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XVIII PICC Day – Bologna - 2-3 Dicembre 2025

3 Dicembre 2025 – ore 11:00 – 12:00

COME PREVENIRE, DIAGNOSTICARE E TRATTARE LA TROMBOSI DA PICC

PRINCIPII DI TRATTAMENTO DELLA TROMBOSI VENOSA DA PICC – Roberto Biffi

VASCULAR ACCESS TEAM – IEO Milano

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Catheter related central venous thrombosis: the development of a nationwide Consensus Paper in Italy

Mauro PITTIRUTI, Roberto BIFFI, Costantino CAMPISI, and the GAVeCeLT Committee for the Consensus Paper about catheter- related central venous thrombosis

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JAVA | Vol 12 No 1 | 2007

The Journal of Vascular Access
Volume 22, Issue 4, July 2021, Pages 501-508
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https://doi.org/10.1177/1129729820947594

Editorial

Reconsidering the GAVeCeLT Consensus on catheter-related thrombosis, 13 years later

Fulvio Pinelli [1], Paolo Balsorano [1], Benedetta Mura [2], and Mauro Pittiruti [3]

Abstract

Catheter-related thrombosis represents one of the most common complications following central venous access insertion. Despite the amount of available studies, many aspects surrounding catheter-related thrombosis remain controversial. Thirteen years ago, the Italian Study Group for Long Term Central Venous Access (GAVeCeLT) developed a nationwide Consensus in order to clarify some key aspects on this topic. Despite most of them still remain valid, however, knowledge around catheter-related thrombosis has greatly evolved over the last decade, with a natural evolution in terms of catheter technologies, insertion techniques, and management bundles. Aims of this editorial are to readdress conclusions of the 2007 GAVeCeLT Consensus in the light of the new relevant evidences that have been added in the last 13 years and to analyze some unsolved issues that still remain debated.

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https://doi.org/10.1177/1129729820947594

- CRT can be regarded as an **inevitable side-effect of venous access**, since vein injury can be minimized but not avoided.

- Based on new evidence, **the implementation of insertion and management bundles have been shown to be effective in reducing catheter-related complications**.

- **Safe insertion of PICCs (SIP) e PICCports (SIP-Port):** preprocedural ultrasound assessment utilizing the RaPeVA (Rapid Peripheral Venous Assessment) protocol; appropriate skin antiseptic technique; choice of appropriate vein, adoption of the Zone Insertion Method™; clear identification of the median nerve and brachial artery; ultrasound-guided puncture; ultrasound-guided tip navigation; intra-procedural assessment of tip location; correct securement of the catheter, and appropriate protection of the exit site.

- In fact, CRT rates have been steadily decreasing over the years, thanks to the adoption of further appropriate strategies, such as **ultrasound guidance, proper selection of vein and catheter size, adequate tip placement, and adequate catheter securement**.

Tipi di complicanze, tassi e azioni intraprese; N = **178 pazienti** e 194 PICC. Indicazione: **Tumori onco- ematologici.**

Complicanza	N. (%)	Tasso d'Incidenza /1000 giorni di PICC (95% IC)	Misure adottate(N)
Infezione [a]	6 (3.4)	0.20 (0.7 – 0.44)	Rimozione e reimpianto differito (4 CRBSI + 1 Exit site); terapia antibiotica (1 exit site)
Occlusione	5 (2.8)	0.17 (0.06 – 0.37)	Rimozione e reimpianto
Trombosi [b]	3 (1.6)	0.10 (0.02 – 0.30)	Rimozione e reimpianto (2, trombosi occlusive); terapia con EBPM (1)
Rottura	3 (1.6)	0.10 (0.02 – 0.30)	Rimozione e reimpianto (2); riparazione tratto extravascolare (1)
Dislocazione	2 (1.1)	0.07 (0.01 – 0.25)	Reimpianto
Totali [c]	**19 (10.6)**	**0.65 (0.39 – 1.01)**	
Follow up (x)	**211 gg.**		

Tipi di complicanze, tassi e azioni intraprese; N = **482 pazienti** e 500 PICC. Indicazione: **Tumori solidi.**

Complicanza	N. (%)	Tasso d'Incidenza /1000 giorni di PICC (95% IC)	Misure adottate(N)
Infezione [a]	5 (1.0)	0.10 (0.03 – 0.25)	Rimozione e reimpianto differito (2 CRBSI + 3 Exit site)
Occlusione	11 (2.3)	0.22 (0.09 – 0.35)	Rimozione e reimpianto
Trombosi [b]	13 (2.7)	0.26 (0.14 – 0.45)	Rimozione e reimpianto (1, trombosi infetta); terapia con EBPM (12)
Rottura	3 (0.6)	0.06 (0.01 – 1.76)	Rimozione e reimpianto
Dislocazione	7 (1.5)	0.14 (0.03 – 0.25)	Reimpianto
Totali [c]	**42 (8.7)**	**0.84 (0.61 – 1.14)**	
Follow up (x)	**95 gg.**		

a: p = 0.10 NS
b: p = 0.09 NS
c: p = 0.18 NS

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Peripherally inserted central catheter (PICC)-related venous thrombosis in adults

AUTHOR: Vineet Chopra, MD, MSc
SECTION EDITOR: Ingemar Davidson, MD, PhD, FACS
DEPUTY EDITOR: Kathryn A Collins, MD, PhD, FACS

Contributor Disclosures

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: **Oct 2025**.
This topic last updated: **Mar 13, 2025**.

…Later studies examining PICC insertion using "modern" insertion techniques such as ultrasound-guided insertion, micro-introducers, and ECG guidance suggest that when these are used, the risk of PICC-related DVT may be lower than previously reported. In a systematic review of 15 studies published after 2010, the overall rate of PICC-related DVT was 2.4 percent (95% CI 1.5 to 3.3 percent) .

Ref 22: Balsorano P, Virgili G, Villa G, et al. Peripherally inserted central catheter-related thrombosis rate in modern vascular access era-when insertion technique matters: A systematic review and meta-analysis. J Vasc Access 2020; 21:45.

Anticoagulation

Guidelines for the treatment of venous thromboembolism disease (including PICC-related DVT) recommend **at least three months of uninterrupted systemic anticoagulation** for catheter-related upper extremity DVT involving deep veins of the upper extremity.
LMWH is preferred in patients with catheter-related DVT who are pregnant or those with cancer.
Alternative agents may be needed for those who cannot take heparin (fondaparinux, unfractionated heparin), followed by LMWH or a vitamin K antagonist (eg, warfarin).

Anticoagulation should be continued for as long as the PICC remains in place. However, data supporting this recommendation are scant and largely extrapolated from retrospective cohort studies and trials involving lower extremity DVT.

Although there are no specific recommendations regarding direct oral anticoagulants (DOACs) for catheter-related upper extremity DVT, two studies reported faster resolution of PICC-related DVT with low rates of bleeding in those treated with rivaroxaban compared with traditional agents [Bhakta A et al, 2014; Fan F et al, 2017].

Several ongoing studies are examining the role of DOACs in catheter-related DVT.
In addition, cancer-related guidelines and recommendations are evolving to more frequently recommend DOACs in patients with malignancy-related thrombosis.

TABLE 3 Guideline recommendations on CRT management.

Guideline	Anticoagulant treatment	Catheter removal	Thrombolysis/catheter directed therapy
NCCN 2021[65]	Anticoagulation for at least 3 months or as long as CVC in place	Consider if symptoms persist, catheter is infected, dysfunctional or no longer necessary or contraindication to anticoagulation	Consider catheter-directed pharmacomechanical or mechanical thrombectomy in appropriate candidates
ESC 2022[56]	Anticoagulation in patients with cancer and CVC-associated VTE for at least 3 months or as long as CVC in place	–	–
ASH 2021[51]	–	Consider removal if infected, mispositioned or malfunctioning, in patients no longer requiring the CVC or who cannot receive anticoagulant treatment	–
ESMO 2023[52]	Anticoagulant treatment for a minimum of 3 months or as long as CVC in place. LMWH suggested, VKAs or DOACs alternatives	Remove if CVC not needed, infected, anticoagulant treatment is contraindicated or there is clinical deterioration due to thrombus extension despite treatment	–
ITAC 2022[50]	Anticoagulant treatment for a minimum of 3 months or as long as CVC in place. LMWH suggested	Remove if CVC malfunctional, infected, symptoms persist despite anticoagulant treatment	–

Abbreviations: CRT, catheter-related deep vein thrombosis; CVC, central venous catheter; DOACs, direct oral anticoagulants, LMWH, low molecular weight heparin; VKA, vitamin K antagonist; VTE, venous thromboembolism.

NCCN
Natl. Compreh. Cancer Network

ESC
European Society of Cardiology

ASH
American Society of Hematology

ESMO
European Society of Medical Oncology

ITAC
International Initiative on Thrombosis and Cancer

IEO Istituto Europeo di Oncologia

From: Girardi L et al, *Eur J Clin Invest. 2025;55:e14311*

Archives of Cardiovascular Disease 117 (2024) 72–83

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Review

Central venous catheter associated upper extremity deep vein thrombosis in cancer patients: Diagnosis and therapeutic management

Antoine Elias[a,i,1,*], Philippe Debourdeau[b,i,1], Olivier Espitia[c], Marie-Antoinette Sevestre[d,i], Philippe Girard[e,i], Isabelle Mahé[f,h,i,2], Olivier Sanchez[g,h,i,2], for the INNOVTE CAT Working Group[3]

[a] Département de Cardiologie et de Médecine Vasculaire, Délégation Recherche Clinique et Innovation, Centre Hospitalier Intercommunal Toulon La Seyne-sur-Mer, Toulon, France
[b] Équipe Mobile Territoriale Soins Palliatifs, Hôpital Joseph-Imbert d'Arles, Arles, France
[c] Service de Médecine Interne et Vasculaire, Nantes Université, CHU de Nantes, Institut du thorax, Inserm UMR 1087, CNRS UMR 6291, Team III Vascular & Pulmonary Diseases, Nantes, France
[d] Service de Médecine Vasculaire, EA Chimère 7516, CHU Amiens, 80054, Amiens, France
[e] Institut du Thorax Curie-Montsouris, Institut Mutualiste Montsouris, Paris, France
[f] Service de Médecine Interne, Hôpital Louis-Mourier, AP-HP, Colombes, France
[g] Service de Pneumologie et de Soins Intensifs, AP-HP, Hôpital Européen Georges-Pompidou, Paris, France
[h] Université Paris Cité, Inserm UMR S1140, innovations thérapeutiques en hémostase, Paris, France
[i] F-CRIN INNOVTE network, Saint-Étienne, France

Archives of Cardiovascular Disease xxx (xxxx) xxx–xxx

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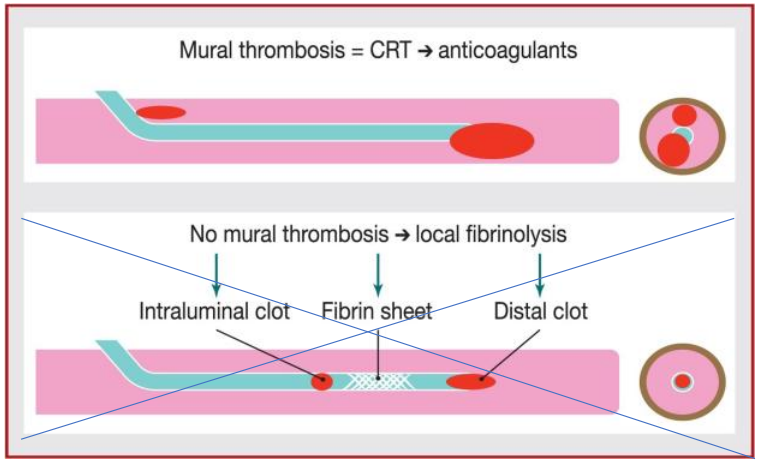
Guidelines

The management of cancer-associated thromboembolism: Proposals from the French multidisciplinary INNOVTE CAT Working Group

Isabelle Mahé[a,b,*], Ygal Benhamou[c], Asmahane Benmaziane[d], Laurent Bertoletti[e], Virginie Bichon[f], Coralie Bozec[g], Ariel Cohen[h], Francis Couturaud[i], Philippe Debourdeau[j], Pascale Dielenseger[k], Éric Douriez[l], Antoine Elias[m], Olivier Espitia[n], Corinne Frère[h,z], Yoann Gaboreau[o], Pascale Gendron[p], Philippe Girard[q], Olivier Hanon[r], Ahmed Idbaih[s,z], Silvy Laporte[e], Didier Mayeur[t], Farès Moustafa[u], Gilles Pernod[v], Pierre-Marie Roy[w], Marie-Eve Rouge Bugat[x], Jeannot Schmidt[t], Florian Scotte[k], Marie-Antoinette Sevestre[y], Patrick Mismetti[e], Olivier Sanchez[b,f]

…**no diagnostic studies or clinical trials have been published that included exclusively patients with cancer and a central venous catheter (CVC).** For this reason, many questions regarding optimal management of CRT remain unanswered. Due to the paucity of high-grade evidence regarding CRT in cancer patients, guidelines are derived from upper extremity DVT studies for diagnosis, and from those for lower limb DVT for treatment.

In the absence of direct comparative clinical trials, **we suggest treating patients with CRT with a therapeutic dose of either a LMWH or a direct oral factor Xa inhibitor,** with or without a loading dose**. These anticoagulants should be given for a total of at least three months, including at least one month after catheter removal following initiation of therapy.**



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Platelet-adjusted low molecular weight heparin (LMWH) - fondaparinux dosing protocol in onco-hematology patients

Journal of Thrombosis and Thrombolysis (2018) 46:386–392
https://doi.org/10.1007/s11239-018-1711-5

Incidence and outcomes of catheter related thrombosis (CRT) in patients with acute leukemia using a platelet-adjusted low molecular weight heparin regimen

Kay T. Htun[1] · Mabel J. Y. Ma[2] · Agnes Y. Y. Lee[3,4]

Published online: 16 July 2018
© Springer Science+Business Media, LLC, part of Springer Nature 2018

Abstract
Patients with acute leukemia frequently develop catheter-related thrombosis (CRT) despite concurrent thrombocytopenia. The incidence, treatment and outcomes of this complication are poorly documented. We undertook this study to determine the incidence of CRT in patients with acute leukemia and assess the safety and effectiveness of a treatment strategy using a platelet-adjusted low molecular weight heparin (LMWH) dosing protocol. Patients (18 years and older) with newly diagnosed acute leukemia from January 2014 to December 2015 who received central venous catheters were included. The clinical data were reviewed up to 12 months from acute leukemia diagnosis to capture objectively documented CRT events. The outcome events including recurrent venous thromboembolism (VTE), bleeding events, infectious or mechanical complications, and death were reported up to 3 months from the time of CRT diagnosis. The incidence of CRT among 214 patients was 10.7% (23 patients) in the first 12 months after acute leukemia diagnosis. Among 18 patients who were treated with anticoagulation, 14 (78%) received reduced LMWH dosing due to concurrent thrombocytopenia. There were no recurrent VTE episodes, but 3 patients experienced bleeding events while on anticoagulation. Fifteen patients (83%) completed a minimum of 3 months anticoagulation. Twelve patients (52%) experienced an infectious complication, which was the main reason for catheter removal. Deaths occurred in 2 patients, related to underlying acute leukemia during 3 months period following CRT. Symptomatic CRT is frequent in patients with acute leukemia. Platelet-adjusted LMWH dosing may be effective and well tolerated despite thrombocytopenia.

Keywords Catheter related thrombosis · Acute leukemia · Anticoagulant · Low molecular weight heparin · Thrombocytopenia

Journal of Thrombosis and Thrombolysis (2020) 49:426–430
https://doi.org/10.1007/s11239-020-02040-8

PICC-related upper deep venous thrombosis in patients with hematological malignancies. Management of anticoagulant therapy according to the platelet count

Maria Cristina Scamuffa[1] · Salvatore Giacomo Morano[1] · Alessandra Serrao[1] · Antonella Bruzzese[1] · Francesca Stocchi[1] · Cristina Santoro[1] · Federico Vozella[1] · Roberto Latagliata[1] · Antonio Chistolini[1]

Published online: 24 January 2020
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Abstract
Peripherally inserted central catheters (PICCs) for central venous access are frequently used in patients with hematological malignancies. Their use may be complicated by upper extremity deep venous thrombosis (UEDVT). Additionally, hematological patients are frequently thrombocytopenic and the optimal management of UEDVT in patients with thrombocytopenia is challenging and poorly standardized. We retrospectively analyzed 50 adult patients affected by hematological malignancies who presented a PICC-associated UEDVT. UEDVT treatment was compared in 3 groups: patients with a platelet count $\geq 50\times10^9$/l (group1) who underwent a therapeutic dose of low molecular weight heparin (LMWH) or fondaparinux 7.5 mg; patients with a platelet count $< 50\times10^9$/l and $\geq 30\times10^9$/l (group 2) who were treated with a 50% reduced dose of LMWH or fondaparinux 5 mg; patients with platelets $< 30\times10^9$/l (group 3) were observed and treated with anticoagulants when the count was $> 30\times10^9$//l. At the onset of thrombosis, 36 patients were in group 1, 8 in group 2 and 6 in group 3. We observed no hemorrhagic or thrombotic complications related to the anticoagulant therapy; length of treatment was comparable between groups 1 and 2 (51 days group 1 vs 50 days group 2). Reduced doses of LMWH or fondaparinux may represent a safe and effective therapeutic approach in patients with moderate thrombocytopenia ($< 50\times10^9$/l and $\geq 30\times10^9$/l) and a PICC-associated UEDVT.

Keywords PICC · Thrombosis · Thrombocytopenia · Anticoagulant therapy

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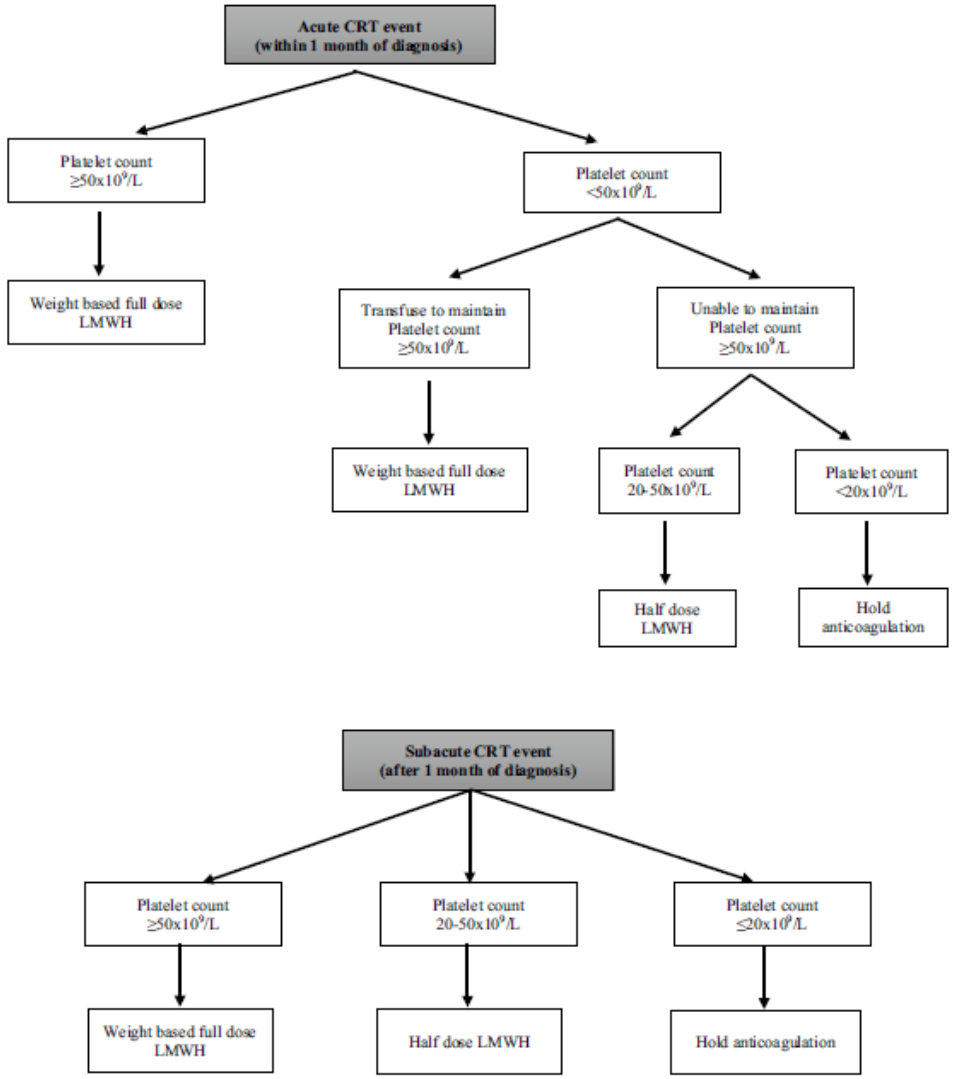

Fig. 1 Treatment algorithm of CRT in patients with acute leukemia. Dalteparin 200 and 100 IU/kg were predominantly used as full dose and half dose weight-based LMWH respectively (creatinine clearance ≥ 30 ml/min)

Table 2 Treatment of CRT and outcomes

	Number, n (%) N = 23
Mode of treatment received for CRT	
Anticoagulant therapy	18 (78%)
Full treatment	4
Partial treatment	14
No anticoagulation	5 (22%)
Median duration of treatment, months (range)	3 (2 weeks to 12 months)
Recurrent thrombosis event	0
Bleeding events	3 (13%)
Major bleeding	1
Clinically relevant non-major bleeding	1
Minor bleeding	1
Infectious complications	12 (52%)
All cause bacteraemia including CRSBI	9
Catheter exit site wound infection	2
Culture negative sepsis	1
Mechanical complications	3 (13%)
Death	
Due to thrombosis	None
Due to bleeding	None
Due to leukemia	2

Thrombolysis

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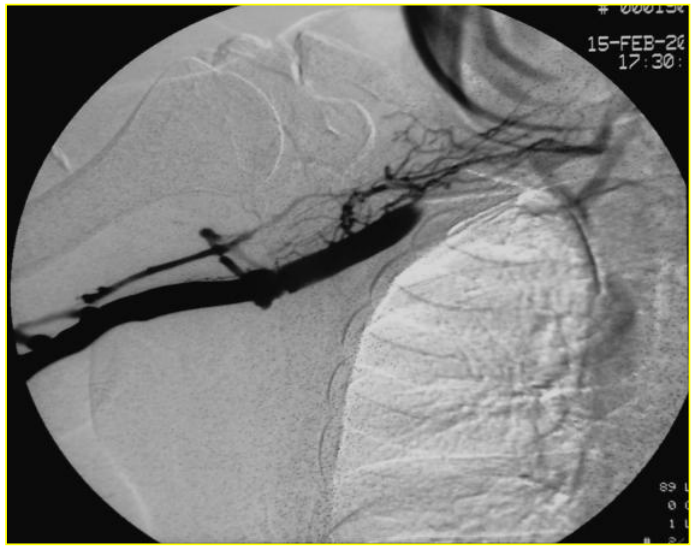
ACCP Guidelines:
For most patients with upper extremity catheter-related DVT, we suggest not instituting deep vein thrombolysis as a first-line therapy. **Compared with anticoagulation, there is insufficient evidence to suggest that thrombolysis leads to better outcomes.**

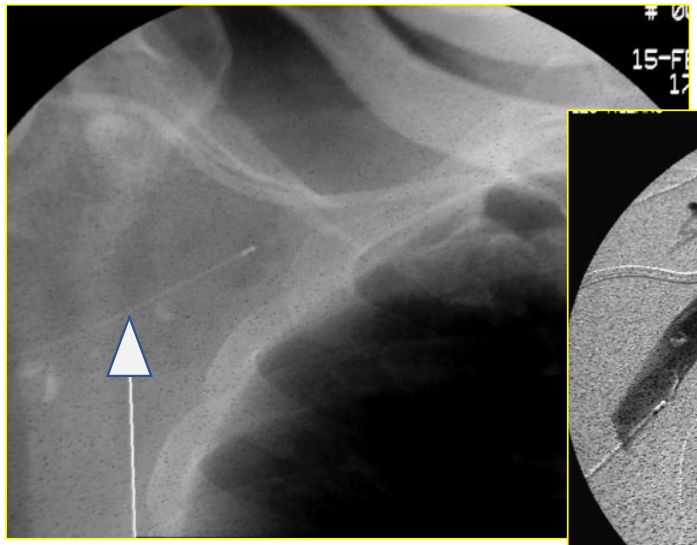
Interventional techniques may also be used to treat PICC-related DVT, especially if the burden of thrombosis is large or if there is concern for phlegmasia.

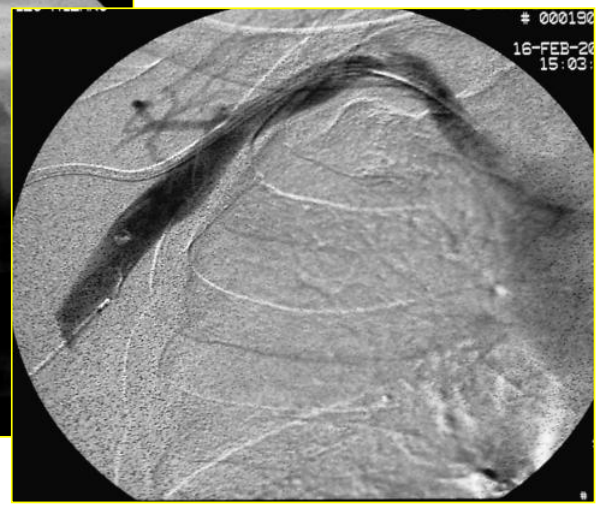
Thrombolysis can be considered for patients who meet the following criteria:

- severe symptoms that do not improve with anticoagulation
- thrombosis spanning both the subclavian and axillary veins
- symptoms <14 days
- good performance status
- life expectancy >1 year
- and low risk for bleeding.

50 to 90 percent clot lysis, an increased risk of bleeding (10 percent).







G AVeCeLT

Trombosi venosa sintomatica insorta nelle 72 ore:
- 1000 UI/kg/h urokinasi attraverso il CVC (12-24 h)
-2000 UI/kg/h urokinasi in vena periferica (12-24 h)

Infusione locale intra-trombo di urokinasi 100.000 UI/h x 72 h

(Agazzi A et al- J Thromb Thrombolysis. 2003).

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The Journal of Vascular Access
Volume 22, Issue 4, July 2021, Pages 501-508
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https://doi.org/10.1177/1129729820947594

Recommendations on anticoagulation for CRT (i.e. 3 months of treatment) are mainly extrapolated from data on non-CRT of deep veins of the lower limb. However, the latter phenomenon is quite different from CRT in terms of pathophysiology. Prolonged anticoagulation is not devoid of risks, while the optimal duration of treatment and following CVAD removal is not clear, due to lack of quality data. In this context, length of treatment is often variable between different institutions, reflecting personal preferences and believes. Therefore, also in this field, further studies are warranted in order to reach a more coherent and uniform approach.

Received: 21 September 2023 | Revised: 8 November 2023 | Accepted: 14 November 2023

https://doi.org/10.1016/j.jtha.2023.11.017

jth

ORIGINAL ARTICLE

Management of catheter-related upper extremity deep vein thrombosis in patients with cancer: a systematic review and meta-analysis

Tzu-Fei Wang[1] | Roger Kou[2] | Marc Carrier[1] | Aurélien Delluc[1]

Department of Medicine, University of Ottawa at The Ottawa Hospital and Ottawa Hospital Research Institute, Ottawa, ON, Canada

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Objective

We performed a systematic review and meta-analysis to evaluate the rates of recurrent VTE and bleeding in patients with cancer and catheter-related upper extremity DVT.

Methods

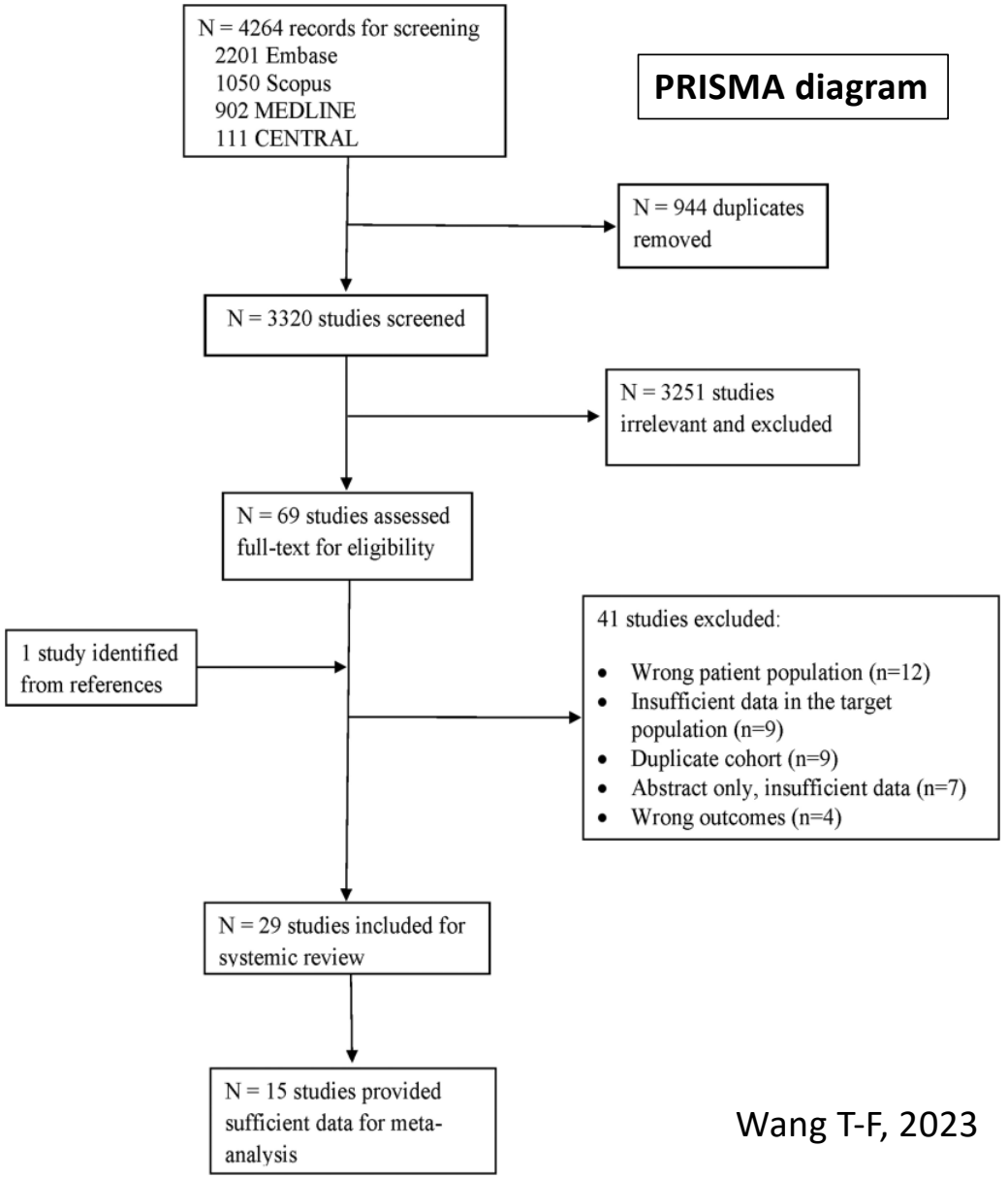
We searched MEDLINE, Embase, Scopus, and CENTRAL from inception to June 2, 2023. The primary efficacy outcome was recurrent VTE, and the primary safety outcome was major bleeding. The incidence rates (with 95% CI) of outcomes were pooled using random effects model.

Results

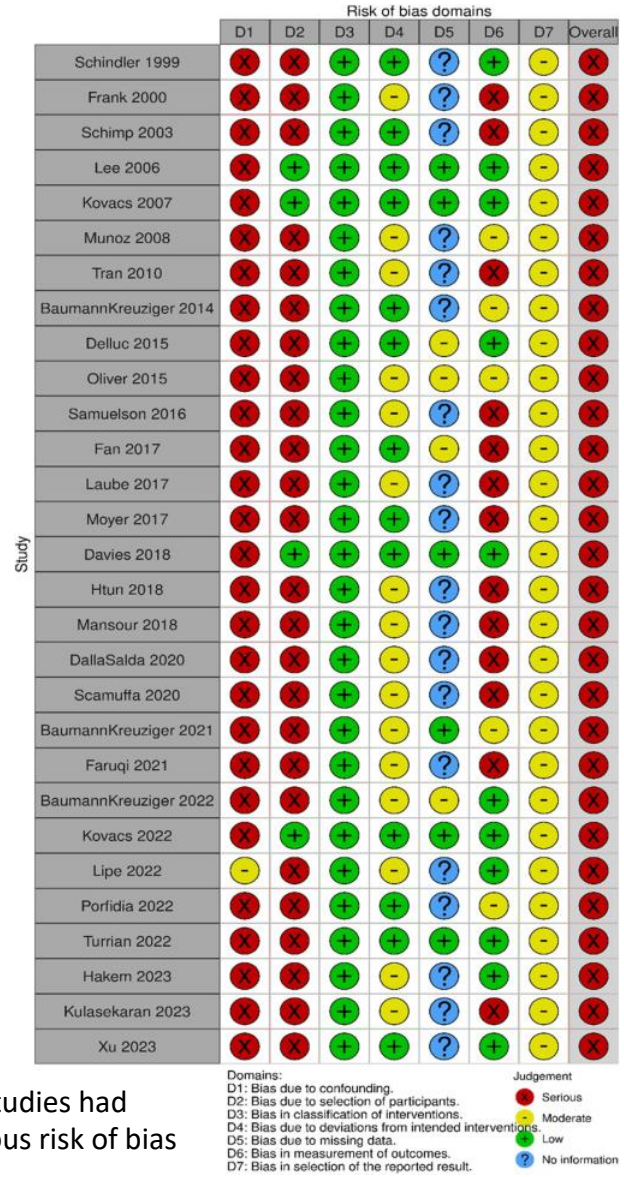
We included 29 studies (N = 2,836), among which 5 were prospective. The duration of follow-up and anticoagulation varied considerably.

<u>The main long-term anticoagulant used was low molecular weight heparin, followed by direct oral anticoagulants</u>.

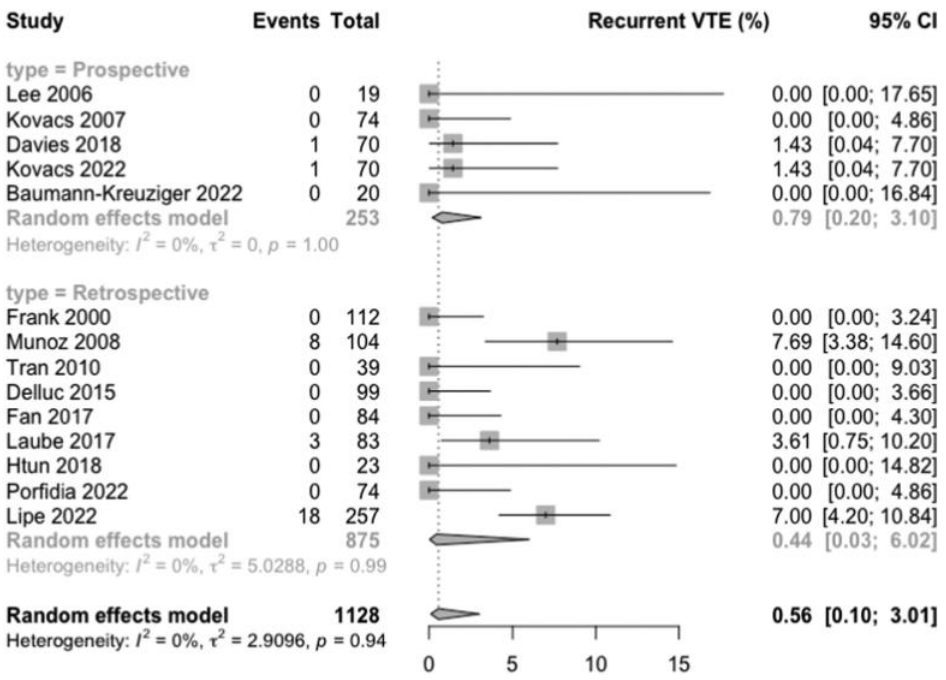
PRISMA diagram



Wang T-F, 2023



All studies had serious risk of bias



The pooled 3-month recurrent VTE rate from 14 studies (N = 1,128) was 0.56% (95% CI, 0.10%-3.01%; I2 = 0%).

Authors were unable to pool event rates beyond 3 months, given high heterogeneity.

Forest plot of pooled 3-month recurrent venous thromboembolism rate in patients with cancer and catheter-related upper extremity deep vein thrombosis (grouped by types of studies, prospective vs retrospective).

Another subgroup analysis by the type of anticoagulants (LMWH/VKA vs DOAC) showed similar rates between LMWH/VKA and DOAC

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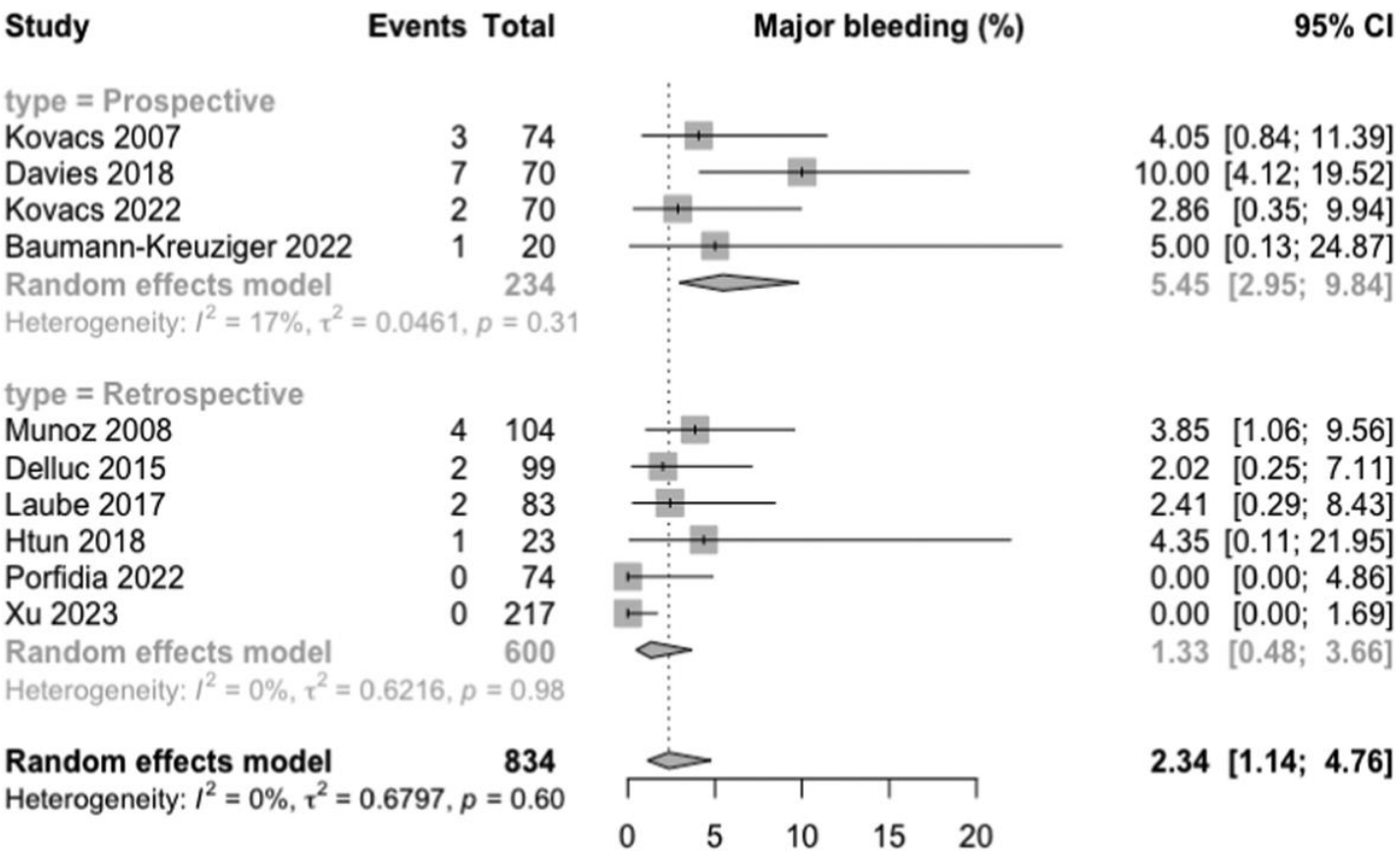
Wang T-F, 2023



The pooled 3-month major bleeding rate from 10 studies (N = 834) was 2.34% (95% CI, 1.14%-4.76%; I2 = 0%).

Authors were unable to pool event rates beyond 3 months, given high heterogeneity.

Forest plot of pooled 3-month major bleeding rate in patients with cancer and catheter-related upper extremity deep vein thrombosis (grouped by types of studies, prospective vs. retrospective).
Another subgroup analysis by the type of anticoagulants (LMWH/VKA vs DOAC) showed similar rates between LMWH/VKA and DOAC.

Conclusions and Key Messages

•Catheter removal should be considered not only for the “classical” indications (secondary malposition, infected thrombus, or complete irreversible occlusion) but also in cases of therapeutic failure after 14 days, for which clinical and instrumental reassessment is mandatory.

•Once left *in situ*, according to most reports and guidelines, the initial management of PICC-related DVT consists of LMWH at a dosage of 100 IU/kg of body weight administered twice daily (and analgesics / NSAID). No head-to-head RCTs.

•A treatment duration of three months is most commonly recommended, followed by vitamin K antagonists administration.

•DOACs—factor Xa or thrombin inhibitors—may represent an alternative to vitamin K antagonists (particularly in oncology patients, given cytochrome P-450 interactions); however, they should be used with caution in the presence of hepatic or renal impairment, pregnancy, bleeding disorders, or mechanical valve prostheses (ONCOLOGY PATIENTS).

•Long-term anticoagulation until PICC removal is advised, whereas discontinuation following catheter removal may be considered, even in patients with active malignancy. This remains a “grey area” requiring further clarification, particularly in the oncologic setting.

•Thrombolysis should be reserved to highly selected cases.

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Gli Accessi Venosi Centrali a Lungo Termine

XVIII PICC Day – Bologna - 2-3 Dicembre 2025

Grazie dell'attenzione

3 Dicembre 202

COME PREVENIRE, DIAGNOSTICARE E TRATTARE LA TROMBOSI DA PICC

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