

Original Research Article

Real-world utilization of topical heparin ointment for superficial venous thrombophlebitis in Indian clinical practice: a multicenter knowledge, attitude and practice survey

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ABSTRACT

Background: Superficial venous thrombophlebitis (SVT) is a frequent complication of peripheral intravenous (IV) cannulation, for which topical heparin ointment is widely used despite limited contemporary real-world data on clinician knowledge, attitude, and practice (KAP). This study examined the KAP of practicing clinicians regarding topical heparin ointment in SVT.

Methods: A cross-sectional observational survey of 362 clinicians routinely managing IV cannulation was conducted using an 11-item structured questionnaire. Items were a priori categorized into Knowledge (perceived SVT incidence and non-cannulation etiologies), Attitude (perceived effectiveness and tolerability, including pediatric use), and Practice (preferred treatment, timing, prophylactic use, duration, and use beyond SVT), with daily cannulation volume as a contextual exposure variable. Responses were summarized as frequencies, percentages, and 95% confidence intervals (CI).

Results: Among 362 clinicians, 74.6% performed 2–8 IV cannulations daily. For knowledge, 30.7% perceived that more than half of cannulated patients developed SVT, and 67.7% attributed non-cannulation SVT to vein injury, alone or with varicose veins. For attitude, symptom resolution and overall tolerability were rated excellent by 76.2% and 74.9%, respectively; pediatric tolerability was rated excellent or good by 97.5%. For practice, topical heparin ointment was preferred by 91.2% (alone or in combination), 85.1% (95% CI 81.4–88.8) had used it prophylactically, 62.7% prescribed it at or before cannulation, and a 7–10-day course was most common (50.6%).

Conclusion: Indian clinicians displayed a coherent KAP profile in which topical heparin ointment was overwhelmingly endorsed for prophylaxis and treatment of cannulation-related SVT, supporting its continued role in peripheral IV care pending patient-level outcome studies.

Keywords: Superficial venous thrombophlebitis, Topical heparin, Peripheral intravenous cannulation, Phlebitis, Cross-sectional survey, Real-world evidence

INTRODUCTION

SVT is an inflammatory–thrombotic condition involving a superficial vein and is now recognized as a clinical entity of more than purely local significance. Once

regarded as a benign, self-limiting condition, contemporary epidemiological data demonstrate that superficial venous thrombophlebitis (SVT) is associated with a significant risk of concomitant deep vein thrombosis (DVT) and pulmonary embolism (PE), with

rates of concurrent venous thromboembolism (VTE) at presentation reported between 18% and 25% in pooled analyses.¹⁻³ Although community-based estimates suggest an annual incidence of lower-limb SVT of approximately 0.64 per 1000 person-years, the burden of SVT is considerably greater in hospital settings, where peripheral IV cannulation is a near-universal intervention.⁴ Infusion phlebitis remains one of the most common complications of peripheral IV catheterization, with a recent meta-analysis estimating an overall incidence of 31% among catheterized patients.⁵ The economic and clinical impact of this complication is amplified by reports indicating that as many as half of peripheral IV catheters fail before therapy is completed, frequently because of phlebitis, infiltration, or occlusion.⁶

Pathogenetically, IV-cannulation-related SVT arises from a combination of mechanical endothelial injury at the insertion site, chemical irritation by infusates, and the thrombogenic surface of the catheter material itself, compounded in some patients by anatomical factors such as pre-existing varicose veins.^{7,8} The condition typically presents as a tender, palpable, erythematous cord along the course of the cannulated vein and, while usually self-limited, the thrombosed segment may extend proximally or be complicated by suppurative thrombophlebitis or, less commonly, propagation into the deep venous system.⁸⁻¹⁰

Management strategies for SVT fall broadly into anticoagulant, anti-inflammatory, and supportive categories. Systemic anticoagulation with intermediate-dose low-molecular-weight heparin or prophylactic-dose fondaparinux for 45 days remains the preferred approach for objectively confirmed lower-limb SVT of ≥ 5 cm, based on the CALISTO trial and endorsed by current European society for vascular surgery (ESVS) and CHEST guidelines or intermediate-dose LMWH for 30 days, shown to be superior to prophylactic dosing in the STEFLUX trial.^{3,11-13} However, for the much larger population of patients with localized, cannulation-associated SVT, where the thrombus is short, the underlying vein is small, and systemic anticoagulation may be neither warranted by guideline criteria nor practical topical agents and supportive measures remain the mainstay of therapy.^{7,9}

Topical heparin and heparinoid-containing products have a long history of use in superficial venous disorders. Mechanistically, they exert local anticoagulant, anti-inflammatory, and microcirculatory effects after dermal absorption, with measurable improvements in pain, swelling, erythema, and the size of the palpable cord reported across small randomized and observational studies.¹⁴⁻¹⁶ A recent comprehensive narrative review concluded that topical heparin and heparinoid-containing products effectively relieve symptoms in SVT and chronic venous disease, although the methodological heterogeneity of the underlying evidence base limits firm dose–response and duration recommendations.¹⁶ Despite

widespread clinical use, particularly in resource-conscious settings such as India, where outpatient and inpatient peripheral IV use is extensive, contemporary real-world data describing how clinicians actually use topical heparin ointment in routine practice are scarce. Existing literature has focused predominantly on lower-limb saphenous SVT in European cohorts; comparatively little has been published on prescriber behavior, perceived effectiveness, pediatric use, prophylactic timing, or the practical duration of therapy in the context of IV-cannulation-related SVT. A clearer picture of these patterns is needed to align everyday prescribing with the available evidence base and to identify gaps amenable to future prospective evaluation.

The present cross-sectional study was therefore designed using the KAP framework to characterize how Indian clinicians use topical heparin ointment in the management of SVT associated with IV cannulation. The knowledge, attitude, and practice (KAP) framework was chosen because it allows the cognitive (what clinicians believe to be true about the disease), affective (how they value the treatment), and behavioral (what they actually do) dimensions of prescribing to be separated and examined explicitly.

Specifically, the study examined clinician knowledge of SVT epidemiology and etiology, attitudes towards the perceived effectiveness and tolerability of topical heparin ointment (including in pediatric patients), and practice patterns covering treatment preference, timing of initiation, prophylactic use, duration of therapy, and use beyond the SVT indication. The objective was to generate a contemporary, real-world description of these KAP domains that could inform clinical guidance and future research priorities.

METHODS

Study design

This was a cross-sectional, questionnaire-based, real-world observational study conducted among clinicians to evaluate the utilization of topical heparin ointment in SVT in routine clinical practice involving IV cannulation, with the questionnaire structured around the KAP framework. The study was conducted between April and December 2025. The survey was conducted across multiple clinical practice sites across India, consistent with the multicenter design of the study; no single hospital or institution served as the exclusive study site.

Study participants

Practicing clinicians who were qualified to prescribe and administer peripheral IV cannulation in their routine clinical practice, had clinical experience with the diagnosis and/or management of SVT, and provided complete responses to the structured questionnaire were included. Questionnaires with incomplete responses to the

closed-format items were excluded from the descriptive analysis. Each respondent independently completed a standardized questionnaire based on their routine clinical practice. One questionnaire was completed per respondent.

Data source and instrument

Data were collected using an 11-item structured questionnaire developed for this study. The data collection instrument captured average daily volume of IV cannulation, perceived proportion of cannulated patients developing SVT, preferred treatment for SVT, timing of topical heparin ointment prescription relative to cannulation, prior prophylactic use of topical heparin ointment, clinician rating of symptom resolution with topical heparin ointment, clinician rating of overall tolerability, duration of topical heparin ointment use for symptom resolution, clinician rating of tolerability in pediatric patients, reported use of topical heparin ointment for indications beyond SVT, and perceived non-cannulation causes of SVT.

Items 3, 10, and 11 had more than one response to reflect real-world clinical practice. Categorical response options were pre-defined; free-text fields were available for the “other” categories of items 10 and 11. A case report form (CRF) and the original survey instrument were used to standardize the variable definitions and the response framework.

Variables and KAP domain assignment

The 11 questionnaire items were a priori categorized into three KAP domains. The Knowledge domain (2 items) comprised respondents' perceived incidence of SVT following IV cannulation (item 2) and their perceived non-cannulation etiologies of SVT (item 11). The Attitude domain (3 items) comprised clinician ratings of perceived symptom resolution (item 6), perceived overall tolerability (item 7), and perceived pediatric tolerability (item 9) with topical heparin ointment. The practice domain (5 items) comprised preferred treatment for SVT (item 3), timing of topical heparin ointment prescription relative to cannulation (item 4), prior prophylactic use (item 5), typical duration of use (item 8), and reported use of the product beyond the SVT indication (item 10).

Average daily IV cannulation volume (item 1) was retained as a contextual exposure variable rather than assigned to any KAP domain. The principal variables of interest were the proportion of respondents endorsing topical heparin ointment as their preferred treatment for SVT, the proportion having used the product prophylactically, clinician-rated symptom resolution and tolerability (overall and pediatric), and practice patterns regarding the timing and duration of topical heparin ointment use.

No patient-level clinical outcomes (such as objectively confirmed thrombus extension, recurrence, DVT, or PE) were collected. The study captured clinicians' knowledge, attitude and practice rather than direct patient outcomes.

Statistical analysis

All variables were categorical and were summarized as frequencies and percentages. Two-sided 95% confidence intervals (CI) were calculated for each response category using the Wald (normal approximation) method for proportions. No formal hypothesis testing or subgroup analysis was pre-specified, given the descriptive intent of the survey.

The denominator for each item was the total number of respondents providing a valid response ($n=362$). For items with multiple selections, combined response categories were tabulated alongside single-option categories to preserve the integrity of original responses. Confidence intervals reported reflect those provided in the study results dataset.

RESULTS

Respondent characteristics and IV cannulation exposure

A total of 362 clinicians provided complete responses and were included in the descriptive analysis. The distribution of average daily IV cannulation volume is presented in Table 1. The majority of respondents performed between 2 and 8 cannulations per day, 137 (37.8%; 95% CI 32.8–42.8) reported 2–5 cannulations and 133 (36.7%; 95% CI 31.7–41.7) reported 5–8 cannulations daily. A small minority (51; 14.1%) performed 0–2 cannulations, and 41 (11.3%) reported 8–10 cannulations per day. The cohort therefore comprised clinicians with substantial routine exposure to peripheral IV cannulation. No further respondent demographic characteristics (such as specialty, years in practice, or practice setting) were captured by the study instrument beyond this exposure variable; the available demographic/contextual data are presented in Table 1.

Knowledge domain

Perceived incidence of SVT after IV cannulation

Knowledge of SVT epidemiology, was assessed from respondents estimates of the proportion of cannulated patients who developed SVT (Table 1).

Almost 95 (26.2%; 95% CI 21.7–30.7) considered the post-cannulation SVT incidence to be less than 25%; 156 (43.1%; 95% CI 38.0–48.2) estimated 25–50%; 86 (23.8%; 95% CI 19.4–28.2) estimated 50–75%; and 25 (6.9%; 95% CI 4.3–9.5) considered the incidence to be greater than 75%. Combining the upper two categories,

almost a third of respondents (111; 30.7%) perceived that more than half of cannulated patients developed SVT.

Perceived non-cannulation etiologies of SVT

Two hundred and eleven respondents (58.3%; 95% CI 53.2–63.4) identified vein injury as a sole cause, while 34 (9.4%; 95% CI 6.4–12.4) selected both vein injury and varicose veins and 245 (67.7%) identified vein injury, alone or with varicose veins.

Varicose veins alone were selected by 93 respondents (25.7%; 95% CI 21.2–30.2), and 24 (6.6%; 95% CI 4.0–9.2) identified other causes (Table 1).

Attitude domain

Perceived effectiveness symptom resolution

Clinicians' attitudinal ratings of topical heparin ointment are summarized in Table 2 and illustrated in Figure 1. Topical heparin ointment was rated 'excellent' for symptom resolution by 276 respondents (76.2%; 95% CI 71.8–80.6) and 'good' by 84 (23.2%; 95% CI 18.8–27.6); only two respondents (0.6%; 95% CI 0.0–1.4) rated symptom resolution as 'fair', and no respondent rated it as 'poor'. The combined 'excellent or good' rating for symptom resolution was therefore 99.4%.

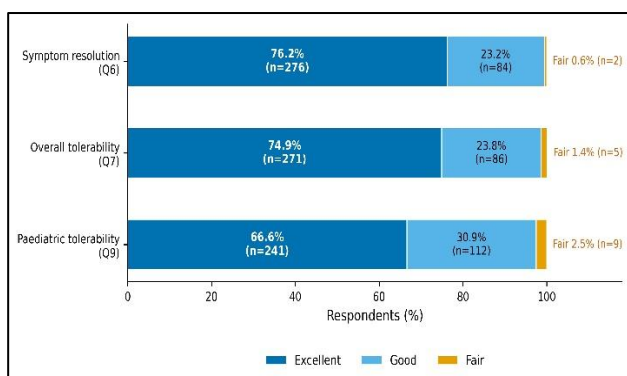


Figure 1: Attitude domain — clinician-rated effectiveness and tolerability of topical heparin ointment in superficial venous thrombophlebitis (n=362).

One hundred percent horizontal stacked bars show the distribution of respondents rating symptom resolution (item 6), overall tolerability (item 7), and paediatric tolerability (item 9) as Excellent, Good, or Fair. Percentages and absolute frequencies (n) are annotated within each segment. No respondent rated any outcome as Poor.

Perceived overall tolerability

Overall tolerability of topical heparin ointment was rated 'excellent' by 271 respondents (74.9%; 95% CI 70.4–79.3) and 'good' by 86 (23.8%; 95% CI 19.4–28.2), with five respondents (1.4%; 95% CI 0.2–2.6) rating

tolerability as 'fair'. The combined 'excellent or good' rating for overall tolerability was 98.6%.

Perceived pediatric tolerability

Pediatric tolerability was rated 'excellent' by 241 respondents (66.6%; 95% CI 61.7–71.5) and 'good' by 112 (30.9%; 95% CI 26.1–35.7), with nine respondents (2.5%; 95% CI 0.9–4.1) rating it as 'fair'; the combined 'excellent or good' rating for pediatric tolerability was 97.5%.

Although the proportion rating pediatric tolerability as 'excellent' was somewhat lower than the corresponding proportion for overall tolerability (66.6% vs 74.9%), the cumulative favorable rating remained high.

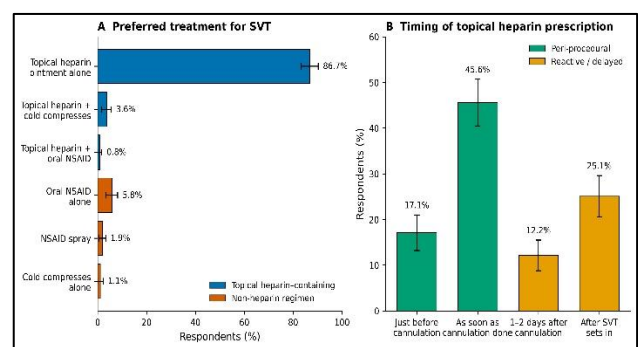


Figure 2: Practice domain — clinician-reported treatment preference and timing of topical heparin ointment prescription for superficial venous thrombophlebitis (SVT) following peripheral intravenous (IV) cannulation (n=362) (A) preferred treatment for SVT. Bars show the proportion of respondents selecting each option; error bars represent 95% confidence intervals. Heparin-containing regimens (blue) collectively accounted for 91.2% of preferred responses and (B) timing of topical heparin ointment prescription in relation to IV cannulation.

Peri-procedural use (green; just before or as soon as cannulation is performed) was reported by 62.7% of respondents; reactive or delayed use (orange) by 37.3%. Error bars represent 95% confidence intervals.

Practice domain

Preferred treatment for SVT

Treatment preferences for SVT are summarized in Table 3 and depicted in Figure 2A. Topical heparin ointment was selected as the preferred single-agent treatment by 314 respondents (86.7%; 95% CI 83.2–90.2). When combination responses were considered (topical heparin ointment with cold compresses [n=13] or with an oral NSAID [n=3], 330 of 362 respondents (91.2%) endorsed topical heparin ointment as part of their preferred regimen. Oral non-steroidal anti-inflammatory drug (NSAID)" as it is first instance as a single agent was

preferred by 21 respondents (5.8%; 95% CI 3.4–8.2), NSAID spray by 7 (1.9%; 95% CI 0.5–3.3), and cold compresses alone by 4 (1.1%; 95% CI 0.0–2.2).

Timing of topical heparin ointment prescription

When topical heparin ointment was first applied in relation to IV cannulation, 165 respondents (45.6%; 95%

CI 40.5–50.7) prescribed it as soon as the cannulation was performed, and 62 (17.1%; 95% CI 13.2–21.0) initiated it just before cannulation, reflecting peri-procedural use in 62.7% of respondents overall (Figure 2B). Further 44 respondents (12.2%; 95% CI 8.8–15.5) initiated topical heparin ointment 1–2 days after cannulation, while 91 (25.1%; 95% CI 20.6–29.6) used it for when overt SVT had set in.

Table 1: Knowledge domain-respondent exposure to peripheral intravenous cannulation (n=362).

KAP domain	Item	Category	N	%	95% CI
Exposure (contextual)	Average daily IV cannulations	0–2	51	14.1	10.5–17.7
		2–5	137	37.8	32.8–42.8
		5–8	133	36.7	31.7–41.7
		8–10	41	11.3	8.0–14.6
Knowledge	Perceived proportion of cannulated patients developing SVT	<25%	95	26.2	21.7–30.7
		25–50%	156	43.1	38.0–48.2
		50–75%	86	23.8	19.4–28.2
		>75%	25	6.9	4.3–9.5
	Perceived non-cannulation cause of SVT*	Injury to the vein	211	58.3	53.2–63.4
		Injury to the vein+varicose veins	34	9.4	6.4–12.4
		Varicose veins	93	25.7	21.2–30.2
		Other	24	6.6	4.0–9.2

*Multiple selection was permitted.

Table 2: Attitude domain-clinician ratings of perceived effectiveness and tolerability of topical heparin ointment in superficial venous thrombophlebitis (n=362).

KAP domain	Item	Rating	N	%	95% CI
Attitude	Perceived symptom resolution	Excellent	276	76.2	71.8–80.6
		Good	84	23.2	18.8–27.6
		Fair	2	0.6	0.0–1.4
	Perceived overall tolerability	Excellent	271	74.9	70.4–79.3
		Good	86	23.8	19.4–28.2
		Fair	5	1.4	0.2–2.6
	Perceived pediatric tolerability	Excellent	241	66.6	61.7–71.5
		Good	112	30.9	26.1–35.7
		Fair	9	2.5	0.9–4.1

Table 3: Practice domain-preferred treatment, timing, prophylactic use, duration, and use beyond SVT for topical heparin ointment (n=362).

KAP domain	Item	Category	N	%	95% CI
Practice	Preferred treatment for SVT*	Topical heparin ointment	314	86.7	83.2–90.2
		Topical heparin+cold compresses	13	3.6	1.7–5.5
		Topical heparin+oral NSAID	3	0.8	0.0–1.7
		Oral NSAID alone	21	5.8	3.4–8.2
		NSAID spray	7	1.9	0.5–3.3
		Cold compresses alone	4	1.1	0.0–2.2
	Timing of topical heparin ointment prescription	Just before IV cannulation	62	17.1	13.2–21.0
		As soon as IV cannulation is done	165	45.6	40.5–50.7
		1–2 days after IV cannulation	44	12.2	8.8–15.5
		As soon as thrombophlebitis sets in	91	25.1	20.6–29.6
	Prophylactic use of topical heparin ointment	Yes	308	85.1	81.4–88.8
		No	54	14.9	11.2–18.6
	Duration of topical heparin	<7 days	158	43.6	38.5–48.7

Continued.

KAP domain	Item	Category	N	%	95% CI
	ointment use for symptom resolution	7–10 days	183	50.6	45.4–55.7
		10–14 days	21	5.8	3.4–8.2
	Use of topical heparin ointment beyond SVT	No	240	66.3	61.4–71.1
		Yes	122	33.7	28.9–38.6

*Multiple selection was permitted.

Prophylactic use

Prophylactic use of topical heparin ointment for SVT was reported by 308 of 362 respondents (85.1%; 95% CI 81.4–88.8); 54 respondents (14.9%; 95% CI 11.2–18.6) had not used the product prophylactically.

Duration of use

A 7–10-day course of topical heparin ointment was reported as the typical duration for symptom resolution by 183 respondents (50.6%; 95% CI 45.4–55.7). Shorter courses of less than 7 days were used by 158 respondents (43.6%; 95% CI 38.5–48.7), and 21 (5.8%; 95% CI 3.4–8.2) reported using the product for 10–14 days.

Use beyond SVT

Approximately one-third of respondents (122; 33.7%; 95% CI 28.9–38.6) reported using topical heparin ointment for indications beyond SVT, while 240 (66.3%; 95% CI 61.4–71.1) restricted its use to SVT. The additional indications included blunt vein injury, post-injection site pain, hematoma, and intramuscular injection site reactions. However, these were not formally aggregated in the available results.

DISCUSSION

In this real-world KAP survey of 362 practicing clinicians, three coherent findings emerged across the three domains. At the knowledge level, respondents perceived SVT after peripheral IV cannulation as a frequent and clinically important problem; almost a third of respondents estimated that more than half of cannulated patients developed SVT and they predominantly attributed non-cannulation SVT to mechanical vein injury and venous insufficiency, consistent with established pathogenetic understanding. At the attitude level, topical heparin ointment was viewed extremely favorably; more than 99% of respondents rated symptom resolution as excellent or good, more than 98% rated overall tolerability as excellent or good, and 97.5% rated pediatric tolerability as excellent or good.

At the practice level, topical heparin ointment emerged as the dominant pharmacological choice, with more than nine of ten respondents endorsing it as preferred therapy (alone or in combination), a similar proportion having used it prophylactically, peri-procedural application predominating (62.7%), a typical 7–10-day course (50.6%), and a meaningful minority (33.7%) using the product for indications beyond SVT. Across the three

KAP domains, the survey thus depicts a consistent and convergent clinical narrative: a problem perceived as common, a product perceived as effective and well tolerated, and a practice pattern shaped accordingly.

Respondents' knowledge of cannulation-associated SVT incidence, with 30.7% perceiving rates above 50%, is broadly consistent with the meta-analytic estimate of ~31% reported by Lv and Zhang for infusion phlebitis with peripheral IV catheters, and with the observation by Helm and colleagues that peripheral IV catheter failure remains 'accepted but unacceptable' in everyday practice.^{5,6} The Maki systematic review of intravascular device-related bloodstream infection similarly highlighted phlebitis as one of the leading non-infectious local complications of short peripheral catheters, although its quantitative focus differed from the present study.¹⁷

Respondents' attribution of non-cannulation SVT to vein injury (alone or with varicose veins) in 67.7% of cases aligns with the long-standing recognition of mechanical endothelial damage and venous insufficiency as central etiological drivers; in the POST observational cohort, Decousus and colleagues reported varicose veins in 62% of patients with lower-limb SVT2, and the community-based STEPH study and review by Litzendorf and Satiani emphasize venous insufficiency, prior thrombophlebitis, malignancy, and hormonal factors as recurrent risk constellations.^{4,18} The strongly favorable attitudes captured in this survey are coherent with but exceed in optimism, the small randomized, and observational evidence base. The Cochrane review by Di Nisio and colleagues on upper-extremity infusion thrombophlebitis concluded that topical heparinoid and diclofenac gels, including Essaven gel, showed favorable symptomatic effects compared with small placebo-controlled trials, but noted that the underlying randomized evidence is limited and of low quality, with no high-quality data on systemic outcomes such as thrombus extension or VTE.⁹

An earlier placebo-controlled randomized study by De Sanctis and colleagues, conducted in 23 patients with arm SVT secondary to IV catheterization, reported significantly faster decreases in symptomatic score and skin temperature with a topical heparinoid (Essaven gel) than with placebo, with no observed intolerance.¹⁵ The recent comprehensive review by Bissacco and colleagues concluded that topical heparin and heparinoid-containing products effectively relieve symptoms in venous disease, while emphasizing that the underlying randomized evidence remains heterogeneous and that head-to-head comparative data with structured oral or systemic therapies are limited.¹⁶

The high pediatric attitudinal rating in the survey (97.5% excellent or good) is broadly compatible with the limited published experience of topical heparin in children, but should be interpreted with caution: no formal regulatory pediatric trial data exist, and patient-reported outcomes were not captured. The Cochrane review by Di Nisio and colleagues on leg SVT found that topical treatments improve symptoms but did not identify a benefit on the rate of thromboembolic complications, reinforcing the view that topical therapy in this context is best framed as symptomatic management; the earlier systematic review by Wichers and co-workers reached a similar conclusion.^{9,19}

The practice pattern observed in the cohort is most striking for its emphasis on prevention. For established SVT, particularly of the great or small saphenous vein, the evidence base supports systemic anticoagulation: the CALISTO trial demonstrated that 45 days of prophylactic-dose fondaparinux reduced the risk of symptomatic VTE and SVT recurrence in patients with isolated SVT of at least 5 cm, and the STEFLUX study demonstrated the role of intermediate-dose parnaparin for 30 days.^{11,13} The non-inferiority SURPRISE trial more recently showed that oral rivaroxaban was non-inferior to fondaparinux for high-risk SVT, broadening the available therapeutic armamentarium.²⁰ The ESVS 2021 and 2023 guidelines, as well as the CHEST guideline, favor anticoagulant treatment for confirmed SVT of ≥ 5 cm, while acknowledging that for shorter, more localized, and cannulation-related lesions the evidence is sparse and local symptomatic measures are appropriate.^{3,12,21}

The infusion nurses society (INS) 2024 standards of practice recommend systematic assessment for phlebitis using validated scales and indicate that clinically appropriate rather than routine replacement of peripheral catheters is a safe strategy, but do not endorse any specific pharmacological prophylaxis.^{22,23} The strong preference for prophylactic topical heparin ointment in the present cohort (85.1%) therefore represents a practice not currently addressed by guideline recommendations, likely driven by clinician familiarity, low perceived risk, and patient acceptance.

These data have several practical implications. First, the convergent clinical view of topical heparin ointment as a well-tolerated, effective symptomatic option in cannulation-related SVT, reflected in both the attitudinal ratings and the practice patterns of this cohort, thereby supports its retention in institutional protocols for IV-care bundles, especially in settings where systemic anticoagulation would be neither indicated nor practicable. Second, the prevalent prophylactic use, even though not currently supported by high-quality randomized evidence, raises a clear research question: whether structured application of topical heparin ointment peri-cannulation reduces the incidence of clinically meaningful phlebitis compared with placebo or no topical therapy. Third, the favorable pediatric tolerability profile reported by clinicians, while reassuring at a descriptive

level, should not be over-interpreted; appropriately designed pediatric studies remain a priority. Fourth, the KAP gap between high knowledge of SVT incidence, high attitudinal endorsement of the product, and a practice pattern that exceeds the formal evidence base highlights a useful target for educational and audit interventions.

Strengths of this study include the relatively large sample of 362 clinicians, the explicit structuring of the 11-item instrument around the KAP framework, the explicit reporting of confidence intervals around each estimate, and the real-world, observational design that captures everyday prescribing behavior rather than idealized or trial-protocolized use. To our knowledge, this is the largest contemporary description of topical heparin ointment utilization in the Indian SVT setting and the first to explicitly disaggregate the findings into knowledge, attitude, and practice domains.

Several limitations should be considered. First, the study collected clinician-reported perceptions rather than objective patient-level outcomes; perceived effectiveness and tolerability may differ from formally measured endpoints such as pain resolution on a validated scale, ultrasonographic thrombus extension, or incidence of progression to DVT. Second, the survey-based design is susceptible to recall and social-desirability bias, both of which are particularly relevant to the attitudinal items. Third, key respondent characteristics such as specialty, years in practice, public versus private sector, and urban versus rural distribution were not captured by the questionnaire, which limits inference about generalizability.

Fourth, the questionnaire did not capture topical heparin ointment strength, formulation, frequency of application, or co-interventions such as compression and limb elevation, all of which may influence outcomes. Fifth, the multi-select format of items on treatment preference and etiology, while reflecting real-world combinatorial choices, prevents straightforward comparison with single-choice surveys. Sixth, the questionnaire was not independently validated, and the categorical response options may have constrained the granularity of knowledge and attitudinal capture. Finally, the cross-sectional design precludes causal inference and recurrence or follow-up data.

Three priority research directions emerge from the KAP profile. First, an adequately powered, prospective, randomized trial of peri-cannulation topical heparin ointment versus standard care, with a validated phlebitis outcome (e.g., the visual infusion phlebitis score), would clarify whether the strong real-world practice preference for prophylactic use is supported by clinically meaningful effect sizes. Second, a pediatric-specific evaluation, ideally embedded within tertiary pediatric units, would address the paucity of formal evidence underlying the favorable pediatric attitudinal rating. Third, comparative head-to-head studies of topical heparin ointment against

alternative topical options (e.g., topical NSAIDs, heparinoid creams) in IV-cannulation-related SVT would help refine evidence-based selection. Embedding educational interventions that align clinician knowledge with the current guideline evidence base and auditing their impact on practice would be a logical complementary direction.

CONCLUSION

In this real-world, cross-sectional KAP survey of 362 Indian clinicians, topical heparin ointment was recommended across all three domains for both the prevention and treatment of SVT associated with peripheral IV cannulation. Respondents demonstrated knowledge of SVT as a frequent post-cannulation complication, expressed a highly favorable attitude towards the product's effectiveness and tolerability in both adults and children, and reported a coherent practice pattern of early or peri-procedural application, frequent prophylactic use, and a typical 7–10-day course. These findings reflect the established place of topical heparin ointment in routine practice and add to the limited contemporary descriptive literature on its use in the Indian setting. They also highlight the need for prospective, patient-outcome studies, especially in the cannulation-related and pediatric contexts, to align widespread real-world utilization with a stronger evidence base.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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