

Kolloquium „Statistische Methoden in der empirischen Forschung“

Wann: 20. Oktober 2020, 17:00 – 18:30 Uhr

Wo: Online

Martin Wolkewitz (Universität Freiburg)

Multistate models to analyse clinical COVID-19 data

The clinical progress of patients hospitalized due to COVID-19 is often associated with severe pneumonia which may require intensive care, invasive ventilation, or extracorporeal membrane oxygenation (ECMO). The length of intensive care and the duration of these supportive therapies are clinically relevant outcomes. From the statistical perspective, these quantities are challenging to estimate due to episodes being time-dependent and potentially multiple, as well as being determined by the competing, terminal events of discharge alive and death. We used multistate models to study COVID-19 patients' time-dependent progress and provide a statistical framework to estimate hazard rates and transition probabilities. These estimates can then be used to quantify average sojourn times of clinically important states such as intensive care and invasive ventilation. The multistate approach gives important insights into the progress of COVID-19 patients in terms of ventilation duration, length of ICU stay, and mortality. In addition to avoiding frequent pitfalls in survival analysis, the methodology enables active cases to be analyzed by allowing for censoring. The stacked probability plots provide extensive information in a concise manner that can be easily conveyed to decision makers regarding healthcare capacities. Furthermore, clear comparisons can be made among different baseline characteristics. Several applications to recent COVID-19 studies will be provided.

References

Hazard, D, Kaier, K, von Cube, M, Grodd, M, Bugiera, L, Lambert, J, Wolkewitz, M (2020). Joint analysis of duration of ventilation, length of intensive care, and mortality of COVID-19 patients: a multistate approach. *BMC Med Res Methodol*, 20, 1:206.

Maja von Cube, Marlon Grodd, Martin Wolkewitz, Derek Hazard, Jerome Lambert. Harmonizing heterogeneous endpoints in COVID-19 trials without loss of information - an essential step to facilitate decision making medRxiv 2020.03.31.20049007; doi: <https://doi.org/10.1101/2020.03.31.20049007>

Wolkewitz M, Lambert J, von Cube M, Bugiera L, Grodd M, Hazard D, White N, Barnett A, Kaier K. Statistical Analysis of Clinical COVID-19 Data: A Concise Overview of Lessons Learned, Common Errors and How to Avoid Them. *Clin Epidemiol*. 2020;12:925-928

Siegbert Rieg, Maja von Cube, Johannes Kalbhenn, Stefan Utzolino, Katharina Pernice, Lena Bechet, Johanna Baur, Corinna N Lang, Dirk Wagner, Martin Wolkewitz, Winfried V Kern, Paul Bieber. COVID-19 in-hospital mortality and mode of death in a dynamic and non-restricted tertiary care model in Germany medRxiv 2020.07.22.20160127; doi: <https://doi.org/10.1101/2020.07.22.20160127>