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

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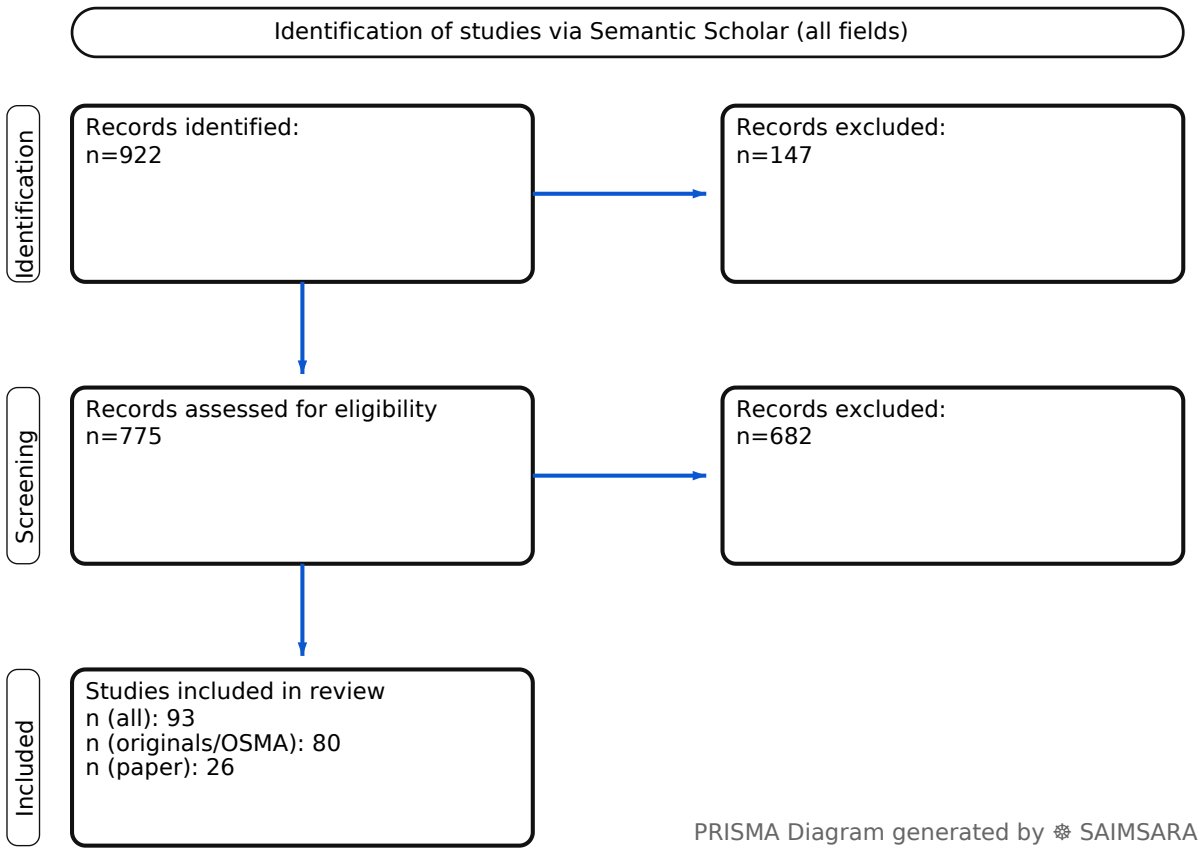
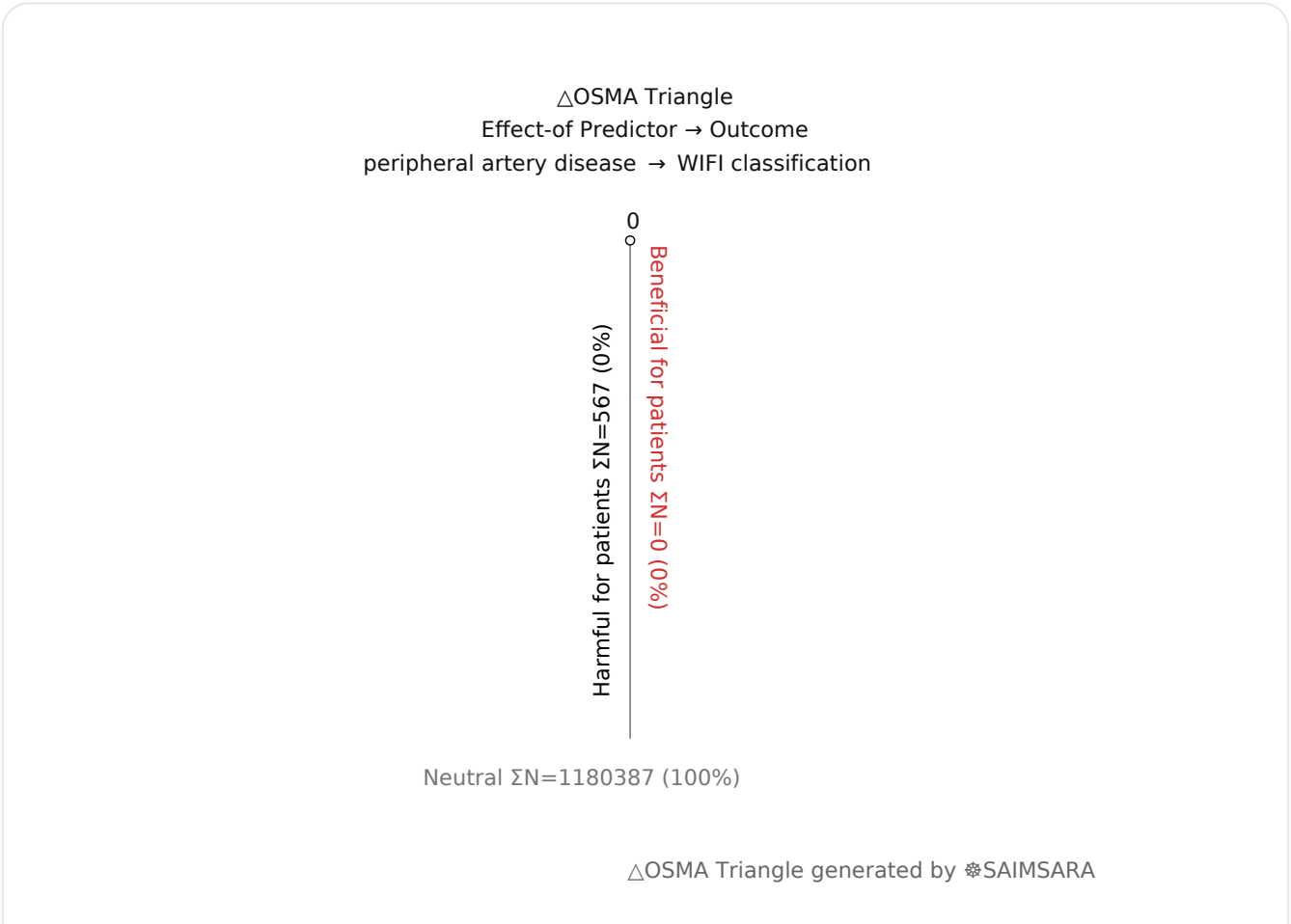
Abstract: This systematic review aims to synthesize the current evidence regarding the prognostic and clinical utility of the WIfI classification system in patients with PAD, focusing on its ability to predict adverse outcomes such as major amputation, mortality, and wound healing, and its integration into modern vascular diagnostic and treatment workflows. The review utilises 80 original studies with 1180954 total participants (naïve ΣN). The WIfI classification system is a vital, evidence-based tool for the clinical management of PAD, offering superior prognostic value for limb salvage and mortality compared to traditional staging systems. Systematic evidence confirms that higher WIfI stages are significantly associated with increased risks of major amputation and cardiac death, with hazard ratios reaching up to 7.54 in high-risk cohorts. While the system is robust, its clinical utility is further enhanced by integration with anatomical staging like GLASS and advanced diagnostic techniques. Future research should focus on prospective validation of WIfI-based treatment algorithms and the automation of staging through digital health solutions to improve patient outcomes in complex CLTI cases.

Keywords: Peripheral artery disease; WIfI classification; Chronic limb-threatening ischemia; Limb salvage; Amputation risk; Vascular surgery; Risk stratification; Diabetic foot ulcers; Endovascular intervention; Clinical decision support

Review Stats

- Generated: 2026-03-04 11:38:32 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: 922
- Downloaded Abstracts/Papers: 775
- Included original Abstracts/Papers (all): 93
- Included original Abstracts/Papers (OSMA; excl. Mixed): 80
- Reference Index (links used in paper): 26
- Total study participants (naïve ΣN): 1180954


Identification of studies via Semantic Scholar (all fields)
Identification
Records identified:
n=922
Records excluded:
n=147
Screening
Records assessed for eligibility
n=775
Records excluded:
n=682
Included
Studies included in review
n (all): 93
n (originals/OSMA): 80
n (paper): 26
PRISMA Diagram generated by ☸ SAIMSARA


△OSMA Triangle
Effect-of Predictor → Outcome
peripheral artery disease → WIFI classification
0
Harmful for patients ΣN=567 (0%)
Beneficial for patients ΣN=0 (0%)
Neutral ΣN=1180387 (100%)
△OSMA Triangle generated by ☸SAIMSARA

Outcome-Sentiment Meta-Analysis (OSMA): *(LLM-only)*
Frame: Effect-of Predictor → Outcome • *Source*: Semantic Scholar
Outcome: WIFI classification Typical timepoints: 1-y, 12-mo. Reported metrics: %, CI, p.
Common endpoints: Common endpoints: complications, healing, survival.
Predictor: peripheral artery disease — exposure/predictor. Typical comparator: using portable doppler alone, aspirin, non-indigenous australians, dual antiplatelet therapy in….

- **1) Beneficial for patients** — WIFI classification with peripheral artery disease — — — ΣN=0
- **2) Harmful for patients** — WIFI classification with peripheral artery disease — [46], [51], [52] — ΣN=567
- **3) No clear effect** — WIFI classification with peripheral artery disease — [2], [3], [4], [5], [6], [7], [8], [9], [11], [12], [15], [16], [17], [18], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42], [44], [45], [47], [49], [50], [53], [54], [55], [56], [58], [59], [60], [64], [65], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83], [84], [85], [86], [87], [88], [89], [90], [91], [92], [93] — ΣN=1180387

1) Introduction

Peripheral artery disease (PAD) represents a significant global health burden, characterized by progressive atherosclerotic narrowing of the lower extremity arteries. Clinical assessment of PAD, particularly in the context of chronic limb-threatening ischemia (CLTI), has historically relied on various classification systems. The Society for Vascular Surgery (SVS) Wound, Ischemia, and foot Infection (WIfI) classification system was developed to provide a more granular, evidence-based approach to assessing limb risk, specifically integrating the severity of tissue loss (Wound), the degree of perfusion deficiency (Ischemia), and the presence of pedal sepsis (foot Infection). As clinical practice evolves, the WIfI system is increasingly evaluated for its prognostic utility in predicting limb salvage, wound healing, and mortality, as well as its role in guiding revascularization strategies.

2) Aim

This systematic review aims to synthesize the current evidence regarding the prognostic and clinical utility of the WIfI classification system in patients with PAD, focusing on its ability to predict adverse outcomes such as major amputation, mortality, and wound healing, and its integration into modern vascular diagnostic and treatment workflows.

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, with a predominance of retrospective cohort studies potentially introducing selection and reporting biases.

4) Results

4.1 **Study characteristics:** This review synthesized evidence from 93 studies, primarily retrospective and prospective cohorts, with sample sizes ranging from single-case reports to large administrative datasets of over 800,000 patients. Follow-up periods varied significantly, ranging from immediate procedural outcomes to long-term assessments of up to 144 months.

4.2 **Main numerical result aligned to the query:** The WIfI classification system is consistently associated with adverse clinical outcomes in PAD patients. Higher WIfI stages (specifically stages 3 and 4) are strong independent predictors of major amputation and mortality, with hazard ratios (HR) or odds ratios (OR) for adverse outcomes ranging from 2.18 to 7.54 [1], [5], [7], [35], [64], [75]. In patients with CLTI, WIfI stage 4 is associated with high rates of major amputation, with one study reporting that 55% of such patients require amputation within one year [35].

4.3 **Topic synthesis:**

- **Amputation Risk Prediction:** Higher WIfI stages correlate with increased major amputation risk, with HRs ranging from 2.18 to 7.54 [1], [64].
- **Mortality and Cardiac Prognosis:** WIfI stage 3/4 is an independent predictor of all-cause and cardiac death, with HRs for mortality/cardiac events between 2.18 and 4.22 [5], [7], [75] .
- **Wound Healing:** WIfI classification is a stronger independent predictor of wound healing in diabetic foot ulcers than traditional perfusion markers, with HRs for healing success at 0.77 [3], [42].
- **Integration with GLASS:** Combining WIfI with the Global Limb Anatomic Staging System (GLASS) improves prognostic accuracy for revascularization outcomes in CLTI [41], [48], [60] , [61].
- **Hemodialysis Population:** In hemodialysis patients, WIfI components (wound and infection grades) effectively stratify amputation and mortality risk, with aHRs for wound grade 3 vs 0 at 3.67 [2], [64].
- **Diagnostic Refinement:** Integrating ultrasound duplex scanning, Transmetatarsal Pressure (TMP), or Pedal Acceleration Time (PAT) into WIfI enhances ischemia assessment accuracy

[4], [9], [65].

- **Artificial Intelligence:** Machine learning and automated classification methods are being integrated to improve WIfI-based risk assessment and clinical decision support [10], [14], [19].
- **Diabetic Foot Management:** WIfI is recommended by IWGDF guidelines for stratifying healing likelihood and amputation risk in diabetic foot disease [57], [66].
- **Quality of Life:** Lower WIfI stages are associated with better health status responses at 1 year post-revascularization [71].
- **Psychosocial Factors:** Depression in CLTI patients is associated with higher WIfI grades and increased amputation rates [73].

5) Discussion

5.1 **Principal finding:** The WIfI classification system serves as a robust, independent prognostic tool for stratifying the risk of major amputation and mortality in patients with PAD, particularly those with CLTI, with higher stages (3/4) demonstrating significantly increased hazard for adverse limb and cardiac events [1], [35], [75].

5.2 **Clinical implications:**

- Standardization of care: WIfI provides a common language for vascular specialists to communicate limb risk and guide revascularization [62].
- Risk-stratified treatment: Clinicians should use WIfI to identify high-risk patients (stage 3/4) who may require more aggressive or multidisciplinary management [43], [63].
- Diabetic foot pathways: Integration of WIfI into diabetic foot clinics facilitates better identification of patients requiring urgent vascular intervention [57], [66].
- Diagnostic augmentation: Where standard indices are unreliable, clinicians should consider integrating PAT or TMP into the WIfI ischemia assessment [4], [65].

5.3 **Research implications / key gaps:**

- Standardization of reporting: Future studies should adopt uniform reporting for WIfI stages to facilitate meta-analysis [48], [62].
- AI validation: Prospective validation of machine learning models that integrate WIfI data to predict individual patient outcomes is needed [10], [19].
- Long-term AFS: Further research is required to determine if WIfI-guided revascularization improves long-term amputation-free survival (AFS) compared to standard care [41].

- Psychosocial integration: Studies should investigate whether incorporating depression or other quality-of-life scores into WIfI improves its predictive power[71], [73].

5.4 **Limitations:**

- Retrospective Design Bias — Many studies are retrospective, limiting the ability to establish definitive causal links between WIfI staging and specific treatment outcomes.
- Population Heterogeneity — Variability in patient populations, including the presence of diabetes or hemodialysis, complicates the comparison of WIfI prognostic values across studies.
- Outcome Metric Inconsistency — Different studies utilize varying definitions of "adverse outcomes," such as MALE or AFS, hindering direct numerical synthesis.

5.5 **Future directions:**

- Prospective Multicenter Trials — Large-scale prospective trials are needed to validate WIfI as a primary endpoint for revascularization success.
- Automated Staging Tools — Development of validated software to automate WIfI scoring from electronic health records could improve clinical utility.
- Refined Ischemia Metrics — Investigation into non-invasive perfusion imaging as a replacement for traditional Doppler in the WIfI ischemia grade.

6) Conclusion

The WIfI classification system is a vital, evidence-based tool for the clinical management of PAD, offering superior prognostic value for limb salvage and mortality compared to traditional staging systems. Systematic evidence confirms that higher WIfI stages are significantly associated with increased risks of major amputation and cardiac death, with hazard ratios reaching up to 7.54 in high-risk cohorts. While the system is robust, its clinical utility is further enhanced by integration with anatomical staging like GLASS and advanced diagnostic techniques. Future research should focus on prospective validation of WIfI-based treatment algorithms and the automation of staging through digital health solutions to improve patient outcomes in complex CLTI cases.

Session data (all downloaded records)

SAIMSARA Session Index — session.json

Figure 1. Publication-year distribution of included originals

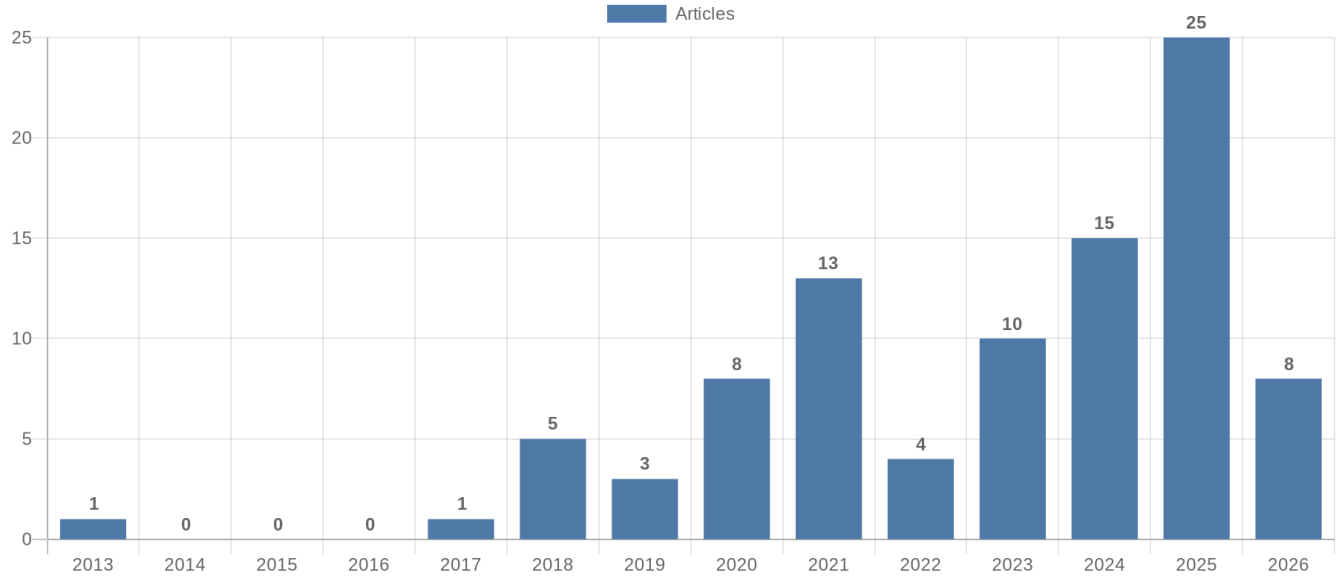


Figure 2. Study-design distribution of included originals

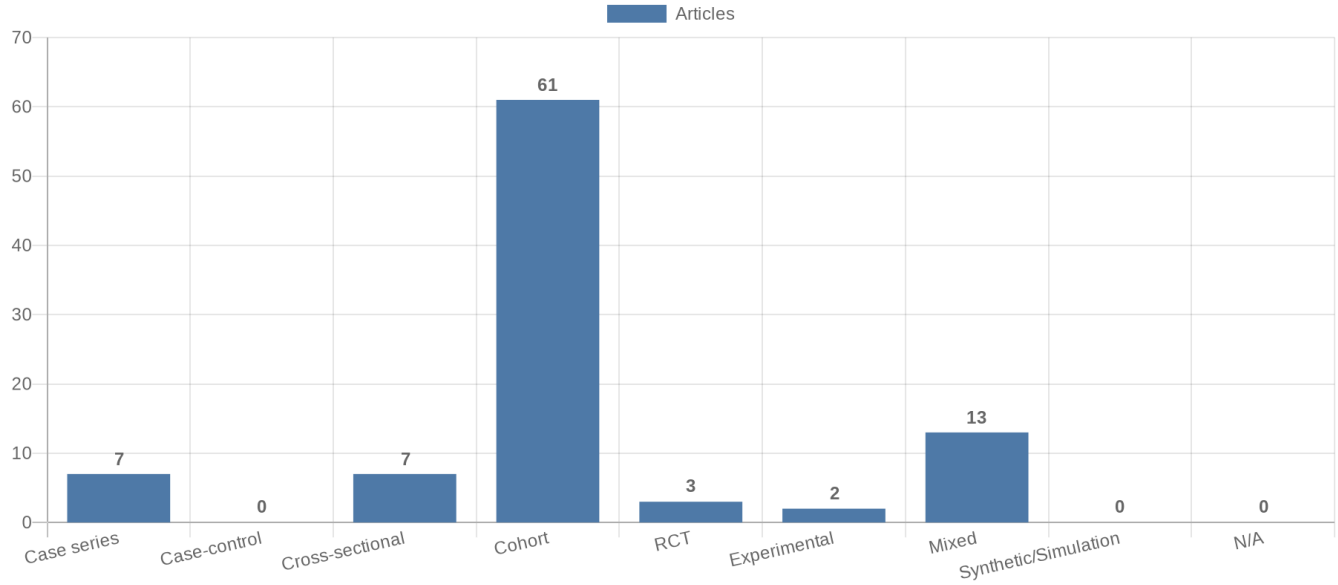


Figure 3. Study-type (directionality) distribution of included originals

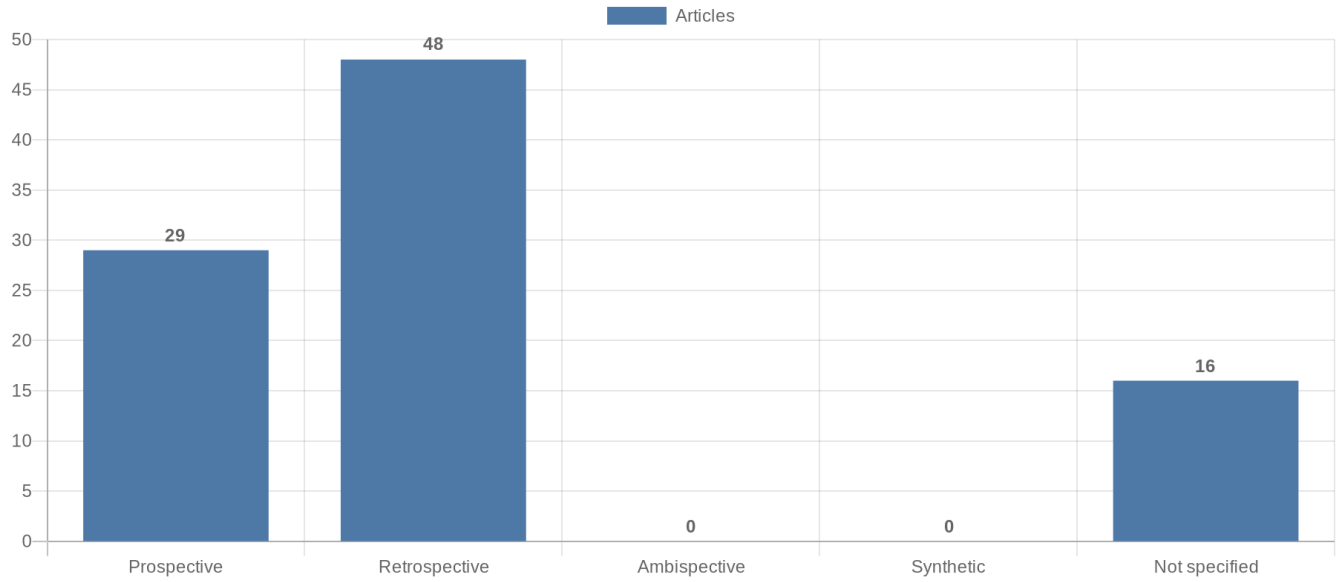


Figure 4. Main extracted research topics

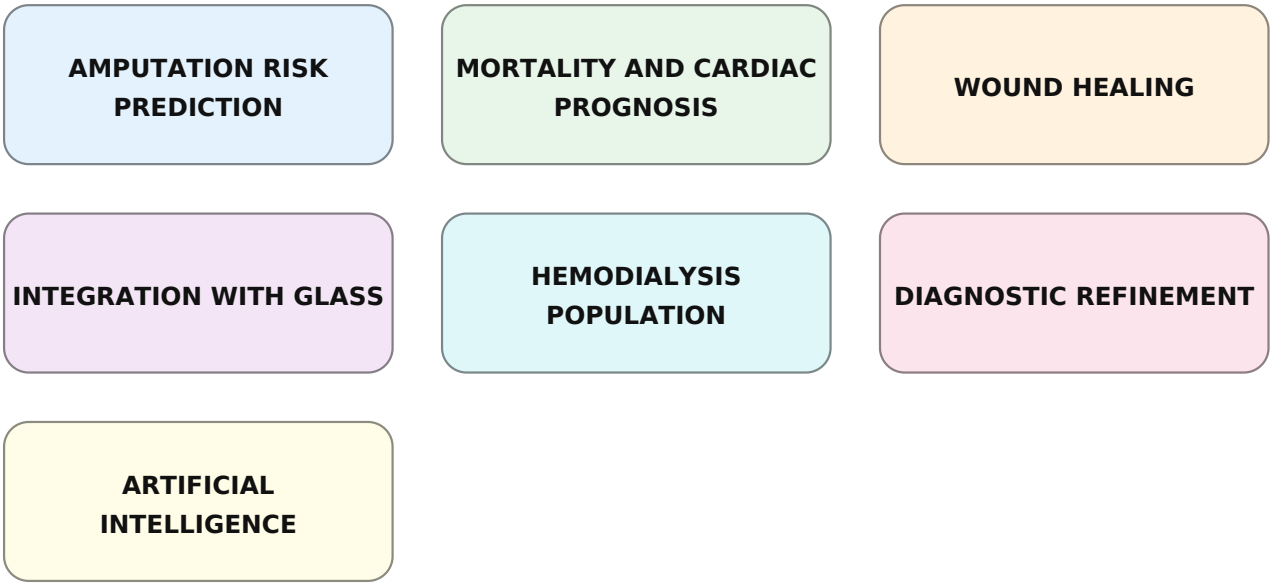


Figure 5. Limitations of current studies (topics)

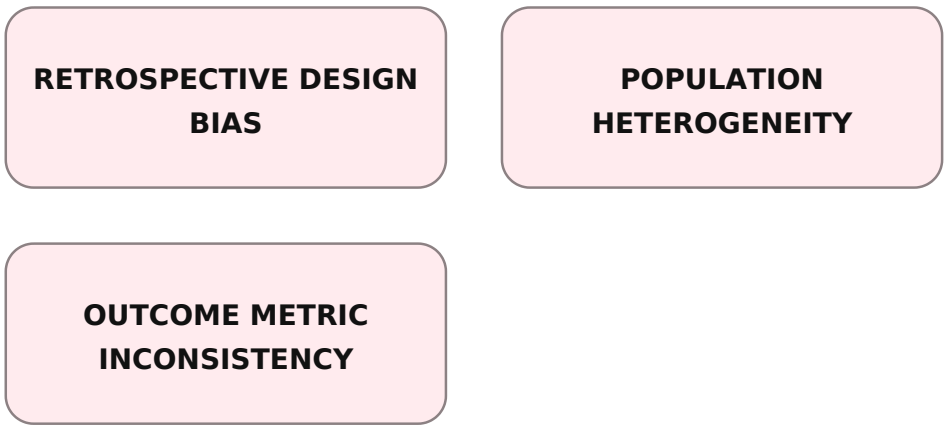
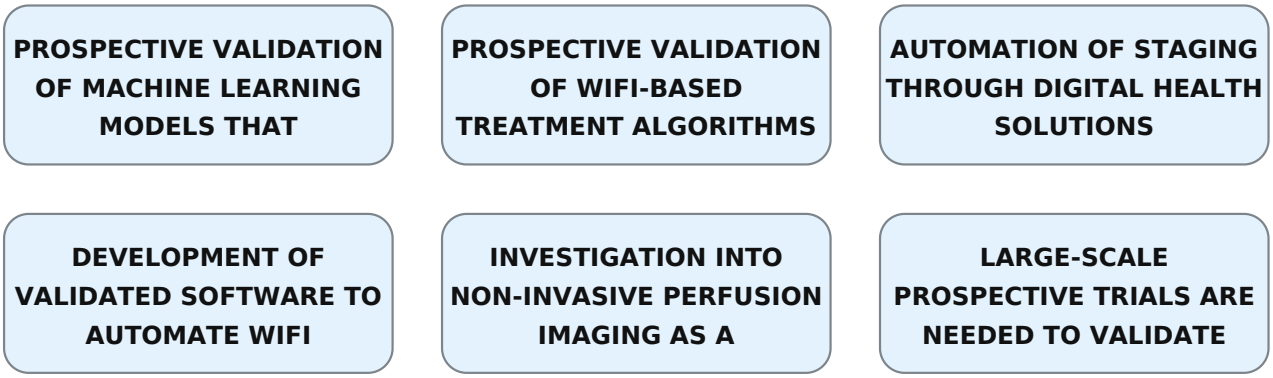


Figure 6. Future research directions (topics)



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- **[43]** How to Select for Angioplasty or Surgical Bypass in People With Diabetes and Peripheral Arterial Disease. — https://doi.org/10.31083/bjhm50657
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- **[57]** Podcast on How to Classify Foot Ulcers in People with Diabetes (2023 Update of the IWGDF Guidelines on Classification). — https://doi.org/10.1007/s13300-023-01521-2
- **[60]** Clinical Outcomes of Infrapopliteal Angioplasty in Chronic Limb-threatening Ischemia: A Global Limb Anatomic Staging System Staging Perspective — https://doi.org/10.4103/ijves.ijves_118_25
- **[61]** Evolving Paradigms in Chronic Limb-threatening Ischemia: A Systematic Review of Current and Emerging Diagnostic and Therapeutic Approaches — https://doi.org/10.1055/a-2798-9516
- **[62]** The Diagnostic Classification of Critical Limb Ischemia — https://doi.org/10.3400/avd.ra.18-00122
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- **[64]** Outcomes of severe limb ischemia with tissue loss and impact of revascularization in haemodialysis patients with wound, ischemia, and foot infection (WIfI) stage 3 or 4. — https://doi.org/10.1024/0301-1526/a000819
- **[65]** Validation of transmetatarsal pressure as an alternative for evaluating severity of chronic limb-threatening ischemia — https://doi.org/10.1177/1358863x251346133
- **[66]** An overview of diabetes-related foot ulcers. — https://doi.org/10.12968/bjcn.2024.29.sup6.s30
- **[71]** Abstract 4147018: Predictors of Clinically Meaningful 1-Year Health Status Improvements Following Endovascular or Surgical Revascularization: Insights from the BEST-CLI Trial — https://doi.org/10.1161/circ.150.suppl_1.4147018
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- **[75]** Abstract 13060: Nutritional Status is Associated With Cardiac Death in Patients With Chronic Limb-Threatening Ischemia Undergoing Endovascular Intervention — https://doi.org/10.1161/circ.148.suppl_1.13060