

A monocentric evaluation study on the compound method for forensic death time estimation

Anders-Lohner S. ^{1*}, Rimkus-Ebeling F. ², Dietz E. ², Raupach T ³, Ondruschka B. ², Heinrich F. ^{2,4}

*lead presenter

¹ s.anders-lohner@uke.de, University Medical Center Hamburg-Eppendorf, Institute of Legal Medicine, Germany

² University Medical Center Hamburg-Eppendorf, Institute of Legal Medicine, Germany

³ University Hospital Bonn, Institute for Medical Education, Germany

⁴ Department of Medical Statistics, London School of Hygiene and Tropical Medicine, London, UK

In the early post-mortem interval, the compound method for time since death (TSD) estimation, according to Henssge and Madea, has been established internationally and is composed of temperature- and non-temperature-based examination techniques. The temperature model is based on the monocentric work of Henssge on 39 corpses, and despite the wide usage of the method, evaluation studies are scarce.

We carried out a single-blinded cohort study on 76 deceased individuals with a known time of death (TOD) using conditions comparable to the work of Henssge. Individuals >18 years were assigned to cold (9.3°C) and warm storage (19.7°C) conditions. We aimed to evaluate the prediction accuracy of this model in our cohort.

In this cohort, the actual TOD was compatible with the 95% prediction interval (PI) for the TSD in 36.8% of cases (95% CI: 26.1 to 48.7, $p < 0.0001$). When adjusting for confounder variables, with every 1-unit increase in BMI, corpses had 1.11 (95% CI: 1.02 to 1.21, $p = 0.02$) times the odds of compatibility between the actual TOD and the 95% PI for the TSD. Warm-stored corpses had 4.40 (95% CI: 1.24 to 15.65, $p = 0.02$) times the odds of compatibility between TOD and the 95% PI that cold-stored corpses had when adjusting for confounder variables. Allowing for an interaction between admission time and storage conditions and adjusting for confounder variables, with every hour increase in time from death until admission, cold-stored corpses had 0.55 (95% CI: 0.36 to 0.83, $p = 0.01$), and warm-stored corpses had 1.38 (95% CI: 0.85 to 2.24, $p = 0.20$) times the odds of compatibility.

In summary, we found strong evidence against the null hypothesis of a 95% coverage of the 95% PI for the TSD obtained from the Henssge equations in our cohort. Several factors were associated with the odds of compatibility between the actual TOD and the 95% PI. Our results suggest that neglecting the effect of several relevant variables by Henssge might contribute to our findings regarding the limited predictive accuracy of the model. Considering factors beyond a corpse's weight as potential modifiers of corpse cooling kinetics might help gain prediction accuracy of the actual TOD.