

The first 48 hours belong to the embolus: mode, timing and bedside predictors of late in-hospital death after acute pulmonary embolism

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Background. Risk stratification of acute pulmonary embolism (PE) is performed once, at presentation. We asked who dies after the first 48 hours, of what, and whether a bedside reassessment at 48 hours adds to it.

Methods. Of 1,650 patients with CT-confirmed acute PE in a registry of 11 German university hospitals (2019–2023), we analysed the 1,602 alive at the end of day 2 for in-hospital death thereafter. A baseline model (age, cancer, ESC category, CT RV/LV ratio) was compared with the same model plus three 24–48-hour variables (heart rate, supplemental oxygen, intensive care or ventilation), and with presenting heart rate and oxygen added instead, by likelihood-ratio test, corrected AUC and leave-one-centre-out validation. A three-item reassessment rule was compared with baseline low-risk definitions, including for 30-day death.

Results. Of 125 deaths with a known day, 47 (38%) occurred on days 0–2, 72% of them embolic; 78 (62%) occurred later, 37% embolic. Late mortality was 4.9%; the intermediate-high category and RV/LV ratio were not associated with it. The 48-hour variables raised the corrected AUC from 0.71 to 0.81 (0.77 in held-out centres), but presenting heart rate and oxygen achieved almost as much (0.80 vs 0.81, $n = 1,207$); the 48-hour variables still added information ($p < 0.001$; AUC gain 0.02), chiefly heart rate and escalated care. Patients with no criterion (46%) had late mortality of 1.6% in hospital and 2.1–3.0% at 30 days, similar to sPESI 0 (1.8%; 1.8–2.7%), which cleared 27%; seven of the nine missed deaths were embolic, on days 4–8. No criterion plus sPESI 0 cleared 18% at 0.5%.

Conclusions. Late death after PE is mostly non-embolic and follows physiology rather than the ESC imaging and biomarker criteria. A 48-hour reassessment adds modestly to presenting physiology; a negative reassessment lowers but does not remove risk and should not by itself shorten monitoring.

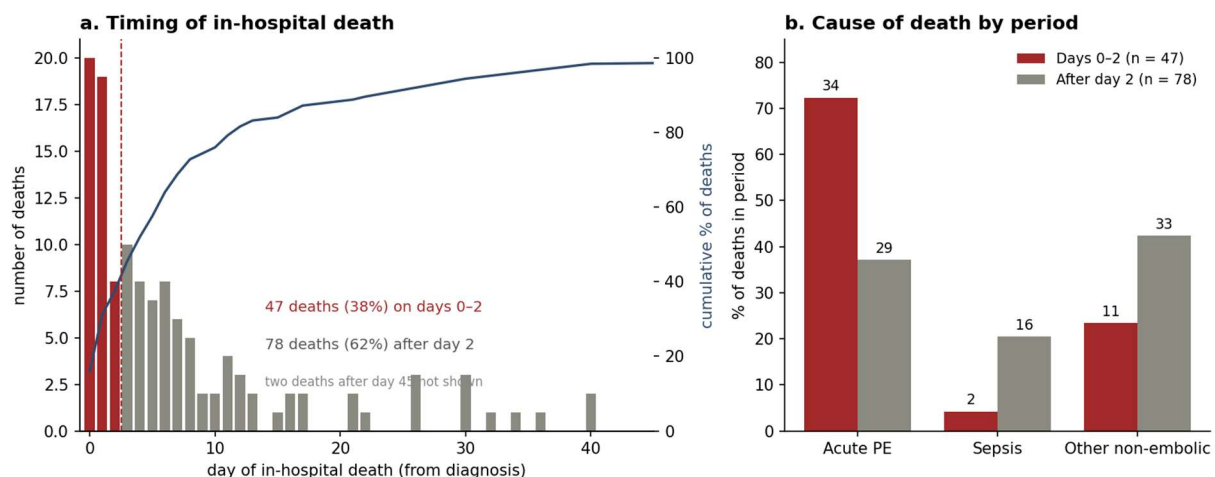


Figure. Timing and cause of in-hospital death ($n = 125$ deaths with a recorded day). (a) Deaths per day from diagnosis (red, days 0–2; grey, later) with the cumulative percentage of all deaths. (b) Cause of death by period: 72% of early deaths were embolic versus 37% of late deaths ($\chi^2 p < 0.001$).