1403], [1407], [1415], [1418], [1423], [1425], [1435], [1447], [1448], [1449], [1451], [1452], [1454], [1457], [1458], [1459], [1460], [1462], [1463], [1464], [1466], [1467], [1469], [1474], [1477], [1487], [1503], [1509], [1511], [1512], [1513], [1514], [1515], [1519], [1520], [1521], [1522], [1526], [1528], [1531], [1532], [1535], [1538], [1541], [1544], [1547], [1553], [1554], [1559], [1560], [1561], [1563], [1564], [1565], [1567], [1568], [1569], [1570], [1571], [1573], [1626], [1635], [1647], [1650], [1675], [1692], [1698], [1713], [1714], [1718], [1722], [1723], [1724], [1730], [1736], [1742], [1744], [1745], [1747], [1751], [1754], [1760], [1763], [1764], [1771], [1772], [1773], [1801], [1803], [1804], [1818], [1819], [1822], [1823], [1824], [1825], [1826], [1828], [1833], [1836], [1838], [1843], [1851], [1852], [1857], [1863], [1869], [1875], [1880], [1881],

[1882], [1885], [1886], [1887], [1893], [1896], [1897], [1899], [1901], [1902], [1903], [1905], [1906], [1907], [1908], [1909], [1912], [1915], [1916], [1917], [1919], [1926], [1928], [1934], [1936], [1937], [1938], [1939], [1943], [1945], [1955], [1956], [1957], [1958], [1959], [1960], [1961], [1964], [1965], [1967], [1968], [1970], [1971], [1975], [1983], [1990], [2002], [2005], [2014], [2015], [2017], [2024], [2030], [2032], [2033], [2034], [2036], [2039], [2040], [2042], [2043], [2044], [2047], [2048], [2076], [2081], [2083], [2084], [2085], [2086], [2089], [2090], [2092], [2094], [2097], [2098], [2099], [2100], [2101], [2104], [2106], [2108], [2109], [2111], [2112], [2113], [2115], [2116], [2117], [2118], [2119], [2120], [2123], [2124], [2126], [2127], [2133], [2134], [2141], [2144], [2145], [2146], [2147], [2148], [2169], [2171], [2174], [2175], [2176], [2177], [2178], [2180], [2183], [2184], [2185], [2186], [2191], [2194], [2196], [2199], [2227], [2228], [2230], [2231], [2232], [2237], [2247], [2248], [2263], [2265], [2269], [2276], [2279], [2285], [2286], [2287], [2288], [2290], [2292], [2293], [2295], [2297], [2298], [2302], [2306], [2313], [2318], [2320], [2321], [2323], [2324], [2335], [2340], [2346], [2353], [2357], [2358], [2360], [2361], [2367], [2377], [2378], [2381], [2382], [2383], [2386], [2388], [2390], [2391], [2392], [2393], [2394], [2395], [2396], [2397], [2433], [2485], [2494], [2495], [2496], [2526], [2528], [2534], [2546], [2551], [2553], [2555], [2556], [2564], [2565], [2567], [2568], [2573], [2575], [2579], [2590], [2606], [2637], [2651], [2652], [2653], [2655], [2656], [2657], [2658], [2660], [2661], [2662], [2663], [2664], [2665], [2666], [2667], [2668], [2669], [2671], [2672], [2673], [2674], [2685], [2694], [2701], [2703], [2705], [2715], [2721], [2723], [2726], [2733], [2741], [2745], [2746], [2749], [2750], [2755], [2757], [2758], [2767], [2769], [2773], [2775], [2804], [2806], [2817], [2822], [2827], [2828], [2832], [2833], [2837], [2845], [2847], [2858], [2863], [2867], [2870], [2871], [2904], [2906], [2920], [2924], [2925], [2930], [2933], [2940], [2943], [2944], [2945], [2951], [2956], [2958], [2964], [2967], [2970], [2972], [2974], [2976], [2977], [2982], [2988], [2989], [2996], [2997], [3000], [3003], [3004], [3007], [3009], [3011], [3012], [3014], [3015], [3017], [3018], [3024], [3030], [3033], [3034], [3035], [3036], [3041], [3047], [3048], [3050], [3054], [3058], [3061], [3065], [3095], [3101], [3104], [3105], [3106], [3107], [3109], [3111], [3113], [3115], [3116], [3117], [3119], [3120], [3121], [3125], [3126], [3127], [3131], [3132], [3133], [3134], [3135], [3143], [3146], [3147], [3148], [3150], [3152], [3154], [3155], [3162], [3167], [3201], [3202], [3205], [3206], [3207], [3208], [3209], [3211], [3212], [3214], [3219], [3220], [3221], [3222], [3223], [3224], [3226], [3229], [3234], [3235], [3236], [3237], [3238], [3239], [3240], [3242], [3243], [3244], [3248], [3252], [3255], [3257], [3259], [3264], [3272], [3273], [3276], [3280], [3281], [3291], [3292], [3303], [3305], [3314], [3318], [3329], [3331], [3332], [3334], [3336], [3339], [3341], [3346], [3353], [3356], [3357], [3364], [3367], [3368], [3370], [3372], [3373], [3375], [3376], [3377], [3378], [3379], [3382], [3384], [3386], [3388], [3390], [3391], [3392], [3398], [3401], [3406],

[3408], [3410], [3415], [3419], [3420], [3421], [3422], [3424] — $\Sigma N=1801433$

• **2) Harmful for patients** — Outcome with abdominal aortic aneurysm treatment —

[30], [36], [67], [185], [201], [208], [212], [254], [260], [265], [284], [299], [414], [442], [452], [457], [479], [490], [605], [610], [616], [735], [762], [800], [830], [850], [861], [883], [900], [906], [919], [922], [932], [934], [936], [939], [951], [961], [1001], [1002], [1003], [1009], [1017], [1079], [1099], [1118], [1121], [1141], [1176], [1178], [1195], [1197], [1198], [1227], [1236], [1268], [1289], [1386], [1398], [1399], [1555], [1628], [1738], [1757], [1761], [1762], [1769], [1807], [1911], [1923], [1932], [1951], [1962], [1987], [2031], [2037], [2041], [2046], [2049], [2105], [2107], [2125], [2156], [2157], [2165], [2166], [2187], [2229], [2245], [2296], [2325], [2438], [2554], [2707], [2709], [2747], [2797], [2807], [2815], [2839], [2962], [2973], [2985], [3023], [3042], [3045], [3069], [3070], [3136], [3145], [3149], [3183], [3217], [3266], [3342], [3348], [3349], [3350], [3355], [3358], [3366], [3371], [3374], [3380], [3381], [3395], [3397], [3399], [3418] — $\Sigma N=664364$

• **3) No clear effect** — Outcome with abdominal aortic aneurysm treatment — [1], [2],

[3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [31], [34], [40], [41], [44], [45], [47], [49], [51], [52], [53], [54], [55], [56], [58], [59], [60], [61], [62], [64], [65], [66], [68], [69], [70], [71], [72], [73], [74], [75], [77], [78], [79], [80], [83], [84], [86], [87], [89], [90], [91], [92], [93], [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], [120], [121], [122], [123], [124], [125], [126], [128], [129], [131], [132], [133], [135], [136], [137], [138], [139], [140], [141], [142], [143], [144], [146], [147], [148], [150], [151], [152], [154], [157], [158], [160], [161], [162], [164], [165], [166], [168], [170], [171], [172], [174], [175], [176], [177], [178], [180], [181], [186], [187], [188], [191], [193], [196], [197], [198], [200], [202], [204], [205], [206], [207], [209], [210], [215], [216], [218], [220], [221], [223], [226], [227], [228], [229], [230], [231], [232], [233], [234], [235], [236], [237], [238], [239], [240], [241], [242], [243], [244], [245], [246], [247], [248], [249], [250], [251], [252], [253], [255], [256], [257], [258], [261], [262], [263], [264], [266], [267], [268], [270], [271], [272], [273], [274], [277], [278], [279], [280], [281], [282], [285], [286], [287], [290], [292], [293], [294], [295], [296], [297], [300], [301], [302], [303], [304], [305], [306], [307], [308], [309], [310], [311], [312], [313], [314], [315], [316], [317], [318], [319], [320], [321], [322], [323], [324], [325], [326], [327], [328], [329], [330], [331], [332], [333], [334], [335], [336], [337], [338], [340], [341], [342], [343], [344], [345], [346], [347], [349], [350], [351], [352], [353], [354], [355], [356], [357], [358], [359], [360], [361], [362], [363], [364], [365], [366], [367], [368], [369], [370], [371], [372], [373], [374], [375], [376], [377], [378], [379], [380], [381], [382], [384], [385], [386], [387], [388], [389], [390], [391], [393], [394], [395], [396],

[397], [399], [401], [402], [403], [404], [405], [408], [409], [410], [411], [413], [415], [416], [417], [419], [420], [421], [422], [423], [424], [426], [427], [428], [429], [431], [432], [433], [434], [435], [436], [437], [438], [439], [440], [441], [443], [444], [445], [446], [447], [448], [449], [450], [451], [454], [455], [456], [458], [459], [460], [461], [462], [463], [464], [465], [466], [467], [468], [469], [470], [472], [475], [476], [477], [486], [489], [491], [492], [493], [494], [499], [501], [502], [503], [504], [505], [506], [507], [508], [509], [510], [511], [512], [513], [514], [515], [516], [517], [518], [519], [520], [521], [522], [523], [524], [525], [526], [527], [528], [529], [530], [531], [532], [533], [534], [535], [538], [539], [540], [542], [543], [544], [548], [550], [551], [552], [553], [554], [555], [556], [557], [558], [559], [560], [561], [562], [563], [564], [566], [567], [568], [569], [570], [571], [572], [573], [574], [575], [576], [577], [578], [579], [580], [581], [582], [583], [584], [585], [586], [587], [588], [589], [590], [591], [592], [593], [594], [595], [596], [597], [598], [599], [600], [606], [609], [614], [615], [617], [618], [619], [620], [622], [623], [624], [628], [635], [636], [637], [639], [642], [645], [646], [647], [649], [650], [651], [652], [653], [654], [656], [657], [658], [659], [660], [661], [662], [664], [665], [667], [668], [669], [670], [671], [672], [673], [674], [675], [676], [677], [678], [679], [680], [681], [682], [683], [684], [685], [686], [687], [688], [689], [690], [691], [692], [693], [694], [695], [696], [697], [698], [699], [700], [701], [702], [703], [704], [705], [706], [707], [708], [709], [710], [711], [712], [713], [714], [715], [716], [717], [718], [719], [720], [721], [722], [726], [727], [728], [729], [730], [731], [732], [733], [734], [736], [737], [738], [740], [741], [743], [745], [746], [747], [749], [750], [751], [752], [753], [754], [755], [756], [757], [758], [759], [760], [761], [763], [764], [765], [766], [767], [768], [769], [770], [771], [772], [773], [774], [775], [776], [777], [778], [779], [780], [781], [782], [783], [784], [785], [786], [787], [788], [789], [790], [791], [792], [793], [794], [795], [796], [797], [798], [799], [801], [802], [803], [804], [805], [806], [807], [808], [809], [810], [811], [812], [813], [814], [815], [816], [817], [818], [819], [820], [821], [822], [823], [824], [825], [826], [827], [828], [829], [831], [832], [833], [834], [835], [836], [837], [838], [839], [840], [841], [842], [843], [844], [845], [846], [847], [848], [849], [851], [852], [854], [855], [858], [859], [860], [862], [864], [866], [867], [868], [869], [870], [871], [873], [874], [876], [877], [878], [879], [880], [881], [882], [884], [885], [886], [887], [888], [889], [890], [891], [892], [893], [894], [895], [896], [897], [898], [899], [902], [903], [907], [908], [909], [910], [912], [913], [914], [915], [916], [918], [921], [923], [928], [930], [931], [933], [937], [938], [941], [943], [945], [947], [949], [950], [952], [953], [955], [956], [958], [959], [960], [962], [963], [964], [965], [968], [969], [971], [972], [973], [974], [975], [976], [977], [978], [979], [981], [982], [983], [984], [986], [987], [988], [989], [990], [991], [992], [993], [994], [995], [996], [997], [998], [1000], [1004], [1005], [1006], [1007], [1010], [1012], [1013], [1015], [1016], [1018], [1019], [1020], [1021], [1022],

[1023], [1024], [1025], [1026], [1027], [1028], [1029], [1030], [1031], [1033], [1034], [1035], [1036], [1037], [1038], [1039], [1040], [1041], [1042], [1043], [1044], [1045], [1046], [1047], [1048], [1049], [1050], [1051], [1052], [1053], [1054], [1055], [1056], [1057], [1058], [1059], [1060], [1061], [1062], [1063], [1064], [1065], [1066], [1067], [1068], [1069], [1070], [1071], [1072], [1073], [1074], [1075], [1077], [1078], [1080], [1081], [1082], [1083], [1084], [1085], [1086], [1087], [1088], [1091], [1092], [1094], [1095], [1096], [1097], [1098], [1100], [1101], [1102], [1103], [1105], [1106], [1107], [1108], [1109], [1110], [1111], [1112], [1113], [1114], [1115], [1117], [1119], [1120], [1122], [1123], [1124], [1126], [1127], [1128], [1129], [1130], [1131], [1132], [1134], [1135], [1136], [1137], [1138], [1139], [1143], [1144], [1145], [1146], [1147], [1149], [1150], [1151], [1152], [1153], [1154], [1155], [1156], [1157], [1158], [1159], [1160], [1161], [1162], [1163], [1164], [1165], [1166], [1167], [1168], [1169], [1170], [1171], [1172], [1173], [1174], [1175], [1177], [1179], [1180], [1181], [1182], [1183], [1186], [1187], [1188], [1189], [1191], [1192], [1193], [1199], [1200], [1201], [1202], [1203], [1204], [1205], [1206], [1207], [1208], [1209], [1210], [1211], [1212], [1213], [1214], [1215], [1216], [1217], [1218], [1219], [1220], [1221], [1222], [1223], [1224], [1225], [1226], [1228], [1230], [1231], [1232], [1234], [1235], [1237], [1238], [1239], [1240], [1241], [1242], [1243], [1244], [1245], [1246], [1247], [1248], [1249], [1252], [1254], [1256], [1257], [1258], [1260], [1261], [1262], [1263], [1264], [1265], [1266], [1267], [1269], [1270], [1271], [1272], [1273], [1274], [1275], [1276], [1277], [1278], [1279], [1280], [1281], [1282], [1283], [1284], [1285], [1286], [1287], [1288], [1290], [1291], [1292], [1293], [1294], [1295], [1296], [1297], [1298], [1299], [1300], [1301], [1303], [1305], [1307], [1308], [1309], [1310], [1311], [1315], [1316], [1317], [1319], [1320], [1321], [1323], [1324], [1325], [1326], [1327], [1328], [1329], [1330], [1331], [1332], [1333], [1334], [1335], [1336], [1337], [1338], [1339], [1340], [1341], [1342], [1343], [1344], [1345], [1346], [1347], [1348], [1349], [1350], [1351], [1352], [1353], [1354], [1355], [1356], [1357], [1358], [1359], [1360], [1361], [1362], [1363], [1364], [1365], [1366], [1367], [1368], [1369], [1370], [1371], [1372], [1373], [1374], [1375], [1376], [1378], [1379], [1380], [1381], [1382], [1384], [1387], [1390], [1394], [1396], [1401], [1404], [1405], [1406], [1408], [1409], [1410], [1411], [1412], [1413], [1414], [1416], [1417], [1419], [1420], [1421], [1422], [1424], [1426], [1427], [1428], [1429], [1430], [1431], [1432], [1433], [1434], [1436], [1437], [1438], [1439], [1440], [1441], [1442], [1443], [1444], [1445], [1446], [1450], [1453], [1455], [1456], [1461], [1465], [1468], [1470], [1471], [1472], [1473], [1475], [1476], [1478], [1479], [1480], [1481], [1482], [1483], [1484], [1485], [1486], [1488], [1489], [1490], [1491], [1492], [1493], [1494], [1495], [1496], [1497], [1498], [1499], [1500], [1501], [1502], [1504], [1505], [1506], [1507], [1508], [1510], [1516], [1517], [1518], [1523], [1524], [1525], [1527], [1529], [1530], [1533], [1534], [1536], [1537], [1539], [1540], [1542], [1543], [1545], [1546],

[1548], [1549], [1550], [1551], [1552], [1556], [1557], [1558], [1562], [1566], [1572], [1574], [1575], [1576], [1577], [1578], [1579], [1580], [1581], [1582], [1583], [1584], [1585], [1586], [1587], [1588], [1589], [1590], [1591], [1592], [1593], [1594], [1595], [1596], [1597], [1598], [1599], [1600], [1601], [1602], [1603], [1604], [1605], [1606], [1607], [1608], [1609], [1610], [1611], [1612], [1613], [1614], [1615], [1616], [1617], [1618], [1619], [1620], [1621], [1622], [1623], [1624], [1625], [1627], [1629], [1630], [1631], [1632], [1633], [1634], [1636], [1637], [1638], [1639], [1640], [1641], [1642], [1643], [1644], [1645], [1646], [1648], [1649], [1651], [1652], [1653], [1654], [1655], [1656], [1657], [1658], [1659], [1660], [1661], [1662], [1663], [1664], [1665], [1666], [1667], [1668], [1669], [1670], [1671], [1672], [1673], [1674], [1676], [1677], [1678], [1679], [1680], [1681], [1682], [1683], [1684], [1685], [1686], [1687], [1688], [1689], [1690], [1691], [1693], [1694], [1695], [1696], [1697], [1699], [1700], [1701], [1702], [1703], [1704], [1705], [1706], [1707], [1708], [1709], [1710], [1711], [1712], [1715], [1716], [1717], [1719], [1720], [1721], [1725], [1726], [1727], [1728], [1729], [1731], [1732], [1733], [1734], [1735], [1737], [1739], [1740], [1741], [1743], [1746], [1748], [1749], [1750], [1752], [1753], [1755], [1756], [1758], [1759], [1765], [1766], [1767], [1768], [1770], [1774], [1775], [1776], [1777], [1778], [1779], [1780], [1781], [1782], [1783], [1784], [1785], [1786], [1787], [1788], [1789], [1790], [1791], [1792], [1793], [1794], [1795], [1796], [1797], [1798], [1799], [1800], [1802], [1805], [1806], [1808], [1809], [1810], [1811], [1812], [1813], [1814], [1815], [1816], [1817], [1820], [1821], [1827], [1829], [1830], [1831], [1832], [1834], [1835], [1837], [1839], [1840], [1841], [1842], [1844], [1845], [1846], [1847], [1848], [1849], [1850], [1853], [1854], [1855], [1856], [1858], [1859], [1860], [1861], [1862], [1864], [1865], [1866], [1867], [1868], [1870], [1871], [1872], [1873], [1874], [1876], [1877], [1878], [1879], [1883], [1884], [1888], [1889], [1890], [1891], [1892], [1894], [1895], [1898], [1900], [1904], [1910], [1913], [1914], [1918], [1920], [1921], [1922], [1924], [1925], [1927], [1929], [1930], [1931], [1933], [1935], [1940], [1941], [1942], [1944], [1946], [1947], [1948], [1949], [1950], [1952], [1953], [1954], [1963], [1966], [1969], [1972], [1973], [1974], [1976], [1977], [1978], [1979], [1980], [1981], [1982], [1984], [1985], [1986], [1988], [1989], [1991], [1992], [1993], [1994], [1995], [1996], [1997], [1998], [1999], [2000], [2001], [2003], [2004], [2006], [2007], [2008], [2009], [2010], [2011], [2012], [2013], [2016], [2018], [2019], [2020], [2021], [2022], [2023], [2025], [2026], [2027], [2028], [2029], [2035], [2038], [2045], [2050], [2051], [2052], [2053], [2054], [2055], [2056], [2057], [2058], [2059], [2060], [2061], [2062], [2063], [2064], [2065], [2066], [2067], [2068], [2069], [2070], [2071], [2072], [2073], [2074], [2075], [2077], [2078], [2079], [2080], [2082], [2087], [2088], [2091], [2093], [2095], [2096], [2102], [2103], [2110], [2114], [2121], [2122], [2128], [2129], [2130], [2131], [2132], [2135], [2136], [2137], [2138], [2139], [2140], [2142], [2143], [2149], [2150], [2151], [2152], [2153], [2154], [2155],

[2158], [2159], [2160], [2161], [2162], [2163], [2164], [2167], [2168], [2170], [2172], [2173], [2179], [2181], [2182], [2188], [2189], [2190], [2192], [2193], [2195], [2197], [2198], [2200], [2201], [2202], [2203], [2204], [2205], [2206], [2207], [2208], [2209], [2210], [2211], [2212], [2213], [2214], [2215], [2216], [2217], [2218], [2219], [2220], [2221], [2222], [2223], [2224], [2225], [2226], [2233], [2234], [2235], [2236], [2238], [2239], [2240], [2241], [2242], [2243], [2244], [2246], [2249], [2250], [2251], [2252], [2253], [2254], [2255], [2256], [2257], [2258], [2259], [2260], [2261], [2262], [2264], [2266], [2267], [2268], [2270], [2271], [2272], [2273], [2274], [2275], [2277], [2278], [2280], [2281], [2282], [2283], [2284], [2289], [2291], [2294], [2299], [2300], [2301], [2303], [2304], [2305], [2307], [2308], [2309], [2310], [2311], [2312], [2314], [2315], [2316], [2317], [2319], [2322], [2326], [2327], [2328], [2329], [2330], [2331], [2332], [2333], [2334], [2336], [2337], [2338], [2339], [2341], [2342], [2343], [2344], [2345], [2347], [2348], [2349], [2350], [2351], [2352], [2354], [2355], [2356], [2359], [2362], [2363], [2364], [2365], [2366], [2368], [2369], [2370], [2371], [2372], [2373], [2374], [2375], [2376], [2379], [2380], [2384], [2385], [2387], [2389], [2398], [2399], [2400], [2401], [2402], [2403], [2404], [2405], [2406], [2407], [2408], [2409], [2410], [2411], [2412], [2413], [2414], [2415], [2416], [2417], [2418], [2419], [2420], [2421], [2422], [2423], [2424], [2425], [2426], [2427], [2428], [2429], [2430], [2431], [2432], [2434], [2435], [2436], [2437], [2439], [2440], [2441], [2442], [2443], [2444], [2445], [2446], [2447], [2448], [2449], [2450], [2451], [2452], [2453], [2454], [2455], [2456], [2457], [2458], [2459], [2460], [2461], [2462], [2463], [2464], [2465], [2466], [2467], [2468], [2469], [2470], [2471], [2472], [2473], [2474], [2475], [2476], [2477], [2478], [2479], [2480], [2481], [2482], [2483], [2484], [2486], [2487], [2488], [2489], [2490], [2491], [2492], [2493], [2497], [2498], [2499], [2500], [2501], [2502], [2503], [2504], [2505], [2506], [2507], [2508], [2509], [2510], [2511], [2512], [2513], [2514], [2515], [2516], [2517], [2518], [2519], [2520], [2521], [2522], [2523], [2524], [2525], [2527], [2529], [2530], [2531], [2532], [2533], [2535], [2536], [2537], [2538], [2539], [2540], [2541], [2542], [2543], [2544], [2545], [2547], [2548], [2549], [2550], [2552], [2557], [2558], [2559], [2560], [2561], [2562], [2563], [2566], [2569], [2570], [2571], [2572], [2574], [2576], [2577], [2578], [2580], [2581], [2582], [2583], [2584], [2585], [2586], [2587], [2588], [2589], [2591], [2592], [2593], [2594], [2595], [2596], [2597], [2598], [2599], [2600], [2601], [2602], [2603], [2604], [2605], [2607], [2608], [2609], [2610], [2611], [2612], [2613], [2614], [2615], [2616], [2617], [2618], [2619], [2620], [2621], [2622], [2623], [2624], [2625], [2626], [2627], [2628], [2629], [2630], [2631], [2632], [2633], [2634], [2635], [2636], [2638], [2639], [2640], [2641], [2642], [2643], [2644], [2645], [2646], [2647], [2648], [2649], [2650], [2654], [2659], [2670], [2675], [2676], [2677], [2678], [2679], [2680], [2681], [2682], [2683], [2684], [2686], [2687], [2688], [2689], [2690], [2691], [2692], [2693], [2695], [2696], [2697], [2698], [2699], [2700], [2702],

[2704], [2706], [2708], [2710], [2711], [2712], [2713], [2714], [2716], [2717], [2718], [2719], [2720], [2722], [2724], [2725], [2727], [2728], [2729], [2730], [2731], [2732], [2734], [2735], [2736], [2737], [2738], [2739], [2740], [2742], [2743], [2744], [2748], [2751], [2752], [2753], [2754], [2756], [2759], [2760], [2761], [2762], [2763], [2764], [2765], [2766], [2768], [2770], [2771], [2772], [2774], [2776], [2777], [2778], [2779], [2780], [2781], [2782], [2783], [2784], [2785], [2786], [2787], [2788], [2789], [2790], [2791], [2792], [2793], [2794], [2795], [2796], [2798], [2799], [2800], [2801], [2802], [2803], [2805], [2808], [2809], [2810], [2811], [2812], [2813], [2814], [2816], [2818], [2819], [2820], [2821], [2823], [2824], [2825], [2826], [2829], [2830], [2831], [2834], [2835], [2836], [2838], [2840], [2841], [2842], [2843], [2844], [2846], [2848], [2849], [2850], [2851], [2852], [2853], [2854], [2855], [2856], [2857], [2859], [2860], [2861], [2862], [2864], [2865], [2866], [2868], [2869], [2872], [2873], [2874], [2875], [2876], [2877], [2878], [2879], [2880], [2881], [2882], [2883], [2884], [2885], [2886], [2887], [2888], [2889], [2890], [2891], [2892], [2893], [2894], [2895], [2896], [2897], [2898], [2899], [2900], [2901], [2902], [2903], [2905], [2907], [2908], [2909], [2910], [2911], [2912], [2913], [2914], [2915], [2916], [2917], [2918], [2919], [2921], [2922], [2923], [2926], [2927], [2928], [2929], [2931], [2932], [2934], [2935], [2936], [2937], [2938], [2939], [2941], [2942], [2946], [2947], [2948], [2949], [2950], [2952], [2953], [2954], [2955], [2957], [2959], [2960], [2961], [2963], [2965], [2966], [2968], [2969], [2971], [2975], [2978], [2979], [2980], [2981], [2983], [2984], [2986], [2987], [2990], [2991], [2992], [2993], [2994], [2995], [2998], [2999], [3001], [3002], [3005], [3006], [3008], [3010], [3013], [3016], [3019], [3020], [3021], [3022], [3025], [3026], [3027], [3028], [3029], [3031], [3032], [3037], [3038], [3039], [3040], [3043], [3044], [3046], [3049], [3051], [3052], [3053], [3055], [3056], [3057], [3059], [3060], [3062], [3063], [3064], [3066], [3067], [3068], [3071], [3072], [3073], [3074], [3075], [3076], [3077], [3078], [3079], [3080], [3081], [3082], [3083], [3084], [3085], [3086], [3087], [3088], [3089], [3090], [3091], [3092], [3093], [3094], [3096], [3097], [3098], [3099], [3100], [3102], [3103], [3108], [3110], [3112], [3114], [3118], [3122], [3123], [3124], [3128], [3129], [3130], [3137], [3138], [3139], [3140], [3141], [3142], [3144], [3151], [3153], [3156], [3157], [3158], [3159], [3160], [3161], [3163], [3164], [3165], [3166], [3168], [3169], [3170], [3171], [3172], [3173], [3174], [3175], [3176], [3177], [3178], [3179], [3180], [3181], [3182], [3184], [3185], [3186], [3187], [3188], [3189], [3190], [3191], [3192], [3193], [3194], [3195], [3196], [3197], [3198], [3199], [3200], [3203], [3204], [3210], [3213], [3215], [3216], [3218], [3225], [3227], [3228], [3230], [3231], [3232], [3233], [3241], [3245], [3246], [3247], [3249], [3250], [3251], [3253], [3254], [3256], [3258], [3260], [3261], [3262], [3263], [3265], [3267], [3268], [3269], [3270], [3271], [3274], [3275], [3277], [3278], [3279], [3282], [3283], [3284], [3285], [3286], [3287], [3288], [3289], [3290], [3293], [3294], [3295], [3296], [3297], [3298], [3299], [3300], [3301],

[3302], [3304], [3306], [3307], [3308], [3309], [3310], [3311], [3312], [3313], [3315], [3316], [3317], [3319], [3320], [3321], [3322], [3323], [3324], [3325], [3326], [3327], [3328], [3330], [3333], [3335], [3337], [3338], [3340], [3343], [3344], [3345], [3347], [3351], [3352], [3354], [3359], [3360], [3361], [3362], [3363], [3365], [3369], [3383], [3385], [3387], [3389], [3393], [3394], [3396], [3400], [3402], [3403], [3404], [3405], [3407], [3409], [3411], [3412], [3413], [3414], [3416], [3417], [3423], [3425], [3426], [3427], [3428], [3429], [3430], [3431] — ΣN=1522585

1) Introduction

Abdominal aortic aneurysm (AAA) is a significant vascular pathology characterized by localized dilation of the abdominal aorta, posing a substantial risk of rupture and associated mortality. Treatment strategies for AAAs have evolved considerably, ranging from traditional open surgical repair (OSR) to increasingly prevalent endovascular aneurysm repair (EVAR) techniques, including fenestrated (FEVAR), branched (BEVAR), and chimney (Ch-EVAR) approaches. Beyond surgical interventions, a growing body of research explores novel pharmacological and biological therapies aimed at halting aneurysm progression. This paper synthesizes recent findings on the diverse landscape of AAA treatment, encompassing surgical outcomes, emerging endovascular technologies, and preclinical therapeutic advancements.

2) Aim

The aim of this paper is to systematically review and synthesize current research on abdominal aortic aneurysm treatment, identifying key trends, outcomes, and emerging therapeutic strategies.

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 included literature exhibits a range of study designs, from retrospective cohort studies and case series to prospective trials and preclinical experimental models. A notable proportion consists of case reports, which inherently carry a high risk of selection bias and limited generalizability. Retrospective studies often lack randomization, leading to potential confounding. Prospective cohort studies and randomized controlled trials (RCTs), while fewer, offer higher levels of evidence. Preclinical studies, while crucial for mechanistic insights, may not directly translate to human clinical efficacy.

4) Results

4.1 Study characteristics:

The literature primarily comprises mixed study designs, including retrospective and prospective cohorts, case series, and experimental preclinical models. Patient populations range from single case reports of complex anatomies or rare presentations to large cohorts of thousands of patients undergoing elective or emergent repair. Follow-up periods vary widely, from immediate perioperative outcomes to long-term assessments spanning up to 15 years, with many studies reporting 1-year, 2-year, or 5-year outcomes. Preclinical studies typically involve animal models (e.g., mice, rats, rabbits, dogs) with follow-up periods of weeks to months.

4.2 Main numerical result aligned to the query:

For ruptured abdominal aortic aneurysms (rAAA), the median 30-day mortality rate for endovascular aneurysm repair (EVAR) was 23% (range: 13.5% to 30%) [230, 259, 599, 603, 834, 916, 2042, 2285, 2568]. In contrast, the median 30-day mortality rate for open surgical repair (OSR) of rAAA was 38.5% (range: 26% to 50%) [13, 259, 603, 916, 934, 2042, 2285]. For elective, intact AAAs, the median 30-day mortality rate for EVAR was 0.8% (range: 0% to 1.3%) [509, 631, 887, 1010, 1190, 1361, 1591, 2019, 2837, 2997], while for OSR it was 1.9% (range: 1.6% to 2.1%) [501, 887, 1061, 2279].

4.3 Topic synthesis:

- **Endovascular Aneurysm Repair (EVAR) Outcomes:** EVAR is widely utilized for AAA treatment, demonstrating a median 30-day mortality of 0.8% (range 0-1.3%) for elective cases [509, 631, 887, 1010, 1190, 1361, 1591, 2019, 2837, 2997] and 23% (range 13.5-30%) for ruptured AAAs [230, 259, 599, 603, 834, 916, 2042, 2285, 2568], often with lower perioperative morbidity compared to OSR [2169, 2757, 2773]. However, EVAR is associated with higher rates of reintervention (median 16% at 6 years [491, 793, 936, 961, 1061]) and specific complications like endoleaks (type I: 5.3% [500], type II: 35.6% [500]) and limb occlusions (9% [254]).
- **Open Surgical Repair (OSR) Outcomes:** OSR remains a viable and often durable option, particularly for complex anatomies or younger, low-risk patients. Median 30-day mortality for elective OSR is 1.9% (range 1.6-2.1%) [501, 887, 1061, 2279] and 38.5% (range 26-50%) for ruptured AAAs [13, 259, 603, 916, 934, 2042, 2285]. OSR may offer better long-term survival in low-risk patients [598] and fewer reinterventions compared to EVAR [491, 587, 1061].
- **Complex AAA Treatment Strategies:** Fenestrated and branched EVAR (FBEVAR/Ch-EVAR) are effective for juxtarenal, pararenal, and thoraco-abdominal AAAs (TAAAs), with high technical success (96.1% [483], 99.1% [203]) and acceptable early mortality (1-4.8%) [782,

483, 564]. However, these complex procedures can have higher reintervention rates (median 20.2% [212]), and renal complications are a concern [486, 492].

- **Novel Pharmacological and Biological Therapies:** Preclinical studies are investigating various non-surgical treatments. These include exosomes for modulating macrophage polarization [1], chimeric antigen receptor Treg cells targeting VCAM-1 [3], multifunctional nanomedicine with doxycycline [8], IL-1Ra-loaded nanoparticles [10], macrophage-biomimetic nanoparticles [46], metformin [63, 692], edoxaban [76], aged garlic extract [120], Menaquinone-4 [131], bergapten [179], *Akkermansia muciniphila* [183, 722], MLKL inhibitors [217], ROS-responsive nanoparticles [224], curcumin [229, 1977], UCP2 inhibitors [214], GPX4 targeting [309], liraglutide [494, 499], pentagalloyl glucose-loaded nanoparticles [660], mesenchymal stem cell-derived extracellular vesicles [670], tolvaptan [695], galectin-1 [700], IL-19 [744], chemerin-9 [753], spermidine [757], tamsulosin [870], vinpocetine [1148], and androgen receptor blockers [1851].
- **Ruptured AAA (rAAA) Management:** An "EVAR-first" strategy for rAAA is gaining traction, associated with lower 30-day mortality (median 23% for EVAR vs. 38.5% for OSR) [259, 599, 603, 834, 2042, 2285]. Techniques like balloon occlusion and intra-sac thrombin injection improve success rates and reduce complications [14, 601]. Resuscitative endovascular balloon occlusion of the aorta (REBOA) during open surgery also improves survival [496].
- **Patient-Specific Factors and Risk Stratification:** Age, frailty, and comorbidities significantly influence outcomes. Octogenarians undergoing rAAA repair have higher mortality (37.2% EVAR, 50% OSR) [934]. Frailty predicts adverse outcomes after surgical treatment [332]. Chronic kidney disease (CKD) severity is a strong predictor of mortality after AAA repair [939]. Women often undergo AAA repair at smaller aortic diameters but higher aortic size index, suggesting delayed diagnosis [201].
- **Imaging and Diagnostic Advances:** Intravascular ultrasound (IVUS) is valuable for aortic measurements during EVAR, reducing contrast and radiation [27]. 4D Flow MRI helps assess hemodynamic alterations post-EVAR [34]. AI and deep learning are improving aorta segmentation and predicting inflammatory characteristics, fibrosis, and hemodynamics [86, 216, 296, 758, 953].
- **Concomitant Conditions and Complex Cases:** Management of AAAs with concurrent conditions like acute DeBakey type 3A aortic syndrome [2], common femoral artery aneurysms [17], pregnancy [20], acute thrombosis [26], multiple aortic aneurysms [32, 240, 999], infectious aneurysms [48, 330, 401, 503, 657, 685, 696, 702, 1030, 1052, 1086, 3099], colorectal cancer [58, 222, 726, 1049, 1418, 1596, 1621, 2990], horseshoe kidney [615, 624, 739, 1014, 1572, 2159], or Marfan syndrome [176, 465] requires tailored approaches, often involving staged or hybrid procedures.
- **Endoleak Management:** Endoleaks are frequent complications after EVAR [51, 2019]. Type I and III endoleaks require prompt treatment due to rupture risk [2514, 2836]. Type II

endoleaks (T2EL) are common (median 35.6% [500]) and can lead to sac enlargement [735], with various treatment options including transarterial, transcaval, translumbar, and direct sac embolization [198, 530, 602, 940, 1026, 1522, 1893, 3084]. N-butyl-2-cyanoacrylate (NBCA) injection during EVAR can reduce T2EL incidence [1173].

- **Non-Invasive Management and Surveillance:** Aneurysmal calcification is associated with slower AAA growth [23]. Aspirin therapy is linked to decreased aneurysm growth [33]. Metformin therapy showed limited improvement in health-related quality of life in small AAAs but did not significantly impact growth progression in non-diabetic patients [63, 139]. Surveillance programs are crucial, with AI models being developed to predict sac shrinkage [489].

5) Discussion

5.1 Principal finding:

For ruptured abdominal aortic aneurysms (rAAA), the median 30-day mortality rate for endovascular aneurysm repair (EVAR) was 23% (range: 13.5% to 30%), significantly lower than the median 30-day mortality rate of 38.5% (range: 26% to 50%) for open surgical repair (OSR) [259, 599, 603, 834, 2042, 2285]. This suggests a clear perioperative survival advantage for EVAR in the emergency setting.

5.2 Clinical implications:

- **EVAR as First-Line for rAAA:** Given the lower 30-day mortality, EVAR should be considered the primary treatment for anatomically suitable ruptured AAAs in centers with expertise and appropriate facilities [752, 2285, 599].
- **Personalized Treatment for Complex AAAs:** For juxtarenal, pararenal, and thoraco-abdominal AAAs, advanced endovascular techniques like FEVAR and Ch-EVAR are feasible, but patient selection must consider individual anatomy, comorbidities, and the potential for higher reintervention rates [203, 212, 506, 512, 915].
- **Importance of Surveillance:** Long-term surveillance after EVAR is critical due to the risk of endoleaks, sac enlargement, and device-related complications, which can necessitate reinterventions [509, 524, 793, 2400, 2807, 2836].
- **Pharmacological Adjuncts:** Postoperative statin treatment significantly improves long-term survival after AAA repair [283, 1196, 2966]. Aspirin and potentially other anti-inflammatory agents may slow aneurysm growth [33, 2045].
- **Risk Stratification for Elderly/Comorbid Patients:** Age, frailty, and chronic kidney disease are strong predictors of adverse outcomes, requiring careful risk assessment and shared decision-making for treatment selection [332, 934, 939, 150].

5.3 Research implications / key gaps:

- **Standardize Outcome Reporting for EVAR Complications:** There is a need for consistent definitions and reporting of endoleaks, reinterventions, and device failures across studies to enable robust comparisons and meta-analyses [51].
- **Large-Scale RCTs for Novel Pharmacotherapies:** Efficacy of promising agents (e.g., metformin, doxycycline, exosomes, nanomedicine) in slowing AAA growth or preventing rupture needs validation through larger, well-designed randomized controlled trials in human populations [656, 715, 476].
- **Long-Term Durability of Complex EVAR Devices:** Further investigation into the long-term integrity, patency, and reintervention rates of newer fenestrated and branched endografts is essential to optimize device design and patient selection [512, 524, 782, 1074].
- **AI for Predictive Modeling and Treatment Personalization:** Development and validation of advanced AI models are needed to predict aneurysm growth, sac shrinkage, and treatment outcomes, integrating anatomical, hemodynamic, and biological factors for personalized care [296, 489, 953, 1575].
- **Impact of Socioeconomic Factors on Access and Outcomes:** Research should explore the causal links between socioeconomic status, access to timely treatment, and patient outcomes, particularly for ruptured AAAs, to inform public health interventions [398, 2049, 2992].

5.4 Limitations:

- **Heterogeneity of Study Designs** — The diverse array of study designs, from case reports to RCTs, limits the ability to pool data and draw definitive conclusions.
- **Variability in Reporting Outcomes** — Inconsistent reporting of metrics, follow-up durations, and patient characteristics across studies hinders direct comparisons.
- **Limited Long-term Follow-up** — Many studies, especially for newer techniques or ruptured cases, lack comprehensive long-term follow-up data, making it difficult to assess true durability and late complications.
- **Small Sample Sizes** — A substantial number of case reports and small case series reduce the generalizability of findings, particularly for rare presentations or novel techniques.
- **Preclinical Translation Challenges** — Findings from animal models, while informative for mechanisms, may not directly translate to human clinical efficacy due to physiological differences.

5.5 Future directions:

- **Standardize Reporting Guidelines** — Implement universal guidelines for reporting AAA treatment outcomes and patient characteristics to facilitate future comparative analyses.
- **Conduct Comparative Effectiveness Research** — Design large, multicenter studies comparing long-term outcomes of different EVAR devices and strategies, especially for complex anatomies.
- **Integrate Multi-Omics Data** — Explore the use of proteomic [196], genomic [759], and metabolomic data to identify novel biomarkers for AAA progression and treatment response.
- **Develop Decision-Support Tools** — Create and validate clinical decision-support instruments (DSIs) that incorporate patient-specific risks, preferences, and long-term outcomes to guide treatment choices [150].
- **Advance Non-Invasive Therapies** — Prioritize clinical trials for promising pharmacological and biological agents that target AAA pathogenesis to offer alternatives or adjuncts to surgical intervention.

6) Conclusion

For ruptured abdominal aortic aneurysms (rAAA), the median 30-day mortality rate for endovascular aneurysm repair (EVAR) was 23% (range: 13.5% to 30%), significantly lower than the median 30-day mortality rate of 38.5% (range: 26% to 50%) for open surgical repair (OSR) [259, 599, 603, 834, 2042, 2285]. This suggests EVAR offers a perioperative survival advantage for rAAA patients. The generalizability of these findings is somewhat limited by the **Heterogeneity of Study Designs**, particularly the reliance on retrospective data and case reports for many complex scenarios. Clinicians should prioritize EVAR for anatomically suitable rAAA patients, while researchers should focus on conducting large-scale randomized controlled trials to validate emerging non-invasive therapies and standardize outcome reporting for complex endovascular procedures.

References

SAIMSARA Session Index — [session.json](#)

Figure 1. Publication-year distribution of included originals

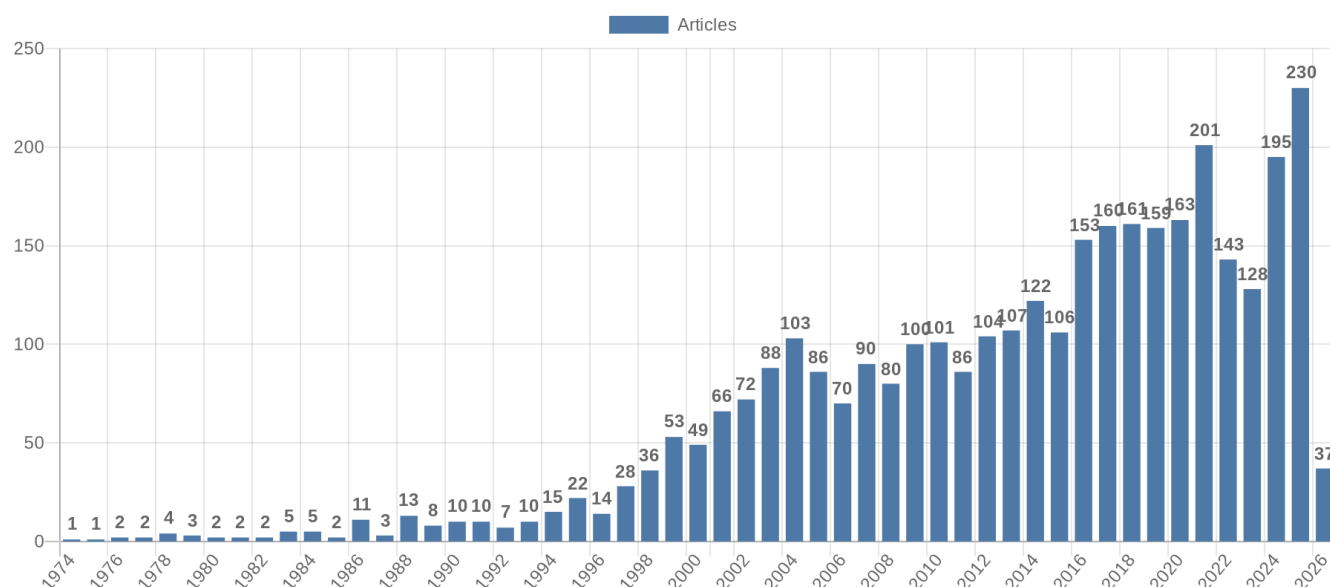


Figure 2. Study-design distribution of included originals

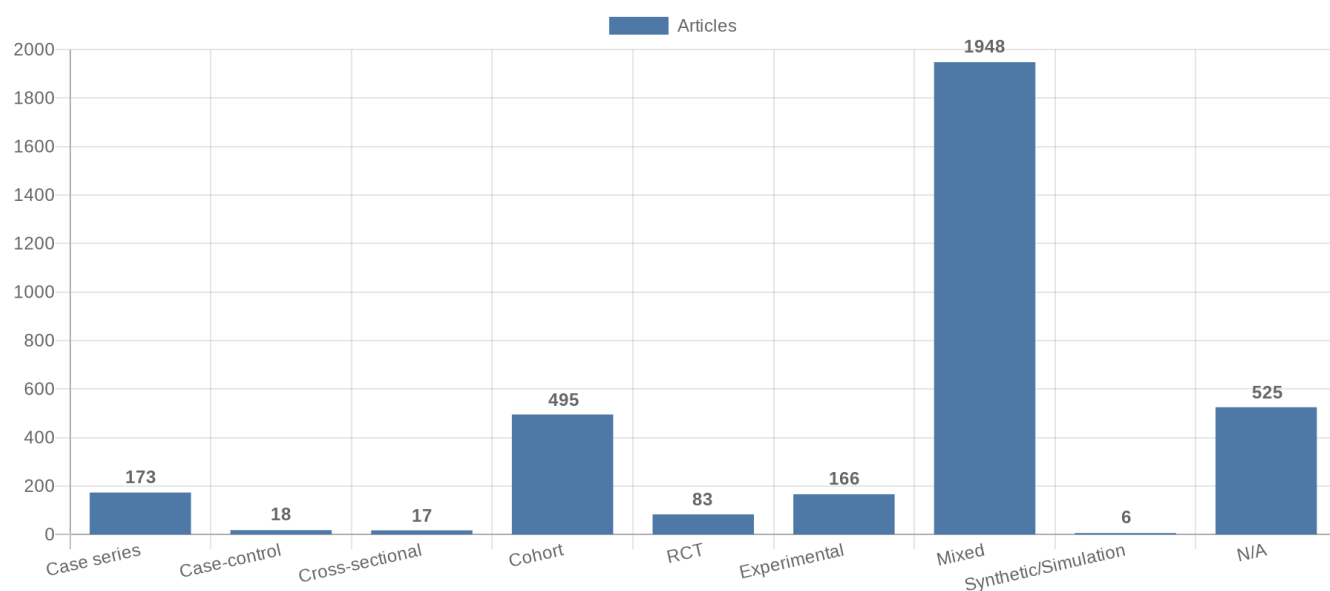


Figure 3. Study-type (directionality) distribution of included originals

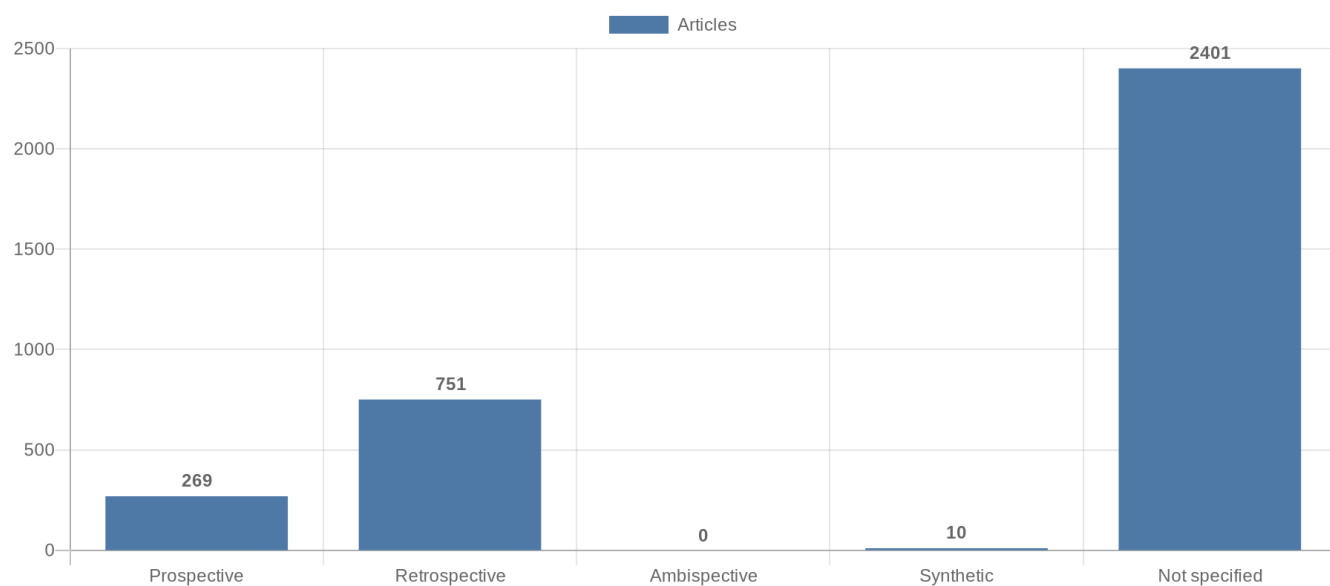


Figure 4. Main extracted research topics

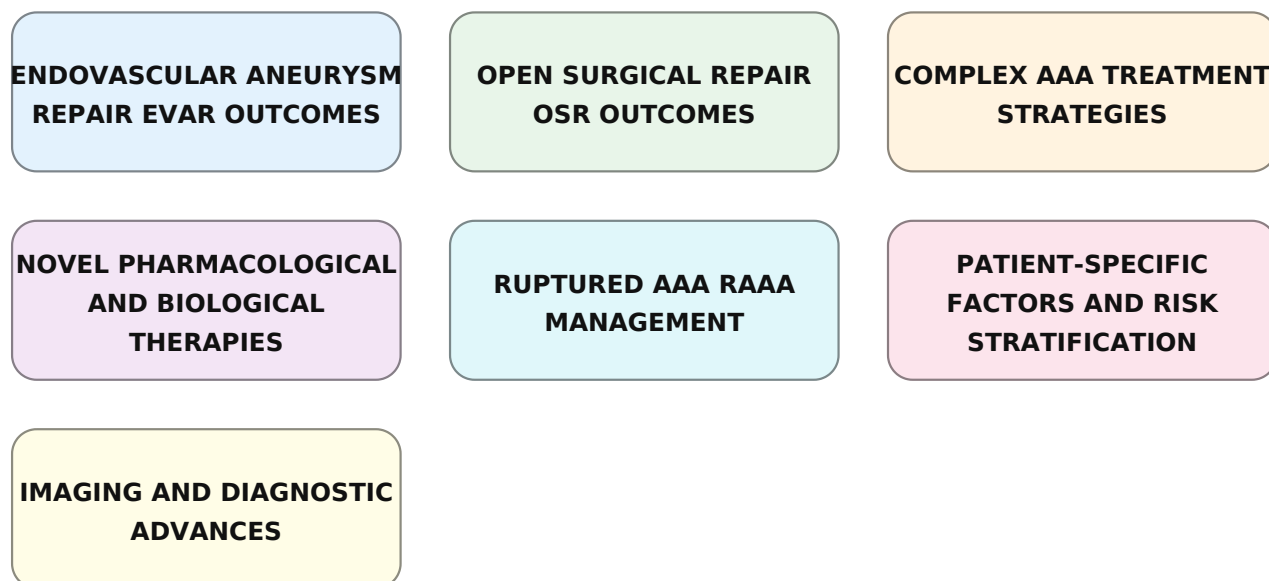


Figure 5. Limitations of current studies (topics)

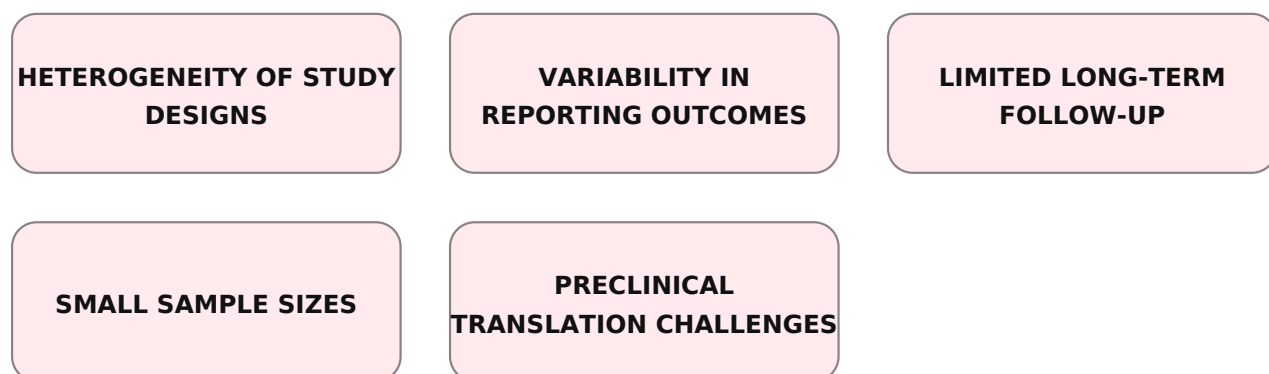


Figure 6. Future research directions (topics)

