Haemoview Diagnostics
Redefining coagulation

CUSTOMER INFORMATION BRIEF

ClotPro® IN/HI-Test for Monitoring Unfractionated Heparin in Critically Ill Patients

Summary of Mirus et al., BMC Anesthesiology, 2026

Why this matters

Unfractionated heparin (UFH) remains widely used in Australian ICUs for ECMO, renal replacement therapy, and high-risk thromboprophylaxis. aPTT is the traditional bedside surrogate, but disease-related coagulopathy, factor deficiencies, and inflammation common in critical illness can blunt or distort the aPTT response to UFH. Anti-Xa activity is a more specific measure but is not universally available 24/7, and turnaround can be slow when decisions are needed at the bedside.

Mirus et al. evaluated whether the **ClotPro® IN/HI-Test CT ratio** – a whole-blood viscoelastic point-of-care measurement – can align more closely with Anti-Xa than aPTT in critically ill, predominantly ECMO patients.

Study at a glance

Study	Single-centre prospective observational study
Setting	ICU, University Hospital Carl Gustav Carus, TU Dresden, Germany
Period	September 2020 – July 2022
Population	75 ICU patients on IV unfractionated heparin (UFH); 466 matched datasets
Patient mix	55 (73.3%) on ECMO; 44 (58.6%) with septic shock; median age 59; 76% male
Tests compared	ClotPro® CT IN/HI ratio, aPTT, Anti-Xa (reference standard)

What the ClotPro® IN/HI-Test measures

- **IN-test** – activates the intrinsic pathway using ellagic acid; sensitive to UFH effect.
- **HI-test** – same activation plus heparinase, which neutralises UFH and reveals the underlying clotting time.
- **CT IN/HI ratio** = clotting time of IN-test divided by clotting time of HI-test. A higher ratio reflects greater UFH effect, independent of baseline coagulation status.

Key findings

- CT IN/HI ratio out-performed aPTT for detecting each Anti-Xa category – AUCs 0.817 vs 0.726 (prophylactic), 0.690 vs 0.494 (therapeutic), 0.845 vs 0.708 (overdosed).
- Moderate agreement with Anti-Xa classification for CT IN/HI ratio (kappa = 0.450); aPTT agreement was insufficient (kappa = 0.220).
- Suggested CT IN/HI ratio cut-offs: > 1.4 (subtherapeutic), > 1.9 (therapeutic), > 2.3 (overdosed).
- CT IN/HI rose stepwise across Anti-Xa categories, whereas aPTT plateaued between sub-therapeutic and therapeutic UFH levels (52 s in both bands).

Comparison of CT IN/HI ratio and aPTT against Anti-Xa

Metric	CT IN/HI ratio	aPTT	Anti-Xa range (reference)
AUC – prophylactic	0.817	0.726	< 0.30 IU/mL
AUC – therapeutic	0.690	0.494	0.50–0.69 IU/mL
AUC – overdosed	0.845	0.708	≥ 0.70 IU/mL
Agreement vs Anti-Xa (kappa)	0.450 (moderate)	0.220 (insufficient)	—
Median – prophylactic	1.464	43 s	< 0.30 IU/mL
Median – subtherapeutic	1.843	52 s	0.30–0.49 IU/mL
Median – therapeutic	2.268	52 s	0.50–0.69 IU/mL
Median – overdosing	2.726	55 s	≥ 0.70 IU/mL

AUC = area under the ROC curve. Kappa = Cohen's kappa for agreement with Anti-Xa categories. Source: Mirus et al., BMC Anesthesiology 2026.

Practical implications for ICU and ECMO settings

- Provides a whole-blood, bedside read of UFH effect with turnaround in minutes – useful when Anti-Xa is unavailable, delayed, or batch-run.
- May support faster titration decisions in ECMO, septic shock, and other high-acuity scenarios where aPTT can be unreliable.
- Complements – not replaces – Anti-Xa as the analytical reference standard for UFH monitoring.
- Integrates into existing ClotPro® viscoelastic workflows already used for global haemostatic assessment.

Important clinical considerations

- Single-centre, observational design with 75 patients; majority on ECMO – generalisability to broader ICU cohorts requires further study.
- Device-specific CT IN/HI thresholds need local validation before being embedded in protocols.
- The study did not demonstrate improved clinical outcomes (bleeding, thrombosis, mortality).
- Anti-Xa is itself an analytical surrogate, not a clinical endpoint – discordance between any two assays should be interpreted with the full clinical picture.
- Implementation requires consideration of reagent cost, operator training, quality assurance, and 24/7 availability.

Suggested customer conversation points

- How frequently does your unit need an Anti-Xa result faster than your laboratory can deliver one?
- Where in your ECMO or ICU anticoagulation pathway is aPTT currently the rate-limiting test?
- What governance and validation steps would your service require to introduce CT IN/HI thresholds locally?
- Would a viscoelastic point-of-care UFH signal change how quickly your team escalates or de-escalates therapy?

Source

Mirus M, Dietze A, Tiebel O, Beyer-Westendorf J, Grottke O, Tesch F, Spieth PM, Heubner L. *Viscoelastic point-of-care testing for monitoring unfractionated heparin in critically ill patients: a prospective observational study comparing ClotPro® IN/HI-Test, aPTT and Anti-Xa activity*. BMC Anesthesiology. Published 24 March 2026.

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Disclaimer

Visual summary

At-a-glance comparison of the three UFH monitoring strategies evaluated in Mirus et al., BMC Anesthesiology 2026: Anti-Xa (analytical reference), aPTT (traditional bedside surrogate), and the ClotPro® CT IN/HI ratio (whole-blood viscoelastic point-of-care).

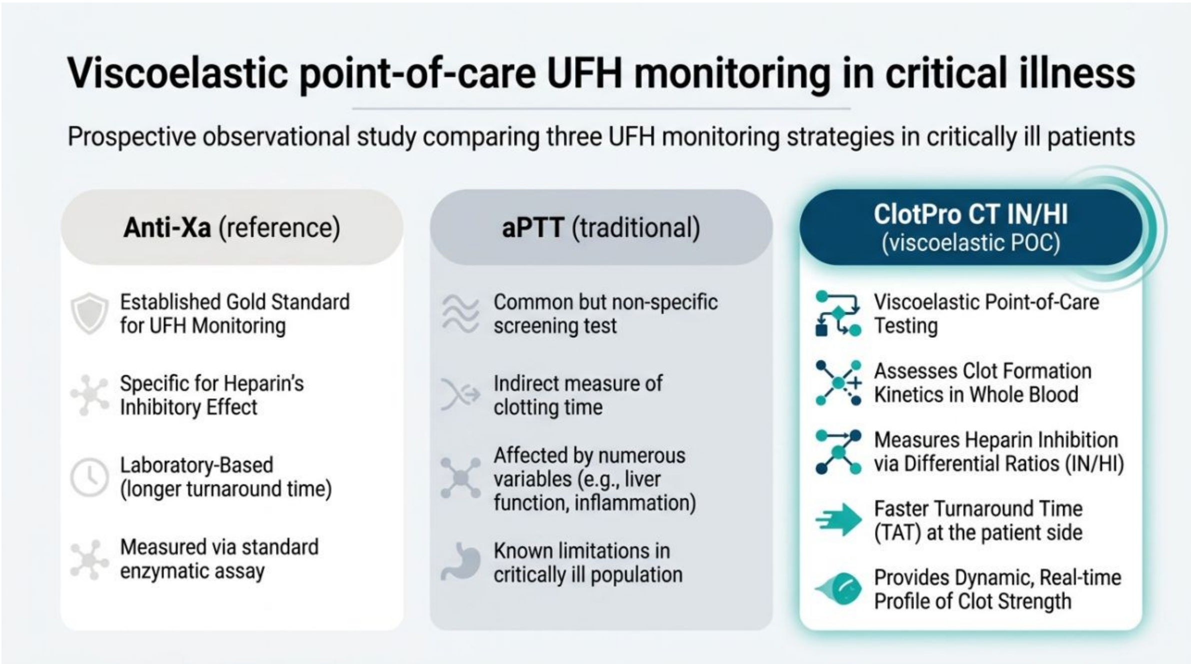

Figure: UFH monitoring strategies compared. Reproduced from the source publication.

Key takeaways from the figure

- **Anti-Xa** – established reference for UFH activity; specific to heparin's inhibitory effect but laboratory-based, with longer turnaround.
- **aPTT** – widely used screening test but an indirect measure of clotting time, affected by many variables (e.g. liver function, inflammation), with known limitations in critically ill patients.
- **ClotPro® CT IN/HI** – whole-blood viscoelastic point-of-care test that measures heparin inhibition via differential IN/HI ratios, with faster bedside turnaround and a dynamic, real-time profile of clot formation.

Source and disclaimer

Mirus M et al. BMC Anesthesiology 2026. **DOI:** https://doi.org/10.1186/s12871-026-03781-4 | **PubMed:** https://pubmed.ncbi.nlm.nih.gov/41877048/ | **PMC:** https://pmc.ncbi.nlm.nih.gov/articles/PMC13063743/