Peripheral Artery Disease WIFI Classification: Systematic Review with ☸SAIMSARA.

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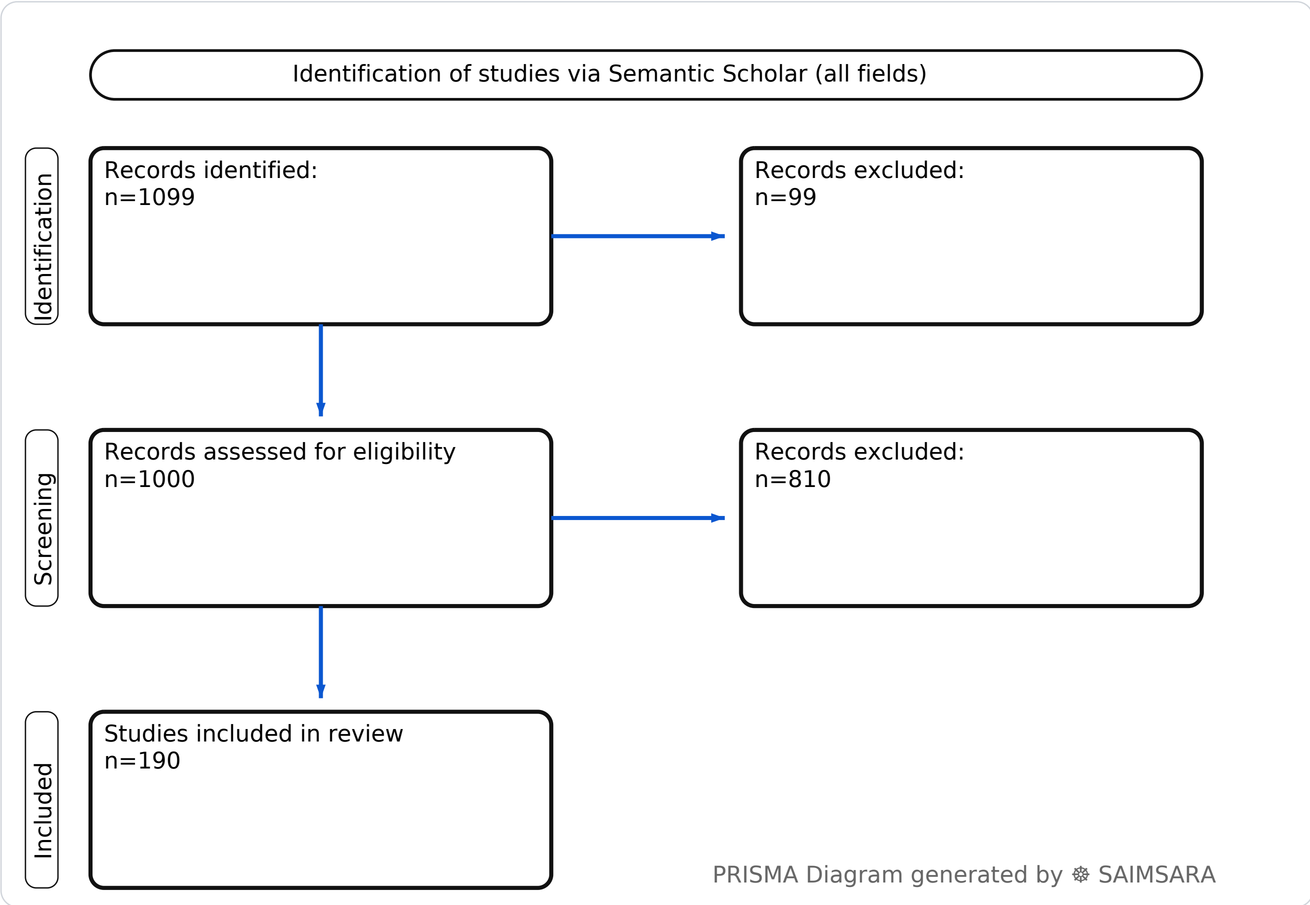
Abstract: This paper aims to systematically review the current evidence on the utility and prognostic value of the WIfI classification system in patients with peripheral artery disease. The review utilises 190 studies with 222085 total participants (naïve ΣN). Higher WIfI stages are consistently associated with a significantly increased risk of adverse outcomes in peripheral artery disease patients, with the median odds ratio or hazard ratio for major amputation or mortality associated with higher WIfI stages (typically stage 3 or 4 compared to lower stages) being 3.74, with a range observed from 2.18 to 7.54. This predictive capability is valuable across various PAD patient settings, including those with chronic limb-threatening ischemia and diabetic foot infections. However, the prevalence of retrospective study designs limits the certainty of causal inferences. Clinicians should integrate WIfI classification into their assessment to tailor revascularization strategies and improve patient outcomes.

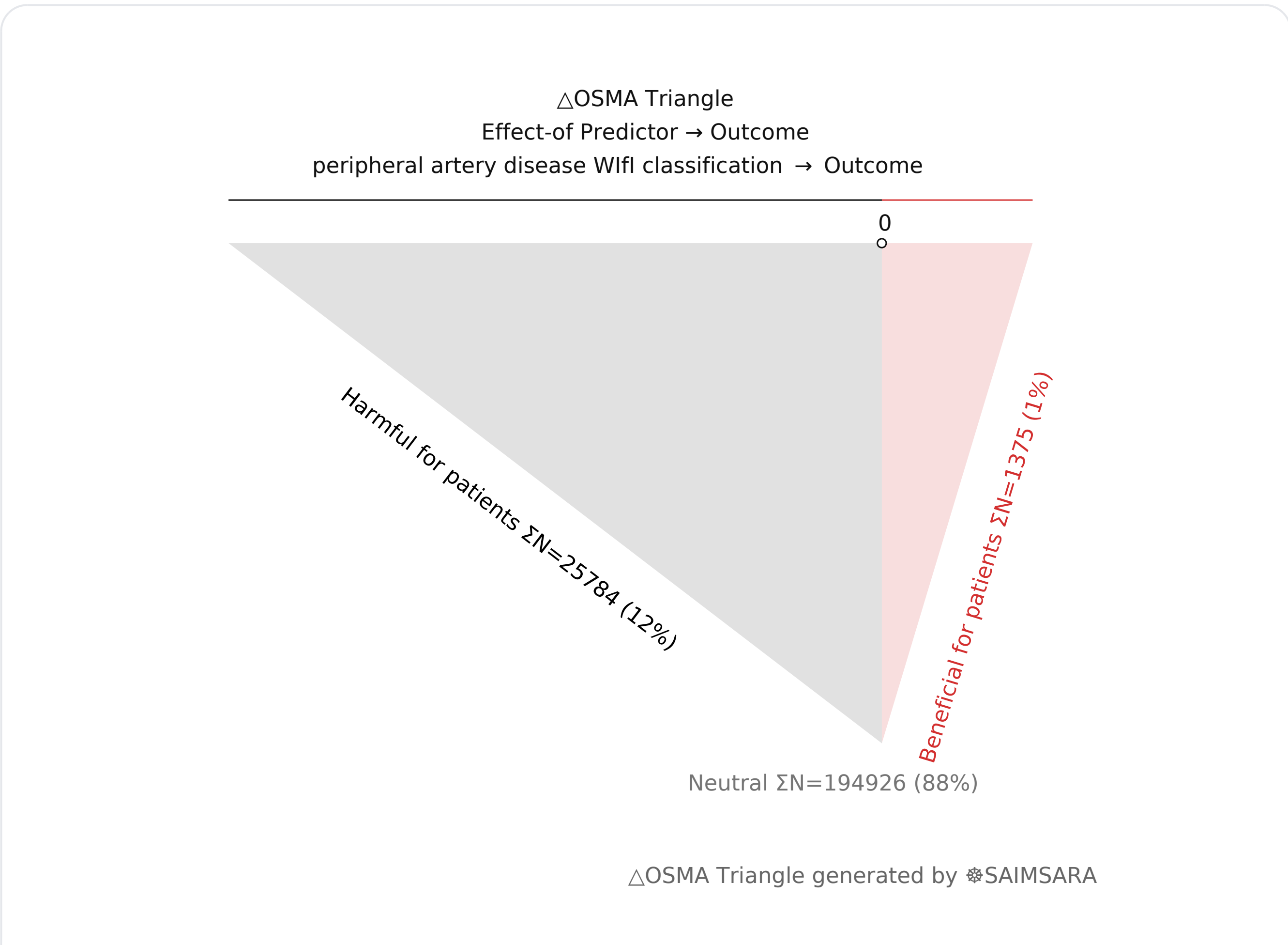
Keywords: Peripheral Artery Disease; WIfI Classification; Chronic Limb-Threatening Ischemia; Amputation; Mortality; Risk Stratification; Diabetic Foot; Limb Salvage; Revascularization; Prognosis

Review Stats

- Generated: 2026-01-30 17:06:12 CET
- Plan: Pro (expanded craft tokens; source: Semantic Scholar)
- Source: Semantic Scholar
- Scope: All fields
- Keyword Gate: Fuzzy (≥60% of required terms, minimum 2 terms matched in title/abstract)
- Total Abstracts/Papers: 1099
- Downloaded Abstracts/Papers: 1000
- Included original Abstracts/Papers: 190
- Total study participants (naïve ΣN): 222085



Identification of studies via Semantic Scholar (all fields)
Identification
Records identified:
n=1099
Records excluded:
n=99
Screening
Records assessed for eligibility
n=1000
Records excluded:
n=810
Included
Studies included in review
n=190
PRISMA Diagram generated by ☸ SAIMSARA



△OSMA Triangle
Effect-of Predictor → Outcome
peripheral artery disease WIfI classification → Outcome
0
Harmful for patients ΣN=25784 (12%)
Beneficial for patients ΣN=1375 (1%)
Neutral ΣN=194926 (88%)
△OSMA Triangle generated by ☸SAIMSARA

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

Frame: Effect-of Predictor → Outcome • *Source*: Semantic Scholar

Outcome: Outcome Typical timepoints: 1-y, 30-day. Reported metrics: %, CI, p.

Common endpoints: Common endpoints: complications, mortality, healing.

Predictor: peripheral artery disease WIfI classification — exposure/predictor. Routes seen: iv. Typical comparator: non-hd patients, 34.7, clopidogrel plus aspirin in, 71.2….

- **1) Beneficial for patients** — Outcome with peripheral artery disease WIfI classification — [7], [13], [22], [24], [35], [174], [175] — ΣN=1375
- **2) Harmful for patients** — Outcome with peripheral artery disease WIfI classification — [1], [3], [4], [5], [6], [8], [10], [18], [21], [25], [31], [37], [43], [49], [50], [81], [82], [83], [169], [171], [172] — ΣN=25784
- **3) No clear effect** — Outcome with peripheral artery disease WIfI classification — [2], [9], [11], [12], [14], [15], [16], [17], [19], [20], [23], [26], [27], [28], [29], [30], [32], [33], [34], [36], [38], [39], [40], [41], [42], [44], [45], [46], [47], [48], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [84], [85], [86], [87], [88], [89], [90], [91], [92], [93], [94], [95], [96], [97], [98], [99], [100], [101], [102], [103], [104], [105], [106], [107], [108], [109], [110], [111], [112], [113], [114], [115], [116], [117], [118], [119], [120], [121], [122], [123], [124], [125], [126], [127], [128], [129], [130], [131], [132], [133], [134], [135], [136], [137], [138], [139], [140], [141], [142], [143], [144], [145], [146], [147], [148], [149], [150], [151], [152], [153], [154], [155], [156], [157], [158], [159], [160], [161], [162], [163], [164], [165], [166], [167], [168], [170], [173], [176], [177], [178], [179], [180], [181], [182], [183], [184], [185], [186], [187], [188], [189], [190] — ΣN=194926

1) Introduction

Peripheral artery disease (PAD) is a prevalent circulatory condition characterized by narrowed arteries that reduce blood flow to the limbs, most commonly the legs. A severe manifestation, chronic limb-threatening ischemia (CLTI), poses a significant risk for amputation and mortality. Accurate risk stratification is crucial for guiding clinical management and improving patient outcomes. The Wound, Ischemia, and foot Infection (WIfI) classification system, developed by the Society for Vascular Surgery (SVS), provides a standardized framework to assess the severity of limb threat based on these three clinical parameters [79, 59]. This system aims to predict amputation risk and the potential benefit of revascularization, thereby informing treatment decisions for PAD patients [187, 59].

2) Aim

This paper aims to systematically review the current evidence on the utility and prognostic value of the WIfI classification system in patients with peripheral artery disease.

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 studies were retrospective cohort or mixed designs, introducing potential for selection and information bias. A notable number of studies did not specify their directionality, further limiting the assessment of bias.

4) Results

4.1 Study characteristics:

The included studies predominantly comprised retrospective cohort and mixed designs, with some prospective cohort studies and randomized controlled trials. Populations frequently focused on patients with chronic limb-threatening ischemia (CLTI), diabetic foot infection (DFI), or those undergoing revascularization procedures for peripheral artery disease. Sample sizes varied widely, from single case reports to large cohorts of several thousand patients. Follow-up periods ranged from 30 days to 12 years, with many studies reporting median follow-up times or not specifying duration.

4.2 Main numerical result aligned to the query:

Higher WIfI stages are consistently associated with a significantly increased risk of adverse outcomes in peripheral artery disease patients. The median odds ratio (OR) or hazard ratio (HR) for major amputation or mortality associated with higher WIfI stages (typically stage 3 or 4 compared to lower stages) was 3.74, with a range observed from 2.18 to 7.54 [1, 3, 4, 6, 25, 81, 130, 140].

4.3 Topic synthesis:

- **Prognostic Value for Amputation and Mortality:** Higher WIfI stages, particularly wound and infection grades, are strong predictors of amputation-free survival and all-cause mortality after revascularization in PAD patients, including those on hemodialysis [1, 3, 4, 6, 13, 25, 48, 81, 83, 114, 130, 140, 181, 187]. For instance, wound grade 3 carried an adjusted HR of 3.67 (95% CI 1.67-8.31, p=0.0009) for poorer amputation-free survival compared to grade 0 [1].

- **Utility in Specific Patient Populations:** WIfI effectively stratifies risk in complex populations such as hemodialysis patients, who often present with higher wound and infection grades and poorer amputation-free survival [1, 81, 91, 140]. It is also highly relevant for patients with diabetic foot infection, where higher WIfI scores correlate with increased reamputation risk (OR: 3.85, 95% CI: 2.10-7.05, P=.001) [6].
- **Integration with Other Classification Systems and Diagnostic Tools:** WIfI is frequently used alongside or in conjunction with other systems like Rutherford, Fontaine, GLASS, and TASC II, as well as diagnostic parameters such as Ankle-Brachial Index (ABI), Toe-Brachial Index (TBI), and ultrasound duplex scanning, to enhance diagnostic and prognostic accuracy [2, 3, 7, 8, 9, 21, 24, 25, 48, 59, 69, 90]. For example, integrating ultrasound duplex scanning with WIfI improved prediction of healing and reduced re-hospitalization rates [7].
- **Guidance for Revascularization Strategies:** The WIfI classification helps guide decisions regarding the type and urgency of revascularization procedures (e.g., bypass surgery, endovascular intervention, atherectomy, intravascular lithotripsy) by identifying patients most likely to benefit and those at highest risk of adverse outcomes [1, 3, 4, 5, 7, 10, 13, 24, 25, 48, 60, 63, 67, 69, 91, 102, 114, 123, 140, 161, 181, 187].
- **Impact on Quality of Life and Health Status:** Disease severity, as measured by WIfI stages, significantly impacts health-related quality of life, particularly affecting physical functioning and psycho-social well-being in advanced stages [8]. Lower WIfI stages are associated with a successful health status response at 1 year following revascularization [114].
- **Specific WIfI Components as Predictors:** Individual components of the WIfI score, such as wound and foot infection grades, have been shown to independently stratify amputation and mortality risk, with infection grade 3 showing an adjusted HR of 2.71 (95% CI 1.35-5.32, p=0.0052) for poorer amputation-free survival [1].
- **Dynamic Nature and Monitoring:** The WIfI score can change over time, and its deterioration is observed in contexts such as the COVID-19 pandemic, where patients presented with higher WIfI scores and more severe PAD manifestations [21].

5) Discussion

5.1 Principal finding:

The median odds or hazard ratio for major amputation or mortality associated with higher WIfI stages (typically stage 3 or 4 compared to lower stages) was 3.74, with a range observed from 2.18 to 7.54 [1, 3, 4, 6, 25, 81, 130, 140], indicating that higher WIfI scores are consistently linked to a substantially elevated risk of adverse limb and survival outcomes in PAD patients.

5.2 Clinical implications:

- **Risk Stratification:** WIfI provides an evidence-based tool for stratifying amputation and mortality risk in PAD patients, enabling clinicians to identify high-risk individuals [1, 3, 6, 81, 140].
- **Treatment Guidance:** Higher WIfI stages, particularly stage 3 or 4, indicate a greater benefit from revascularization and can guide decisions on the urgency and type of intervention [25, 187].
- **Monitoring Disease Progression:** Changes in WIfI scores can reflect disease progression or response to treatment, aiding in ongoing patient management [21, 161].
- **Special Population Management:** WIfI is particularly valuable in vulnerable populations like hemodialysis patients and those with diabetic foot infections, where it reliably predicts adverse outcomes [1, 6, 81, 140].
- **Enhanced Diagnostic Accuracy:** Combining WIfI with other diagnostic modalities like ultrasound duplex scanning can improve the prediction of wound healing and reduce re-hospitalization rates [7, 69].

5.3 Research implications / key gaps:

- **Standardized Prospective Trials:** There is a need for large-scale, prospective studies to validate WIfI's predictive power across diverse populations and interventions [1, 3, 10, 24].
- **Comparative Effectiveness Studies:** Future research should systematically compare WIfI's predictive accuracy and clinical utility against other established classification systems (e.g., Rutherford, GLASS) in various settings [2, 9, 24, 48, 59, 69].
- **Long-Term Outcome Evaluation:** More studies are needed to assess the long-term (beyond 5 years) prognostic implications of WIfI stages for amputation, mortality, and quality of life [1, 3, 4, 10, 13, 25, 43, 130].
- **Integration with Novel Biomarkers:** Investigate the combined predictive value of WIfI with emerging diagnostic tools, such as machine learning models based on gait data or camera-based plantar perfusion imaging [12, 15, 29, 185].
- **Intervention-Specific WIfI Thresholds:** Determine optimal WIfI-guided revascularization strategies and specific thresholds for different interventions (e.g., bypass vs. endovascular) to maximize limb salvage and survival [1, 25, 69, 187].

5.4 Limitations:

- **Retrospective Designs** — Many studies were retrospective, limiting causal inference and increasing potential for bias.
- **Heterogeneous Populations** — Studies included diverse PAD populations, limiting the generalizability of specific findings.
- **Variable Follow-up** — Follow-up periods varied widely or were not specified, hindering comprehensive long-term outcome assessment.
- **Limited Direct Comparisons** — WIfI's comparative efficacy against other classification systems was not consistently evaluated.
- **Geographic/Setting Specificity** — Several studies were single-center or region-specific, affecting external validity.

5.5 Future directions:

- **Standardized Prospective Trials** — Conduct large-scale, prospective studies to validate WIfI across diverse populations.
- **Comparative Effectiveness Studies** — Systematically compare WIfI with other classification systems for predictive accuracy.
- **Long-Term Outcome Evaluation** — Assess WIfI's ability to predict very long-term amputation and mortality risks.
- **Integration with Novel Biomarkers** — Explore the utility of combining WIfI with emerging diagnostic tools.
- **Intervention-Specific WIfI Thresholds** — Determine optimal WIfI-guided revascularization strategies and thresholds.

6) Conclusion

Higher WIfI stages are consistently associated with a significantly increased risk of adverse outcomes in peripheral artery disease patients, with the median odds ratio or hazard ratio for major amputation or mortality associated with higher WIfI stages (typically stage 3 or 4 compared to lower stages) being 3.74, with a range observed from 2.18 to 7.54 [1, 3, 4, 6, 25, 81, 130, 140]. This predictive capability is valuable across various PAD patient settings, including those with chronic limb-threatening ischemia and diabetic foot infections. However, the prevalence of retrospective study designs limits the certainty of causal inferences. Clinicians should integrate WIfI classification into their assessment to tailor revascularization strategies and improve patient outcomes.

References

SAIMSARA Session Index — session.json

Figure 1. Publication-year distribution of included originals

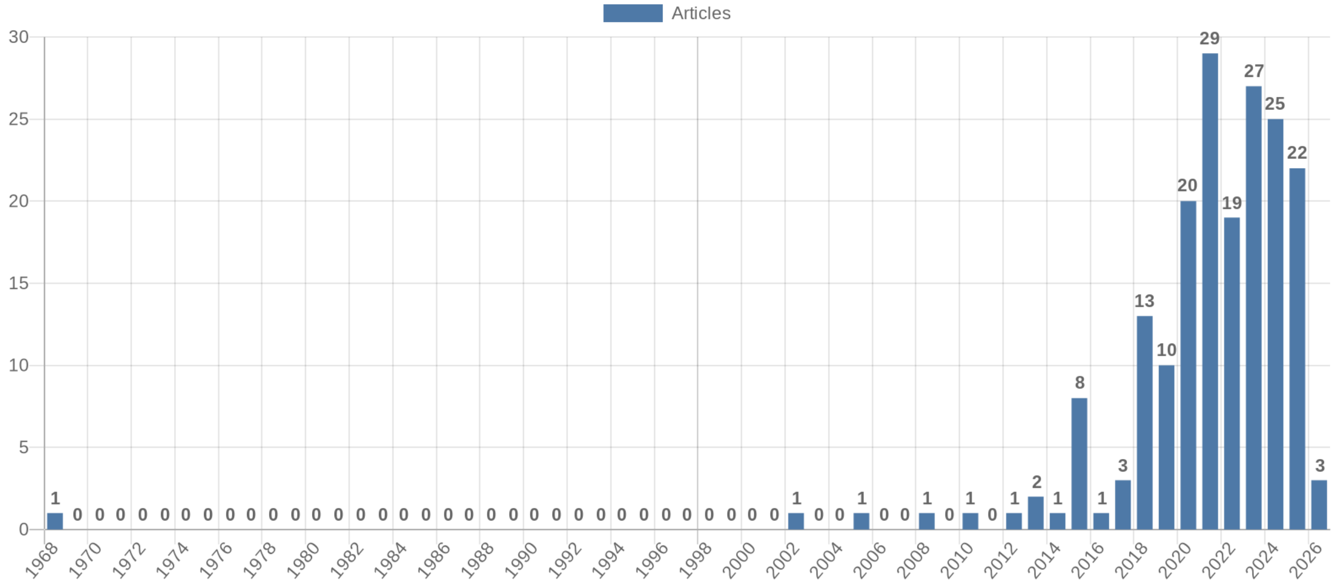


Figure 2. Study-design distribution of included originals

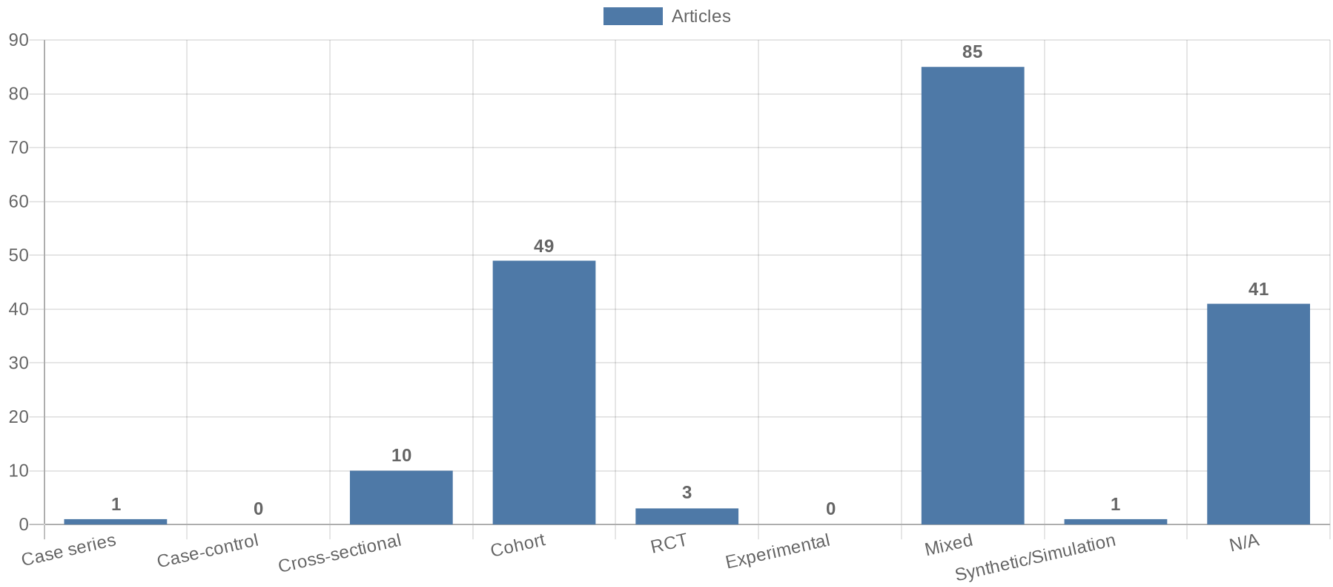


Figure 3. Study-type (directionality) distribution of included originals

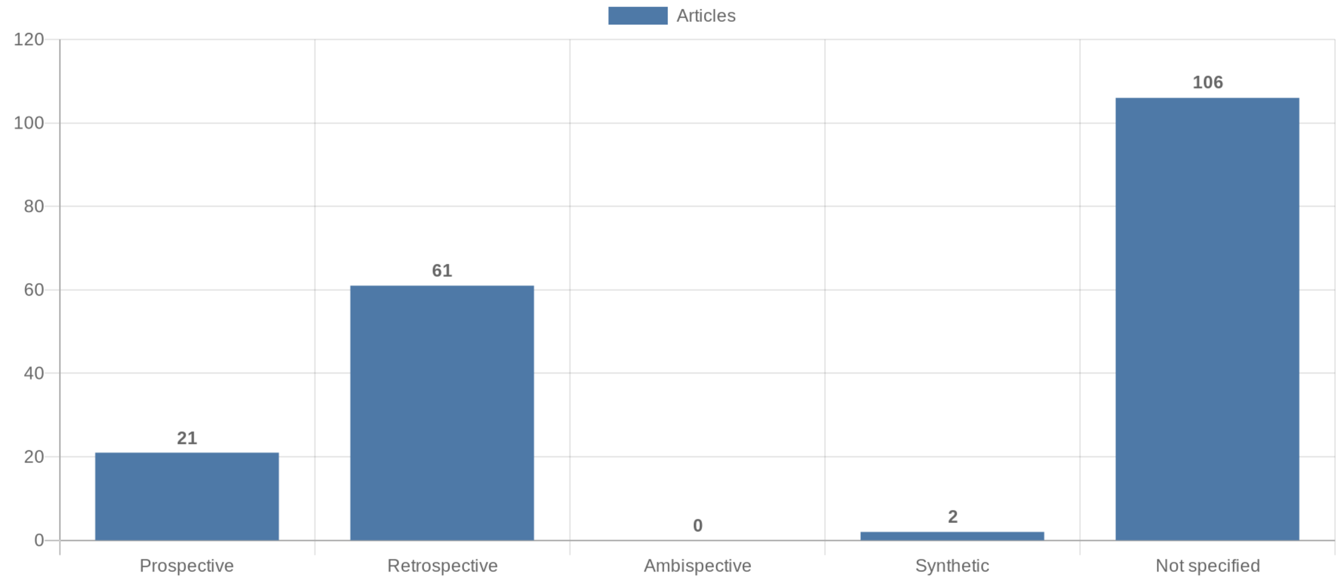


Figure 4. Main extracted research topics

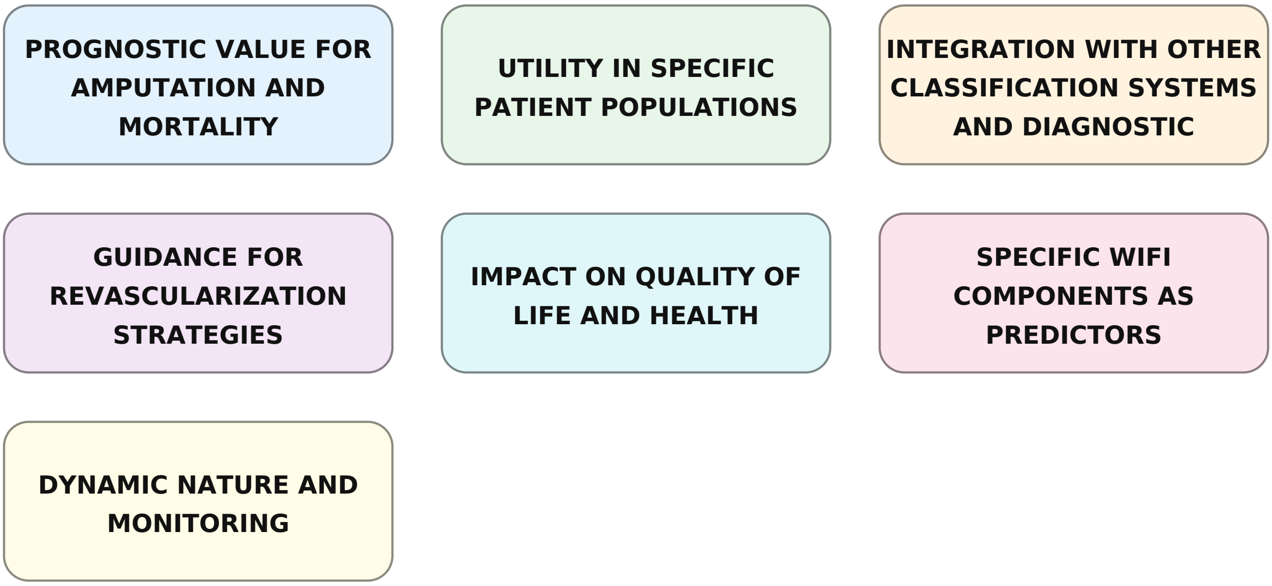


Figure 5. Limitations of current studies (topics)

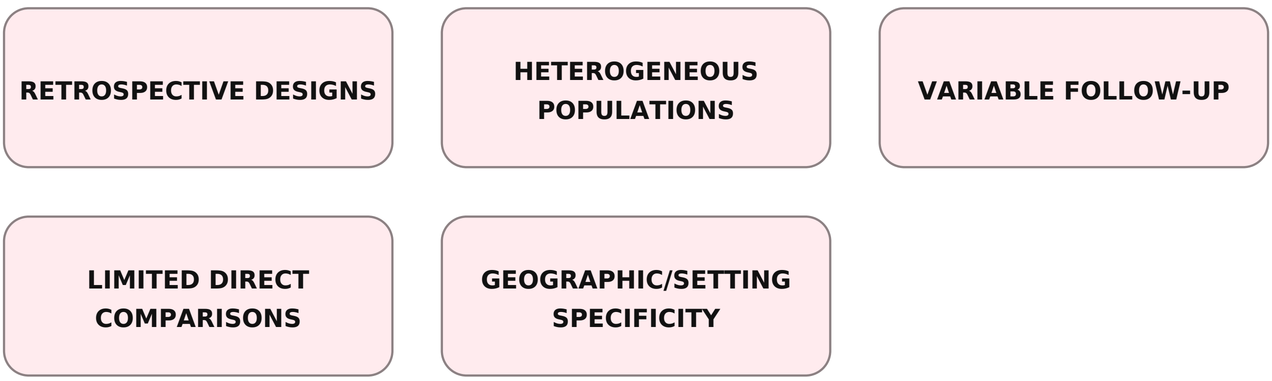
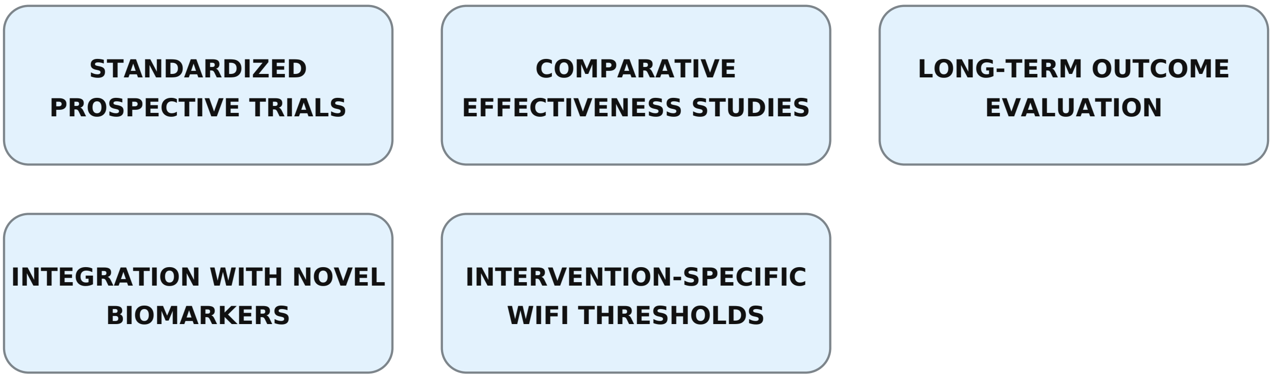


Figure 6. Future research directions (topics)


STANDARDIZED PROSPECTIVE TRIALS
COMPARATIVE EFFECTIVENESS STUDIES
LONG-TERM OUTCOME EVALUATION
INTEGRATION WITH NOVEL BIOMARKERS
INTERVENTION-SPECIFIC WIFI THRESHOLDS