VTE Prophylaxis: Orthopedic Surgery Perspectives

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Disclosures

- None relevant to this talk

- Board/Committee: OTA, AAOS, ACS, AOA
- Editorial Board: JOT, JAAOS

Thromboembolism Prophylaxis

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Previous Guidelines: AAOS Arthroplasty

- Elective Hip and Knee Arthroplasty (2011)

DVT Prophylaxis

- Major orthopaedic surgery
  - Total knee arthroplasty
  - Total hip arthroplasty
  - Hip fracture surgery
- No guidelines for polytrauma
- Isolated injuries below the knee:
- **We suggest no prophylaxis rather than pharmacologic thromboprophylaxis in patients with isolated lower-leg injuries requiring leg immobilization** (Grade 2C)**.**

CLINICAL GUIDELINES | DECEMBER 3, 2019

American Society of Hematology 2019 guidelines for management of venous thromboembolism: prevention of venous thromboembolism in surgical hospitalized patients

David R. Anderson, Gian Paolo Morgano, Carole Bennett, Francesco Dentali, Charles W. Francis, David A. Garcia, Susan R. Kahn, Maryam Rahman, Anita Rajasekhar, Frederick B. Rogers, Maureen A. Smythe, Kari A. O. Tikkinen, Adolph J. Yates, Tejan Baldeh, Sara Balduzzi, Jan L. Brożek, Itziar Etxeandia- Ikobaltzeta, Herman Johal, Ignacio Neumann, Wojtek Wiercioch, Juan José Yepes-Nuñez, Holger J. Schünemann, Philipp Dahm

Blood Adv (2019) 3 (23): 3898–3944.

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Article history

American Soc. Hematology

- For patients undergoing major surgery in general, the panel made conditional recommendations for mechanical prophylaxis over no prophylaxis, for pneumatic compression prophylaxis over graduated compression stockings, and against inferior vena cava filters.
- In patients undergoing total hip or total knee arthroplasty, conditional recommendations included using either aspirin or anticoagulants, as well as for a direct oral anticoagulant over low-molecular-weight heparin (LMWH). For major general surgery, the panel suggested pharmacological prophylaxis over no prophylaxis, using LMWH or unfractionated heparin. **For major trauma surgery or major gynecological surgery, the panel suggested pharmacological prophylaxis over no prophylaxis.**

OTA Recommendations

- Chemical prophylaxis: The optimal form of VTE prophylaxis is LMWH. Enoxaparin 30mg SQ bid is agent of choice and should be initiated in all trauma patients with musculoskeletal injury (isolated or poly-trauma) within 24 hours if no contraindications. *Rating:Strong*
- The use of unfractionated low-dose heparin, aspirin (and other anti-platelet medications), and warfarin over low molecular weight heparin in the setting of patients with musculoskeletal trauma is not recommended. These agents are recommended over no prophylaxis when LMWH is contraindicated, not available or prohibitive to patient due to cost or choice. *Rating: Moderate*

OTA Recommendations

- Combined prophylaxis with calf SCDs and LMWH over either regimen alone provided that no contraindication to either exists. *Rating:Strong*
- Calf pneumatic compression devices when low molecular weight heparin is contraindicated. *Rating : Moderate*
- AV foot pumps as a form of mechanical prophylaxis only in patients whose lower extremity injuries preclude the use of calf pumps. *Rating: Moderate*
- Initiation of VTE prophylaxis within 24 hours of MSK trauma provided no contraindication exist. *Rating: Strong*

OTA Recommendations

- Continuation of VTE prophylaxis in patients with musculoskeletal and multi-system trauma for at least one month after discharge. *Rating: Limited*
- Do not recommend chemical prophylaxis in patients with isolated lower extremity fractures and **"no other risk factors"** for VTE who are able to independently mobilize. *Rating: Moderate*
- Surgeons discuss prolonged chemoprophylaxis VTE in patients with isolated LE fractures and multiple independent risk factors for VTE. Rating: Consensus

OTA Recommendations

- Do not recommend the routine use of screening protocols for DVT in the asymptomatic trauma patient with musculoskeletal injury. *Rating* : Strong
- Do not recommend the routine use of inferior vena cava filters for either low or high-risk patient to prevent PE unless the patient has a documented DVT or PE despite appropriate prophylaxis. *Rating: Strong*
- Patients thought to be at high-risk for VTE with contraindications to acceptable anticoagulant should be considered candidates for prophylactic IVC filter placement. Rating: Moderate

OTA Recommendations

- While patients with hemodynamically stable solid organ injuries can safely be anti- coagulated after 24 hours provided there is no on-going blood loss, consultation with the general/trauma care surgeon is recommended. *Rating: Moderate*
- While patients with closed head injuries and stable serial head CT scans can safely be anti-coagulated after 24-48 hours provided the neurological exam has not worsened, consultation with the neurosurgeon is recommended. *Rating:* Limited

DVT Prophylaxis

- CHEST Guidelines, 9th Ed.
- **2.1.1. THA/TKA: use >10-14 days: LMWH, fondaparinux, apixaban, dabigatran, rivaroxaban, low-dose unfractionated heparin (LDUH), adjusted-dose vitamin K antagonist (VKA), aspirin** (all Grade 1B)**, or an intermittent pneumatic compression device (IPCD >18h/day)** (Grade 1C)**.**
- **2.1.2. Hip fracture surgery (HFS): use >10-14 days: LMWH, fondaparinux, LDUH, adjusted-dose VKA, aspirin** (all Grade 1B)**, or an IPCD** (Grade 1C)**.**

DVT Prophylaxis

- CHEST Guidelines, 9th Ed.
- **2.3.1/2. TKA/THA/HFS: LMWH in preference to the other agents we have recommended as alternatives**
- Limitations of alternative agents
  - Increased bleeding (fondaparinux, rivaroxaban, and VKA)
  - Decreased efficacy (LDUH, VKA, aspirin, and IPCD alone)
  - Lack of long-term safety data (apixaban, dabigatran, and rivaroxaban).

DVT Prophylaxis

- CHEST Guidelines, 9th Ed.
- **2.4. For patients undergoing major orthopedic surgery, we suggest extending thromboprophylaxis in the outpatient period for up to 35 days from the day of surgery rather than for only 10 to 14 days** (Grade 2B)**.**

ACS TQIP
BEST PRACTICES IN THE MANAGEMENT OF ORTHOPAEDIC TRAUMA

COMMITTEE ON TRAUMA

With respect to VTE prophylaxis, there is moderate evidence supporting the use of pharmacologic prophylaxis in the postoperative period, although there is no single regimen that is preferred.

CLINICAL MANAGEMENT UPDATE

The Journal of TRAUMA® Injury, Infection, and Critical Care

Practice Management Guidelines for the Prevention of Venous Thromboembolism in Trauma Patients: The EAST Practice Management Guidelines Work Group

Frederick B. Rogers, MD, Mark D. Cipolle, MD, PhD, George Velmahos, MD, PhD, Grace Rozycki, MD, and Fred A. Luchette, MD

J Trauma. 2002;53:142–164.

endations

A. Level I: Patients with spinal cord injuries or spinal fractures are at high-risk for venous thromboembolism after trauma.[2–12]

B. Level II:

1. Older age is an increased factor for venous thromboembolism, but it is not clear at what exact age the risk increases substantially.[4,5,9,11,13,14]

2. Increasing Injury Severity Score (ISS) and blood transfusion appear to increase the risk of venous thromboembolism, but this association is still unclear.[3,5,8,9,14,15]

3. Traditional risk factors such as long bone fractures,[3–6,9–13,15–17] pelvic fractures,[3–5,9–12,15,18] or head injuries,[3–9,15] although significantly associated with a high risk of venous thromboembolisms in single-institution studies, were not found to be powerful risk factors on meta-analysis.

WTA - 2020 ALGORITHM

OPEN

Updated guidelines to reduce venous thromboembolism in trauma patients: A Western Trauma Association critical decisions algorithm

Eric J. Ley, MD, Carlos V.R. Brown, MD, Ernest E. Moore, MD, Jack A. Sava, MD, Kimberly Peck, MD, David J. Ciesla, MD, Jason L. Sperry, MPH, MD, Anne G. Rizzo, MS, MD, Nelson G. Rosen, MD, Karen J. Brasel, MPH, MD, Rosemary Kozar, MD, PhD, Kenji Inaba, MD, *and* Matthew J. Martin, MD, *Los Angeles, California*

Isolated Orthopedic Injuries and Direct Oral Anticoagulants

Pharmacologic prophylaxis with direct oral anticoagulants (DOACs) or aspirin should not be a primary choice for pharmacologic prophylaxis for most trauma patients because of the lack of related clinical trials. The use of DOACs or aspirin may be considered in the setting of isolated orthopedic injuries, but only if the patient declines injection with enoxaparin or unfractionated heparin.[5,61–66] Two DOACs are approved for pharmacologic prophylaxis after elective orthopedic surgery, 10 mg of rivaroxaban once daily, and 2.5 mg of apixaban twice daily, both which are direct oral factor Xa inhibitors. Most orthopedic trials that compare rivaroxaban or apixaban to enoxaparin demonstrate that DOACs have equal to better VTE rates with similar to higher bleeding rates.[62–64,66–68] In contrast, other analyses conclude that enoxaparin has a lower VTE rate[69] and a lower bleeding rate.[70] Because only retrospective analyses have examined the use of DOACs for pharmacologic prophylaxis after trauma, randomized controlled trials are necessary before DOACs becoming a primary agent for trauma patients.[66,71,72]

The use of low dose aspirin may also be considered for pharmacologic prophylaxis in trauma patients with isolated orthopedic injuries who decline injection.[2,5,69,73] For those trauma patients started on a DOAC for pharmacologic prophylaxis, aspirin may replace the DOAC after 5 days with similar prevention of VTE.[74]

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Trauma patients with TBI, orthopedic or spine injuries, and those who undergo major surgery are at particular VTE risk and should be considered for postdischarge pharmacologic prophylaxis.

Pharmacologic prophylaxis after discharge for high VTE risk trauma patients is supported by evidence that demonstrates the practice is efficacious, safe, and cost-effective and may be considered for patients with TBI, orthopedic or spine injuries, and those who undergo major surgery.[2,95–98] The highest VTE risk occurs during the first 3 months after injury with approximately 1 year required until the VTE rate returns to that of the general population.[95,97] Venous thromboembolism–related readmissions account for 1.2% of 1-year trauma readmissions at a cost of US $250 million annually.[99]

4 weeks after the date of admission.[2] For those who undergo major orthopedic surgery, pharmacologic prophylaxis may be extended up to 35 days from the date of surgery.[5] Aspirin may be initiated for postdischarge pharmacologic prophylaxis for high VTE risk trauma patients, as it has been shown to be as effective as enoxaparin with less bleeding complications and better postdischarge adherence, and is not limited by the constraints of insurance oversight.[98,100] Direct oral anticoagulants may also be considered for postdischarge pharmacologic prophylaxis after isolated orthopedic injury.[74]

Risk for Postoperative Complications Following Hemiarthroplasty for Femoral Neck Fracture in Patients on Warfarin at the Time of Admission

- OTA Annual Meeting:
- Higher INR at the time of surgery may predispose to increased blood loss, hematoma, and infection
- BUT aggressive reversal increases risk of VTE

BMJ Open

PREVENTion of CLots in Orthopaedic Trauma (PREVENT CLOT): a randomised pragmatic trial protocol comparing aspirin versus low-molecular-weight heparin for blood clot prevention in orthopaedic trauma patients

Robert V O'Toole ,[1] Deborah M Stein,[2] Katherine P Frey,[3] Nathan N O'Hara ,[1] Daniel O Scharfstein,[4] Gerard P Slobogean,[1] Tara J Taylor,[3] Bryce E Haac,[5] Anthony R Carlini,[3] Theodore T Manson,[1] Kuladeep Sudini,[3] C Daniel Mullins,[6] Stephen T Wegener,[7] Reza Firoozabadi,[8] Elliott R Haut,[9] Michael J Bosse,[10] Rachel B Seymour,[10] Martha B Holden,[11] Ida Leah Gitajn,[12] Samuel Z Goldhaber,[13] Alexander L Eastman,[14] Gregory J Jurkovich,[15] Heather A Vallier,[16] Joshua L Gary,[17] Conor P Kleweno,[8] Joseph Cuschieri,[18] Debra Marvel,[19] Renan C Castillo,[3] METRC

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ABSTRACT

Introduction Patients who sustain orthopaedic trauma are at an increased risk of venous thromboembolism (VTE), including fatal pulmonary embolism (PE). Current guidelines recommend low-molecular-weight heparin (LMWH) for VTE prophylaxis in orthopaedic trauma patients. However, emerging literature in total joint arthroplasty patients su[illegible] al benefits of VTE prophylaxis [illegible] The primary aim of this trial is to compare aspirin with LMWH as a thromboprophylaxis in fracture patients.

Screenshot

Strengths and limitations of this study

- Current guidelines indicate that many fracture patients should receive medication to reduce the risk of venous thromboembolism; however, there is no consensus on the best thromboprophylaxis for this patient population.
- PREVENT CLOT was designed using patient preference research and prescribing trends in orthopaedic trauma to ensure the findings can be easily adopted into clinical practice.

International Consensus Meeting on Venous Thromboembolism
Swiontkowski, Marc; Parvizi, Javad
The Journal of Bone and Joint Surgery. 104(Suppl 1):1-3, March 16, 2022.

Recommendations from the ICM-VTE: General

The ICM-VTE General Delegates*

International Consensus Meeting on Venous Thromboembolism
Swiontkowski, Marc; Parvizi, Javad
The Journal of Bone and Joint Surgery. 104(Suppl 1):1-3, March 16, 2022.

135 international societies, 68 countries, and various specialties, including anesthesia, cardiology, hematology, internal medicine, and orthopaedics, analyzed the literature in a systematic review format to create practical recommendations related to all subspecialities in orthopaedics that would also have global applications. Nearly 600 experts who followed the strict Delphi process[5], as in prior ICM activities[6,7], to generate the monumental document that is available at **https://journals.lww.com/jbjsjournal/toc/2022/03161**

Recommendations from ICM-VTE: Trauma

- Most optimal VTE PPX in patients with
  - Multiple orthopaedic injuries: Lovenox

Recommendations from ICM-VTE: Trauma

Most optimal VTE PPX in Polytrauma patients with fractures and visceral injuries:

- Once there is evidence that there is no active bleeding, we recommend anticoagulant thromboprophylaxis, generally with weight-based LMWH and generally within 24 hours after injury. For TBI, when consecutive brain imaging is stable for ICB (usually 24 - 36 hours after injury), we recommend starting anticoagulant thromboprophylaxis.
- For patients at high risk for bleeding, we recommend starting SCD

Recommendations from ICM-VTE: Trauma

Most optimal VTE PPX in Polytrauma patients with fractures and visceral injuries:

- Early fixation of unstable fractures to reduce pain, promote mobility and decrease VTE risk. If fracture repair will be delayed, we recommend that LMWH thromboprophylaxis not be delayed.
- Early mobility and daily physiotherapy should also be encouraged; for example, increased risk of DVT was seen after spinal injuries in which spinal precautions persisted beyond 72 hours compared with a shorter time in spite of routine use of SCD in both groups.

Recommendations from ICM-VTE: Trauma

Most optimal VTE PPX in Polytrauma patients with fractures and visceral injuries:

- Thromboprophylaxis generally be limited to the length of hospital stay.
- For patients undergoing in-patient rehabilitation, we recommend continuation of thromboprophylaxis with either a direct oral anticoagulant such as rivaroxaban (generally our preference) or with LMWH.
- Standardized VTE prophylaxis policies, embedded in routine order sets, as well as periodic audits of adherence.

Recommendations from ICM-VTE: Trauma

- Optimal management of patients on anticoagulation presenting with extremity trauma needing surgery: should involve a risk-benefit assessment weighing the risk of bleeding against the risk of thrombosis

Recommendations from ICM-VTE: Trauma

- Concerning VTE risk, which surgeries can be considered major and which surgeries can be considered non-major in orthopaedic trauma? Surgical procedures in the upper extremity and distal to the ankle can be considered nonmajor. The risk of venous thromboembolism (VTE) increases in the lower limb from the distal leg (or ankle) to the pelvis, with higher risk associated with more proximal surgeries. In addition to location of surgery, length of surgery and expected post-operative mobility must be considered

Recommendations from ICM-VTE: Trauma

- Is routine VTE PPX indicated with isolated lower extremity fracture that is nonop (also for casting): no
- Duration of immobilization also does not influence it

Recommendations from ICM-VTE:

- Does WALANT for tibia/fibula fracture fixation have an increased risk of VTE events?
- Response/Recommendation: Whether wide-awake local anesthesia no tourniquet (WALANT) for tibia/fibula fracture fixation has a risk of venous thromboembolism (VTE) compared to other techniques for tibia/fibula fracture is unknown.
- We recommend using anticoagulant prophylaxis as per existing thromboprophylaxis guidelines, independent of the technique used.

Thank you!

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References available upon request