



# VTE prophylaxis administration in trauma patients: we are still behind the eight ball

Amanda L Teichman ,<sup>1</sup> Asanthi Ratnasekera <sup>2</sup>

**To cite:** Teichman AL, Ratnasekera A. VTE prophylaxis administration in trauma patients: we are still behind the eight ball. *Trauma Surg Acute Care Open* 2024;**9**:e001398. doi:10.1136/tsaco-2024-001398  
 ► Additional supplemental material is published online only. To view, please visit the journal online (<https://doi.org/10.1136/tsaco-2024-001398>).

The authors should be commended for addressing this important question regarding the implementation of a pharmacist-driven, low-molecular-weight heparin (LMWH) dosing protocol. The burden of venous thromboembolism (VTE) and LMWH dosing regimens in trauma is well studied. However, previous data have shown that up to one-third of trauma patients on ‘standard’ 30 mg two times per day LMWH have subprophylactic anti-Xa levels.<sup>1–3</sup> Furthermore, studies have found mixed results regarding the impact of anti-Xa level-based dosing on VTE rates.<sup>4–6</sup>

Niziolek *et al* add to the growing body of literature on this topic. The authors found that in this intensive care unit (ICU) trauma population, nearly 40% of those who reached target anti-Xa levels were *not* on traditional 30 mg two times per day dosing. Furthermore, there was no difference in VTE regardless of anti-Xa level, LMWH dose, nor adherence to dosing protocol. Notably, almost 67% of the critically ill trauma patients did not receive LMWH during their ICU admission.<sup>7</sup> The rationale for lack of chemoprophylaxis is not apparent and may not be representative of critically ill trauma populations across other centers. Perhaps, this group precluded chemoprophylaxis due to solid organ injuries, traumatic brain injuries, spinal cord injuries, or ongoing bleeding concerns; hence had chemoprophylaxis initiated post-ICU period or died prior to initiation. Nevertheless, more data regarding VTE and current chemoprophylaxis prescribing practice patterns would be valuable.

It remains unclear why anti-Xa levels are inconsistently associated with VTE prevention. Perhaps there are mitigating patient factors which are incompletely understood contributing to this finding, especially in an ICU population with concomitant metabolic derangements and varying creatinine clearance. Additionally, as alluded to by the authors, assessment of the non-ICU trauma population may have demonstrated a favorable correlation between incidences of VTE and LMWH dosed to prophylactic anti-Xa level.<sup>7</sup>

One challenge of anti-Xa-based LMWH dosing regimens is ensuring precise timing of peak/trough levels. Niziolek and colleagues achieved 91% compliance with their dosing protocol, a credit to the ICU pharmacists at their institution.<sup>7</sup> While impressive, the reproducibility of this initiative at other less resource rich institutions may present

challenges with compliance, as well as accuracy of peak/trough level timing.

In summary, although LMWH is well established as the agent of choice for VTE chemoprophylaxis, the optimal dosing strategy is still uncertain. Questions regarding patient factors contributing to VTE while on chemoprophylaxis, anti-Xa level monitoring and VTE outcomes, as well as institutional protocols around dose monitoring persist.

**Correction notice** This article has been corrected since it published online to include the correct affiliation for Asanthi Ratnasekera.

**Contributors** ALT and AR contributed significantly to this work. Both were involved in content, writing, and critical revisions.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Commissioned; internally peer reviewed.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## ORCID iDs

Amanda L Teichman <http://orcid.org/0000-0003-4120-8345>  
 Asanthi Ratnasekera <http://orcid.org/0000-0003-4618-088X>

## REFERENCES

- Ratnasekera AM, Kim D, Seng SS, Jacovides C, Kaufman EJ, Sadek HM, Perea LL, Monaco C, Shnaydman I, Lee AJ, *et al*. Early VTE prophylaxis in severe traumatic brain injury: A propensity score weighted EAST multicenter study. *J Trauma Acute Care Surg* 2023;**95**:94–104.
- Costantini TW, Min E, Box K, Tran V, Winfield RD, Fortlage D, Doucet J, Bansal V, Coimbra R. Dose adjusting Enoxaparin is necessary to achieve adequate venous thromboembolism prophylaxis in trauma patients. *J Trauma Acute Care Surg* 2013;**74**:128–33;
- Teichman AL, Cotton BA, Byrne J, Dhillion NK, Berndtson AE, Price MA, Johns TJ, Ley EJ, Costantini T, Haut ER. Approaches for optimizing venous thromboembolism prevention in injured patients: findings



► <http://dx.doi.org/10.1136/tsaco-2023-001287>

© Author(s) (or their employer(s)) 2024. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

<sup>1</sup>Division of Acute Care Surgery, Department of Surgery, Rutgers Robert Wood Johnson Medical School, New Brunswick, New Jersey, USA

<sup>2</sup>ChristianaCare Health System, Newark, DE, USA

## Correspondence to

Dr Amanda L Teichman;  
[ateich13@rwjms.rutgers.edu](mailto:ateich13@rwjms.rutgers.edu)



- from the consensus conference to implement optimal venous thromboembolism prophylaxis in trauma. *J Trauma Acute Care Surg* 2023;94:469–78.
- 4 Ko A, Harada MY, Barmparas G, Chung K, Mason R, Yim DA, Dhillon N, Margulies DR, Gewertz BL, Ley EJ. Association between Enoxaparin dosage adjusted by Antifactor Xa trough level and clinically evident venous thromboembolism after trauma. *JAMA Surg* 2016;151:1006–13.
  - 5 Tran A, Fernando SM, Gates RS, Gillen JR, Droege ME, Carrier M, Inaba K, Haut ER, Cotton B, Teichman A, *et al.* Efficacy and safety of anti-Xa-guided versus fixed dosing of low molecular weight heparin for prevention of venous thromboembolism in trauma patients: A systematic review and meta-analysis. *Ann Surg* 2023;277:734–41.
  - 6 Karcutskie CA, Dharmaraja A, Patel J, Eidelson SA, Padiadpu AB, Martin AG, Lama G, Lineen EB, Namias N, Schulman CI, *et al.* Association of anti-factor Xa-guided dosing of Enoxaparin with venous thromboembolism after trauma. *JAMA Surg* 2018;153:144–9.
  - 7 Niziolek G, Mangan L, Weaver C, Pendergast V, Lamore R, Zielke M, *et al.* Inadequate prophylaxis in trauma patients: anti-Xa guided Enoxaparin dosing management in critically ill trauma patients. *Trauma Surg Acute Care Open* 2024.