

Thrombophlebitis and Complications: Systematic Review with SAIMSARA.

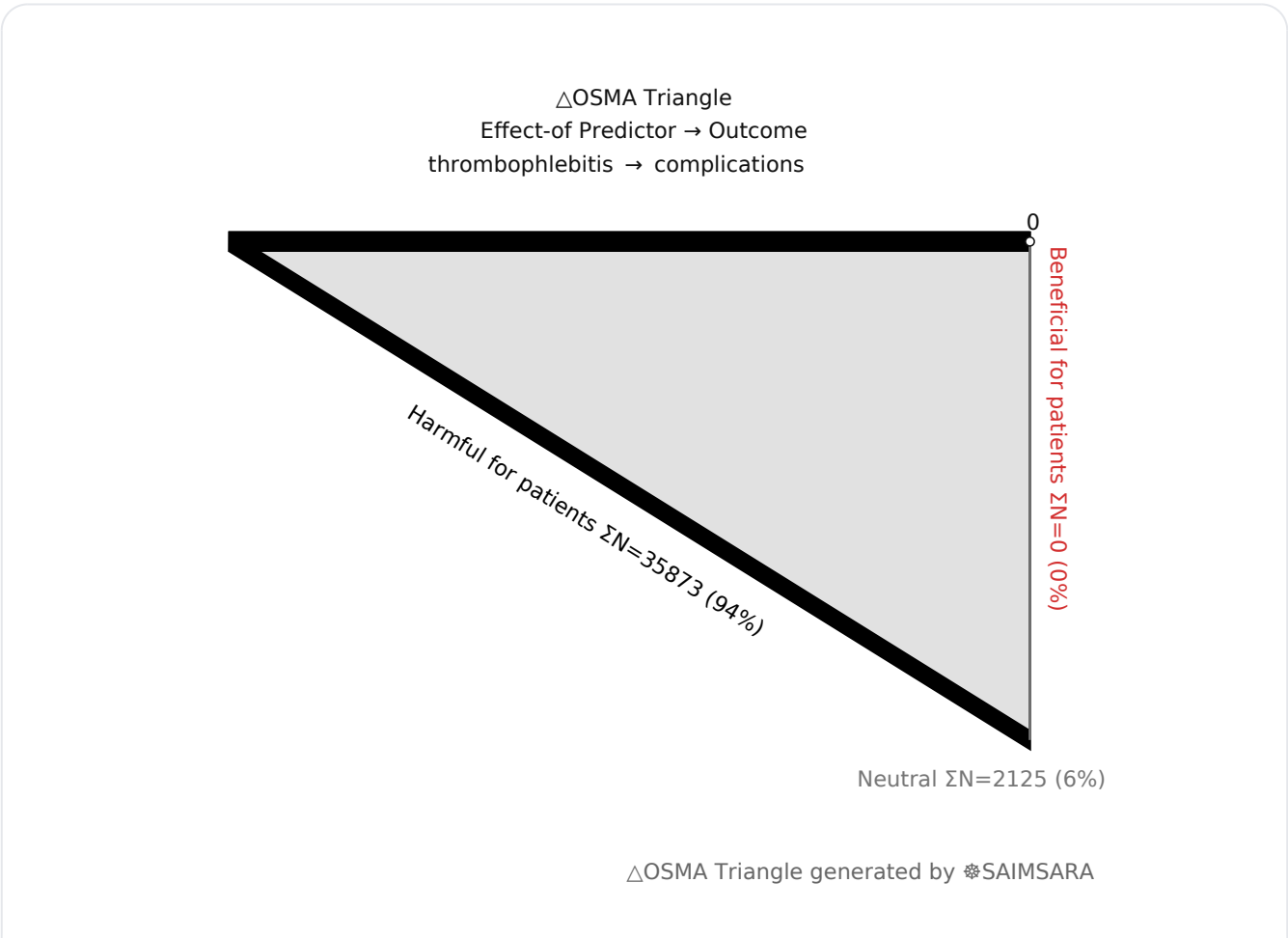
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Abstract: This paper aims to synthesize the current evidence regarding the incidence, risk factors, associated conditions, and complications of thrombophlebitis, drawing exclusively from a structured extraction summary of scientific literature. The review utilises 42 studies with 37998 total participants (naïve ΣN). Thrombophlebitis represents a common and diverse complication across various clinical settings, with incidence rates for catheter-related events ranging widely from 0.4% to 87.1%. It is associated with a spectrum of severe complications, including deep vein thrombosis, pulmonary embolism, cerebral thrombophlebitis, septic shock, and increased mortality. Risk factors such as catheter characteristics, underlying conditions like Behcet's disease, and specific surgical procedures necessitate targeted prevention and management strategies. A key limitation is the heterogeneity in study designs and outcome definitions, underscoring the need for standardized diagnostic criteria and robust comparative effectiveness trials to optimize patient care and improve long-term outcomes.

Keywords: Thrombophlebitis; Superficial thrombophlebitis; Deep vein thrombosis; Pulmonary embolism; Catheter-related complications; Septic thrombophlebitis; Chronic venous insufficiency; Vascular access devices; Infectious complications; Varicose veins

Review Stats

- Generated: 2026-02-24 15:22:50 CET
- Plan: Pro (expanded craft tokens; source: Semantic Scholar)
- Source: Semantic Scholar
- Scope: All fields
- Keyword Gate: Fuzzy ($\geq 60\%$ of required terms, minimum 2 terms matched in title/abstract)
- Total Abstracts/Papers: 6156
- Downloaded Abstracts/Papers: 1000
- Included original Abstracts/Papers: 42
- Total study participants (naïve ΣN): 37998



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

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

Outcome: complications Typical timepoints: 7-day, 5-mo. Reported metrics: %, CI, p.

Common endpoints: Common endpoints: complications, mortality, recurrence.

Predictor: thrombophlebitis — exposure/predictor. Routes seen: iv. Typical comparator: piccs, 13.4, 6.88, those without thrombosis....

- **1) Beneficial for patients** — complications with thrombophlebitis — — — $\Sigma N=0$
- **2) Harmful for patients** — complications with thrombophlebitis — [1], [2], [3], [4], [5], [6], [8], [9], [10], [11], [12], [13], [15], [17], [18], [19], [20], [21], [22], [23], [25], [27], [28], [30], [33] — $\Sigma N=35873$
- **3) No clear effect** — complications with thrombophlebitis — [7], [14], [16], [24], [26], [29], [31], [32], [34], [35], [36], [37], [38], [39], [40], [41], [42] — $\Sigma N=2125$

1) Introduction

Thrombophlebitis, an inflammatory process causing a blood clot to form and block one or more veins, presents a significant clinical challenge across diverse patient populations. Its manifestations range from superficial venous inflammation to life-threatening deep vein thrombosis (DVT) and pulmonary embolism (PE). This condition is frequently associated with medical interventions such as peripheral and central venous catheterization, as well as underlying pathologies including varicose veins, infectious diseases, and systemic inflammatory conditions. Understanding the incidence, risk factors, and array of complications associated with thrombophlebitis is crucial for effective prevention and management strategies.

2) Aim

This paper aims to synthesize the current evidence regarding the incidence, risk factors, associated conditions, and complications of thrombophlebitis, drawing exclusively from a structured extraction summary of scientific literature.

3) Methods

Systematic review with multilayer AI research agent: keyword normalization, retrieval & structuring, and paper synthesis (see SAIMSARA About section for details).

- **Bias:** Qualitatively inferred from study design fields.

4) Results

4.1 Study characteristics

The included studies encompassed a variety of designs, predominantly cohort studies [1], [2], [4], [5], [6], [8], [11], [14], [15], [17], [18], [19], [22], [27], [28], [32], [33], [36], [37], randomized controlled trials (RCTs) [3], [26], [40], [42], cross-sectional studies [7], [31], mixed designs [6], [16], [21], [25], [37], and retrospective analyses without specified design [9], [10], [12], [13], [23], [24], [29], [30], [34], [35], [38], [39], [41]. Populations studied included hospitalized patients in tertiary care settings, critically ill adults, patients with varicose veins, Behcet's disease, cancer, post-surgical patients, pregnant women, and pediatric cases. Follow-up periods varied from short-term (e.g., 1 month [18], 30 days [33], [42]) to several months (e.g., 6 months [2], 90 days [3]) or years (e.g., 1 to 8 years [7]).

4.2 Main numerical result aligned to the query

The incidence of thrombophlebitis varies significantly depending on the context and type of vascular access, ranging from 0.4% [41] to 87.1% [28] for catheter-related events. Specifically, thrombophlebitis developed in 10% of patients after peripheral venous cannulation [1] and in 6% of patients undergoing central venous catheterization [5]. For vasopressor administration, midlines were associated with a 5.2% frequency of superficial thrombophlebitis compared to 13.4% for peripherally inserted central catheters (PICCs) [4]. Catheter-related thrombosis, including superficial venous thrombophlebitis, was reported at 11.88% for midline catheters versus 6.88% for PICCs [6].

4.3 Topic synthesis

- **Catheter-Related Thrombophlebitis Incidence:** Ranges from 0.4% (midline vasopressors) [41] to 87.1% (PIVC-related thrombosis, 40.74% symptomatic) [28]; 10% (peripheral venous cannulation) [1], 6% (central venous catheterization) [5].
- **Superficial Venous Thrombophlebitis (SVT) Rates:** 5.2% (midlines with vasopressors) vs 13.4% (PICCs with vasopressors) [4]; 4.84% (midline catheters, MCs) vs 2.16% (PICCs) [6].
- **MVAD Thrombophlebitis Rates:** 3.84 per 1,000 catheter days (MVAD only) and 4.63 per 1,000 catheter days (MVAD + CVC), significantly correlated with indwell time ($P = .0041$) [22].
- **Risk Factors for Catheter Thrombophlebitis:** Catheter diameter/vein diameter $>1/3$ (AHR=5.41, 95% CI 1.91-15.4, $p=0.0015$) and distal tip angle $\geq 5^\circ$ (AHR=4.39, 95% CI 1.39-13.8, $p=0.0116$) [28]; longer catheter duration [15], [22]; multiple devices [22]; PVC bags [16].
- **Prevention of Catheter Thrombophlebitis:** Training and monitoring reduced incidence from 42 to 16 cases over 6 months ($p<0.05$) [2]; adherence to catheter insertion and maintenance protocols [25].

- **Deep Vein Thrombosis (DVT) Complication:** Occurred in medical treatment groups for acute thrombophlebitis of varicose great saphenous vein (GSV) [3]; predicted by ACCF (OR=2.852, p=0.001) [33]; 2.88-4.63 per 1,000 catheter days (MVADs) [22].
- **Pulmonary Embolism (PE) Complication:** Associated with thrombophlebitis [9], [13]; risk not limited to DVT in pregnancy [12]; higher rates with comorbid lymphedema (OR 2.1, 95% CI 1.9-2.3 for PE with shock/CPR) [27].
- **Cerebral Thrombophlebitis:** Observed in 1 case (0.05%) in VA-ECMO patients [19]; 1 case in chronic hemodialysis (HD) patients, leading to death [15]; associated with sinusitis (4/23 cases, 17.4%) [30]; occurred in 3 cases (20%) of orbital cellulitis [35].
- **Septic Thrombophlebitis:** Occurred in 9.09% of post-caesarean complications [31]; 4 cases in central indwelling catheter (CICC) group for acute myeloid leukemia (AML) patients, contributing to 6 deaths (vs 0 in PICC group, P=.012) [42].
- **Mortality and Severe Outcomes:** Major complications after pelvic exenteration (including thrombophlebitis and PE) were 42.9% with 7% mortality [13]; 20% mortality in cervical necrotizing fasciitis cases with jugular venous thrombophlebitis [23]; 22% mortality in catheter-related infection (CRI) in HD patients, including 1 cerebral thrombophlebitis-related death [15]; higher death rates (OR 1.3, 95% CI 1.2-1.4) with comorbid lymphedema [27].
- **Thrombophlebitis in Varicose Veins:** Acute GSV thrombophlebitis managed by endovenous laser ablation (EVLA) without new venous thrombosis [3], [26]; EVLA complications included thrombophlebitis (4.4%) [18] and minor superficial thrombophlebitis [34]; concomitant phlebectomy reduced thrombophlebitis (12% vs 30%, P=0.039) [36].
- **Thrombophlebitis in Behcet's Disease:** Superficial thrombophlebitis (15.3%) often preceded visceral involvement [10]; thrombophlebitis was the most common vascular manifestation (17/18 cases) [21].
- **Thrombophlebitis in Pregnancy:** Superficial venous thrombophlebitis incidence 0.1% (14/30040), with 27% developing chronic venous insufficiency symptoms [12]. Septic pelvic thrombophlebitis as a postpartum infectious complication (4.3%) [8].
- **Infection-Related Thrombophlebitis:** Lemierre's syndrome (62% jugular vein thrombosis) [14]; Klebsiella pneumoniae liver abscess (KPLA) patients with thrombocytopenia had higher thrombophlebitis rate (OR 2.125, p=0.022) [11]; neoehrlichiosis patients (60%) developed vascular events including repeated thrombophlebitis [17].
- **Post-Surgical Thrombophlebitis:** Occurred after laparoscopic radical retropubic prostatectomy [9]; major complication after pelvic exenteration [13]; anterior cervical corpectomy and fusion (ACCF) independently predicted DVT/thrombophlebitis (OR=2.852, p=0.001) [33].
- **Pharmacological Management:** Medical treatment (e.g., fondaparinux) for acute GSV thrombophlebitis showed comparable efficacy to EVLA, with less persistent edema [26];

postpartum antibiotics were protective against infection including septic pelvic thrombophlebitis (OR 0.28, 95% CI 0.12–0.65) [8].

- **Mechanical Factors in Pathogenesis:** Mechanical compression on vein endothelium increased vWF and IL-8 secretion dose-dependently, linking catheter pressure to short peripheral catheter thrombophlebitis pathogenesis [20].
- **Chronic Venous Insufficiency (CVI):** Developed in 27% of pregnant women with superficial venous thrombophlebitis [12].

5) Discussion

5.1 Principal finding

The incidence of thrombophlebitis, particularly in catheter-related contexts, exhibits wide variability, with reported rates ranging from 0.4% [41] to 87.1% [28], underscoring its pervasive nature and significant association with severe complications such as deep vein thrombosis, pulmonary embolism, and mortality.

5.2 Clinical implications

- **Catheter Selection and Placement:** Careful consideration of catheter type (e.g., PICC vs. midline) and placement technique, including catheter-to-vein diameter ratio and tip angle, is critical to minimize thrombophlebitis risk [4], [6], [28].
- **Prevention Protocols:** Implementing robust training and monitoring programs for vascular access procedures can significantly reduce thrombophlebitis incidence in hospitalized patients [2], [25].
- **Early Detection and Management:** Prompt recognition and conservative management are often effective for peripheral thrombophlebitis [1], while conditions like acute great saphenous vein thrombophlebitis may benefit from endovenous laser ablation (EVLA) [3], [26].
- **High-Risk Patient Monitoring:** Patients with underlying conditions such as Behcet's disease, certain infections (e.g., KPLA, neohelminthiasis), or those undergoing specific surgeries (e.g., ACCF, pelvic exenteration) require heightened vigilance for thrombophlebitis and its severe sequelae [8], [10], [11], [13], [17], [21], [33].
- **Anticoagulation and Antibiotic Use:** Judicious use of anticoagulants and prophylactic antibiotics, where indicated, can mitigate thrombotic progression and infectious complications, respectively [8], [26], [42].

5.3 Research implications / key gaps

- **Standardized Diagnostic Criteria:** Develop and validate uniform diagnostic criteria for various types of thrombophlebitis to enable more consistent reporting and comparability across studies [\[1\]](#), [\[28\]](#).
- **Comparative Effectiveness Trials:** Conduct prospective randomized controlled trials comparing different catheter types and insertion techniques to definitively establish superior methods for reducing thrombophlebitis [\[4\]](#), [\[6\]](#).
- **Long-Term Outcome Studies:** Investigate the long-term impact of thrombophlebitis on patient quality of life, chronic venous insufficiency development, and recurrence rates, especially in specific populations like pregnant women [\[12\]](#).
- **Biomarker Identification:** Explore novel biomarkers for early prediction of thrombophlebitis risk and progression, particularly in high-risk groups such as critically ill or cancer patients [\[11\]](#), [\[20\]](#).
- **Prevention Protocol Optimization:** Research the optimal components and implementation strategies for vascular access care bundles to achieve maximum reduction in thrombophlebitis and related complications [\[2\]](#), [\[25\]](#).

5.4 Limitations

- **Heterogeneous Study Designs** — The varied study designs, including retrospective and non-specified types, limit the ability to draw strong causal inferences or perform comprehensive meta-analysis.
- **Variable Definitions** — Inconsistent definitions and reporting metrics for thrombophlebitis across studies hinder direct comparison of incidence and outcomes.
- **Limited Long-Term Data** — Many studies lacked extended follow-up, precluding a full understanding of chronic complications like chronic venous insufficiency.
- **Small Sample Sizes** — Several studies, particularly those on rare complications or specific conditions, involved small sample sizes, impacting generalizability.
- **Qualitative Bias Inference** — Bias was qualitatively inferred from study design, without formal risk of bias assessment, potentially overlooking specific biases.

5.5 Future directions

- **Prospective Cohort Studies** — To track thrombophlebitis incidence and complications systematically.
- **Randomized Controlled Trials** — To evaluate interventions for prevention and treatment.
- **Standardized Outcome Reporting** — To improve comparability across future research.

- **Risk Factor Stratification** — To identify patient-specific prevention strategies.
- **Implementation Science Research** — To translate evidence into clinical practice guidelines.

6) Conclusion

Thrombophlebitis represents a common and diverse complication across various clinical settings, with incidence rates for catheter-related events ranging widely from 0.4% to 87.1%. It is associated with a spectrum of severe complications, including deep vein thrombosis, pulmonary embolism, cerebral thrombophlebitis, septic shock, and increased mortality. Risk factors such as catheter characteristics, underlying conditions like Behcet's disease, and specific surgical procedures necessitate targeted prevention and management strategies. A key limitation is the heterogeneity in study designs and outcome definitions, underscoring the need for standardized diagnostic criteria and robust comparative effectiveness trials to optimize patient care and improve long-term outcomes.

Session data (all downloaded records)

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Figure 1. Publication-year distribution of included originals

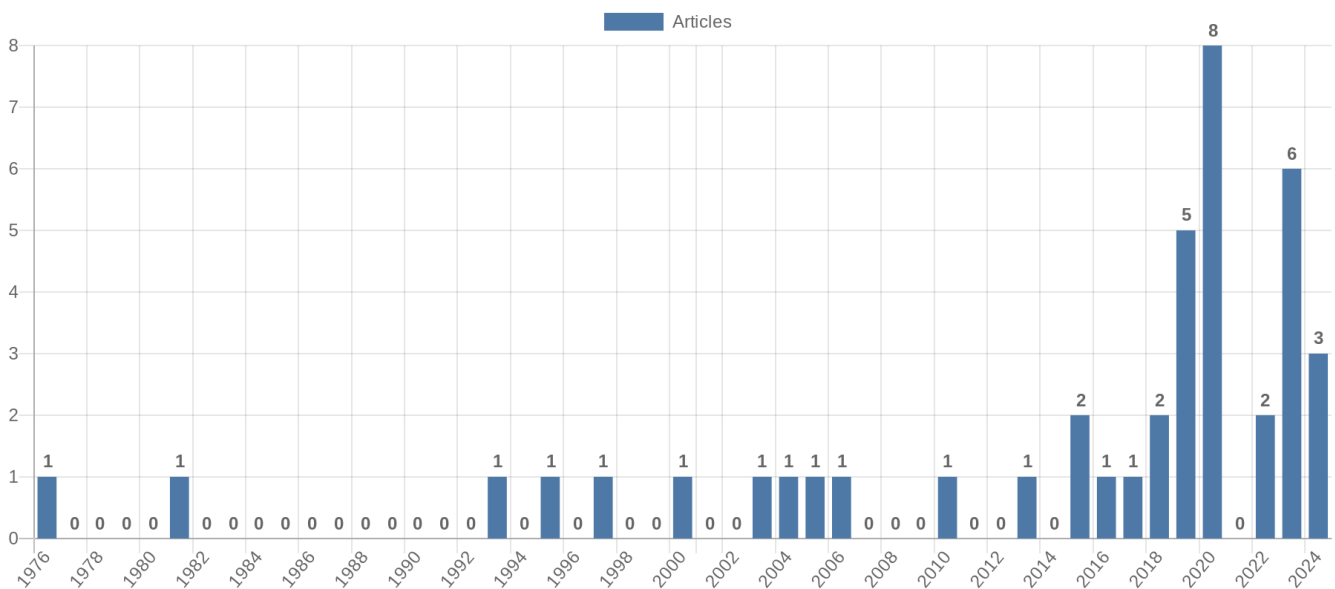


Figure 2. Study-design distribution of included originals

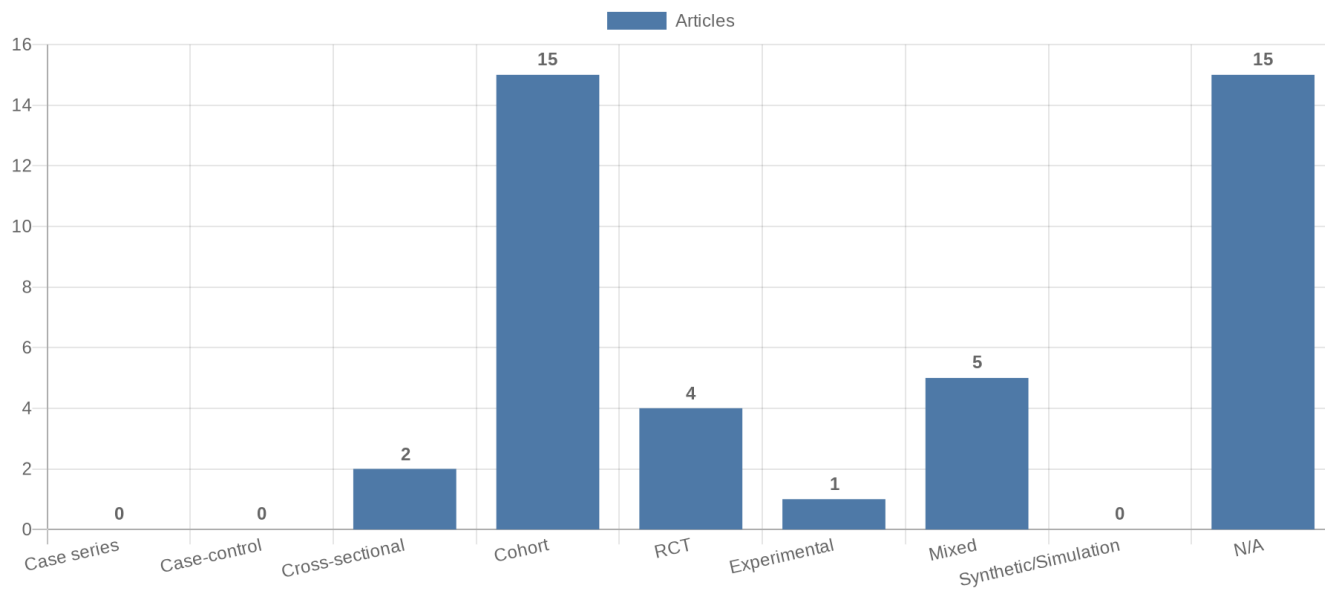


Figure 3. Study-type (directionality) distribution of included originals

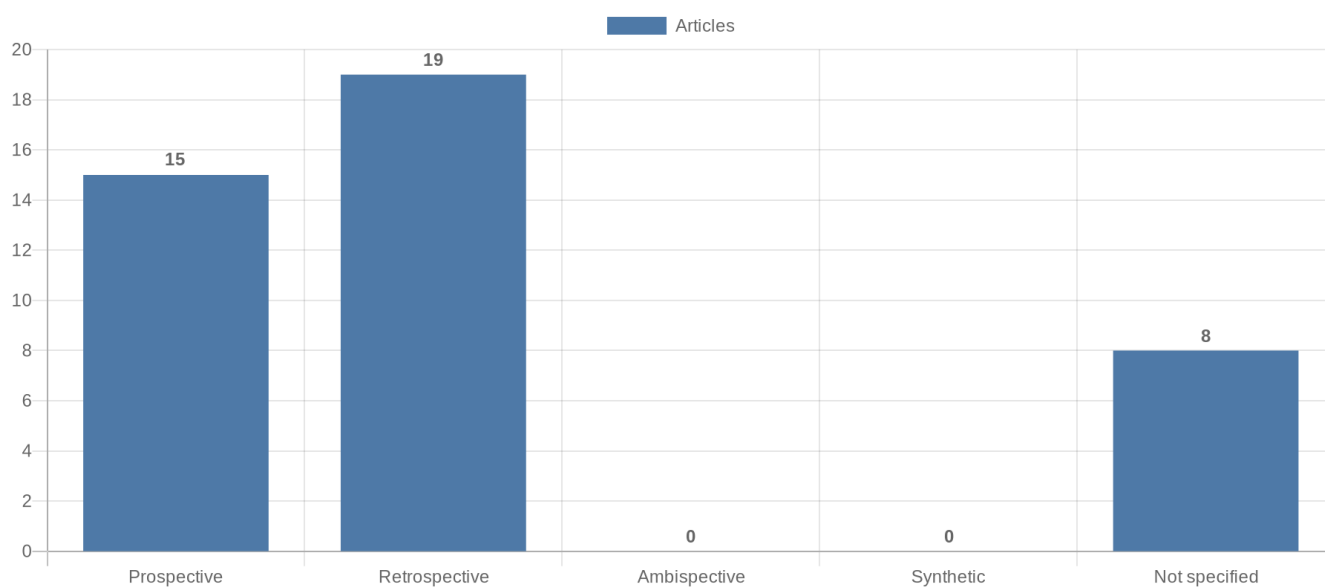


Figure 4. Main extracted research topics

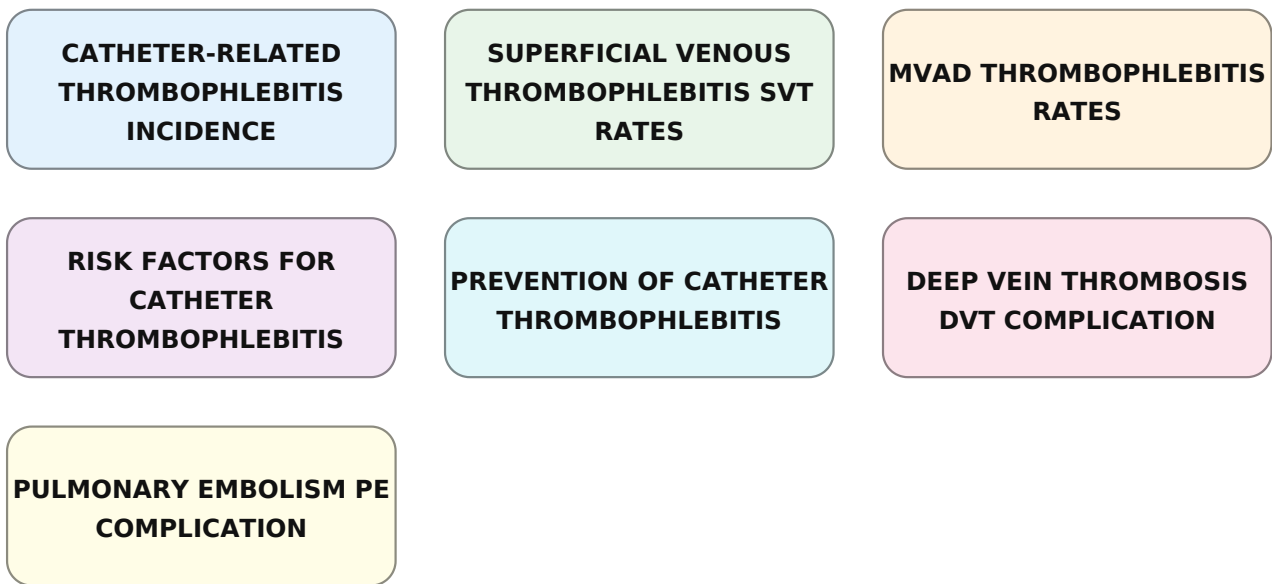
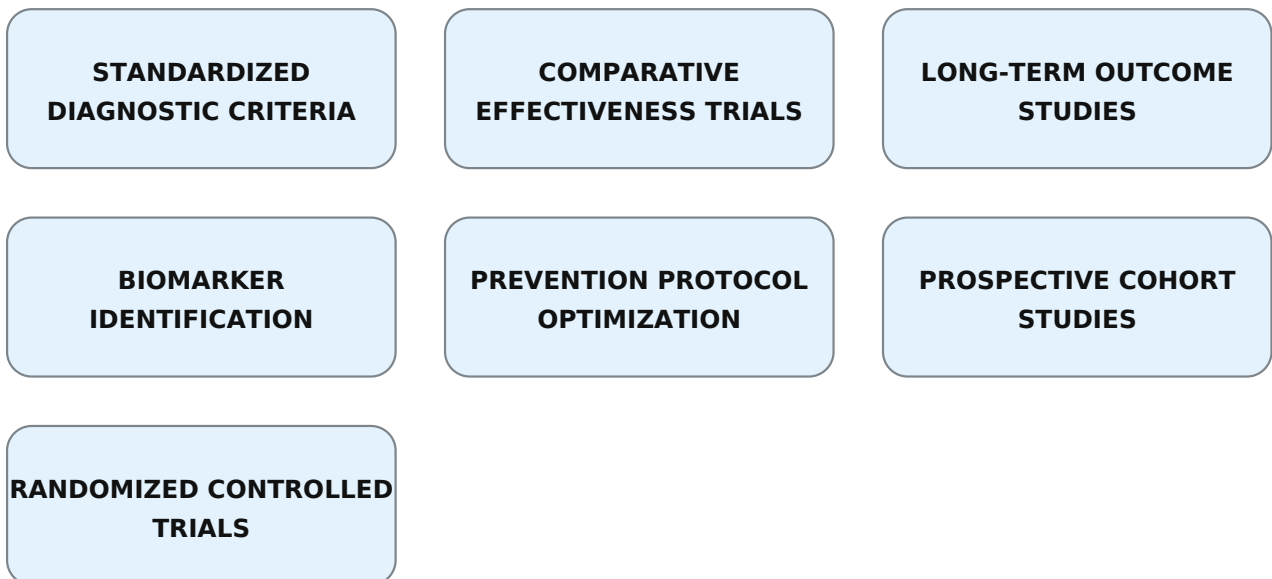


Figure 5. Limitations of current studies (topics)



Figure 6. Future research directions (topics)



[Reference Index \(42\)](#)

- **[1]** Peripheral Venous Cannulation Associated Thrombophlebitis And Its Management — <https://doi.org/10.24018/ejmed.2020.2.3.292>
- **[2]** Role of training and monitoring and its effect on infusion-related peripheral thrombophlebitis in a teaching hospital — <https://doi.org/10.18203/2394-6040.ijcmph20243675>
- **[3]** Comparison of endovenous laser ablation and conservative treatment in acute thrombophlebitis of the varicose great saphenous vein: rationale, design and first results of clinical trial — <https://doi.org/10.15829/1728-8800-2022-3461>
- **[4]** The Association of Vasopressor Administration Through a Midline Catheter with Catheter-Related Complications. — <https://doi.org/10.1513/annalsats.202209-814oc>
- **[5]** Central venous catheterization-related complications in a cohort of 100 hospitalized patients: An observational study — <https://doi.org/10.4103/2221-6189.385685>
- **[6]** Comparison of Venous Thrombosis Complications in Midlines Versus Peripherally Inserted Central Catheters: Are Midlines the Safer Option? — <https://doi.org/10.1177/1076029619839150>
- **[7]** Treatment of Orbital Complications Following Acute Rhinosinusitis in Children. — <https://doi.org/10.5152/balkanmedj.2016.141065>
- **[8]** Chorioamnionitis and Infectious Complications after Vaginal Delivery — <https://doi.org/10.1055/s-0039-1692718>
- **[9]** Laparoscopic radical prostatectomy: initial short-term experience. — [https://doi.org/10.1016/s0090-4295\(97\)00543-8](https://doi.org/10.1016/s0090-4295(97)00543-8)
- **[10]** Are erythema nodosum-like lesions and superficial thrombophlebitis prodromal in terms of visceral involvement in Behcet's disease? — <https://doi.org/10.1111/j.1742-1241.2005.00286.x>
- **[11]** Thrombocytopenia in Klebsiella pneumoniae liver abscess: a retrospective study on its correlation with disease severity and potential causes — <https://doi.org/10.3389/fcimb.2024.1351607>
- **[12]** Venous Thrombotic Complications of Pregnancy — <https://doi.org/10.1177/096721099600400618>
- **[13]** Major complications following exenteration in cases of pelvic malignancy: a 10-year experience. — <https://doi.org/10.3748/wjg.v12.i7.1115>
- **[14]** Jugular Vein Thrombosis and Anticoagulation Therapy in Lemierre's Syndrome—A Post Hoc Observational and Population-Based Study of 82 Patients — <https://doi.org/10.1093/ofid/ofaa585>
- **[15]** Incidence and challenges in management of hemodialysis catheter-related infections — <https://doi.org/10.1038/s41598-022-23787-5>

- **[16]** Comparison of PVC and Glass Containers in the Prevention of Contamination and Thrombophlebitis in Intravenous Therapy — <https://doi.org/10.1111/j.1742-1241.1976.tb07353.x>
- **[17]** Vasculitis due to *Candidatus Neoehrlichia mikurensis*: a cohort study of 40 Swedish patients. — <https://doi.org/10.1093/cid/ciaa1217>
- **[18]** Initial outcomes of endovenous laser ablation with 1940 nm diode laser in the treatment of incompetent saphenous veins — <https://doi.org/10.1177/1708538118797860>
- **[19]** Spinal cord infarction during venoarterial-extracorporeal membrane oxygenation support — <https://doi.org/10.1007/s10047-020-01179-8>
- **[20]** Mechanical Compression Effects on the Secretion of vWF and IL-8 by Cultured Human Vein Endothelium — <https://doi.org/10.1371/journal.pone.0169752>
- **[21]** Vascular manifestations of Behçet's disease. Eighteen cases among 140 patients. — [https://doi.org/10.1016/s1297-319x\(03\)00076-9](https://doi.org/10.1016/s1297-319x(03)00076-9)
- **[22]** Adverse Events Associated With Midline Vascular Catheters — <https://doi.org/10.1017/ice.2020.619>
- **[23]** Hospital epidemiology of emergent cervical necrotizing fasciitis — <https://doi.org/10.4103/0974-2700.62108>
- **[24]** Experience with the Insertion of Vena Caval Filters in Acutely Burned Patients — <https://doi.org/10.1177/000313480006600310>
- **[25]** Evaluation of an intravenous catheter for use in the horse. — <https://doi.org/10.2460/javma.1981.178.03.272>
- **[26]** Endovenous laser ablation and drug treatment of acute great saphenous vein ascending thrombophlebitis: comparison of three approaches to the treatment of patients — <https://doi.org/10.15829/1728-8800-2023-3863>
- **[27]** Prevalence and Prognostic Role of Lymphedema in Patients with Deep Venous Thrombosis and Thrombophlebitis — <https://doi.org/10.1089/lrb.2022.0109>
- **[28]** A prospective sonographic evaluation of peripheral intravenous catheter associated thrombophlebitis — <https://doi.org/10.1177/11297298211009019>
- **[29]** Association between varicose veins anatomical pattern and procedural complications following endovascular laser photothermolysis for chronic venous insufficiency — <https://doi.org/10.1590/1414-431x20198330>
- **[30]** Management of Intracranial Complications of Sinusitis — <https://doi.org/10.4236/ojcd.2015.52016>
- **[31]** Post caesarean section complication and its management in Dhaka medical college hospital — <https://doi.org/10.18203/2320-1770.ijrcog20230781>
- **[32]** Development of hemodynamically relevant acquired arterio-venous fistulae in patients with venous malformations — <https://doi.org/10.3233/ch-221610>
- **[33]** Comparative and Predictor Analysis of 30-Day Readmission, Reoperation, and Morbidity in Patients Undergoing Multilevel ACDF vs Single and Multilevel ACCF Using the ACS-NSQIP

Dataset. — <https://doi.org/10.1097/brs.0000000000003167>

- **[34]** Evaluation of Endovenous Laser Ablation in the Management of Varicose Veins — <https://doi.org/10.7759/cureus.45096>
- **[35]** Spectrum of Orbital Cellulitis on Magnetic Resonance Imaging — <https://doi.org/10.7759/cureus.9663>
- **[36]** A prospective observational cohort study of concomitant versus sequential phlebectomy for tributary varicosities following axial mechanochemical ablation — <https://doi.org/10.1177/0268355519835625>
- **[37]** A phase I study of intravenous bryostatin 1 in patients with advanced cancer. — <https://doi.org/10.1038/bjc.1993.352>
- **[38]** Totally implantable venous catheters for chemotherapy: experience in 500 patients — <https://doi.org/10.1590/s1516-31802004000400003>
- **[39]** A retrospective study of central venous catheters GCRI experience — <https://doi.org/10.4103/0971-5851.125234>
- **[40]** One-Step Approach to Treating Venous Insufficiency — <https://doi.org/10.14740/jocmr2205w>
- **[41]** Safety and efficacy of vasopressor administration through midline catheters. — <https://doi.org/10.1016/j.jcrc.2020.09.024>
- **[42]** A Frontline Approach With Peripherally Inserted Versus Centrally Inserted Central Venous Catheters for Remission Induction Chemotherapy Phase of Acute Myeloid Leukemia: A Randomized Comparison — <https://doi.org/10.1016/j.clml.2018.12.008>