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London fog here, there and everywhere

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Commentary on "Identification of Major Hemorrhage in Trauma Patients in the Pre-hospital Setting: Diagnostic Accuracy and Impact on Outcome" (Short Title: Pre-hospital Identification of Major Traumatic Hemorrhage) by Jared M Wohlgemut, *et al*. (tsaco-2023-001214.R1)

Level of Evidence: NA

In December 1952, a toxic fog enveloped London for 5 days resulting in thousands of deaths. This tragic event finally prompted life-saving air pollution mitigation policies in London and elsewhere.[1] It appears we need a similar wake-up call with haemorrhage. Despite initiatives such as STOP THE BLEED®, prehospital tranexamic acid and prehospital transfusion, haemorrhage remains the leading cause of preventable death in trauma patients in both civilian and military settings.[2–4] The present study by Wohlgemut *et al* examined the accuracy of London Air Ambulance physician diagnosis of traumatic major haemorrhage (MH) in the prehospital setting.[5] The authors found that MH was correctly identified in 97 out of 138 patients (sensitivity of 70%) and accurately excluded in 764 out of 809 (specificity 94%). Penetrating mechanism and abdominal injury were independently associated with missed MH diagnosis, and delayed diagnosis was independently associated with a threefold increase in mortality.

This study underscores the challenges of early recognition of MH, most likely due to early physiological compensation. Indeed, MH was missed in 41 of 138 patients by attending physicians of anaesthesia, intensivist and emergency medicine backgrounds resulting in increased risk of mortality. Overdiagnosis also represents a significant challenge leading to wasted hospital resources. Although this study could not presently be replicated in the USA due to limited physician presence in the prehospital environment, in Philadelphia, we face the same challenges with early recognition and diagnosis of MH due to rapid police transport of at-risk patients to trauma centres.[6]

Artificial intelligence (AI) and machine learning (ML) may facilitate early recognition of MH and increased diagnostic accuracy by leveraging very subtle cues indicating compensated haemorrhagic shock that may quickly spiral into uncompensated shock.[7] In a similar fashion, use of AI or ML in the prehospital setting could augment physician and medic or paramedic assessment leading to improved diagnostic accuracy. With increased awareness of the diagnostic challenges associated with early MH recognition, and eventually the assistance of AI, we will hopefully clear the fog that continues to envelop our massively bleeding trauma patients here, there and everywhere.

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REFERENCES

1 Bell ML, Davis DL. Reassessment of the lethal London fog of 1952: novel indicators of acute and chronic consequences of acute exposure to air pollution. *Environ Health Perspect* 2001;109 Suppl 3:389–94.
2 Longo DL, Cannon JW. Hemorrhagic shock. *N Engl J Med* 2018;378:370–9.
3 Sperry JL, Guyette FX, Adams PW. Prehospital plasma during air medical transport in trauma patients at risk for hemorrhagic shock. *N Engl J Med* 2018;379:1783:315–26.:.
4 Shackelford SA, Del Junco DJ, Powell-Dunford N, Mazuchowski EL, Howard JT, Kotwal RS, Gurney J, Butler FK Jr, Gross K, Stockinger ZT. Association of Prehospital blood product transfusion during medical evacuation of combat casualties in Afghanistan with acute and 30-day survival. *JAMA* 2017;318:1581–91.
5 Wohlgemut JM, Pisirir E, Stoner R, *et al*. Identification of major hemorrhage in trauma patients in the pre-hospital setting: diagnostic accuracy and impact on outcome. *Trauma Surgery & Acute Care Open* 2023.
6 Winter E, Byrne JP, Hynes AM, Geng Z, Seamon MJ, Holena DN, Malhotra NR, Cannon JW. Coming in hot: police transport and Prehospital time after firearm injury. *J Trauma Acute Care Surg* 2022;93:656–63.
7 Benjamin AJ, Young AJ, Holcomb JB, Fox EE, Wade CE, Meador C, Cannon JW. Early prediction of massive transfusion for patients with traumatic hemorrhage: development of a multivariable machine learning model. *Ann Surg Open* 2023;4:e314.