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Stratification of Cancer Patients Using Visit Trajectory Analysis

Keywords: Patient trajectories, Healthcare networks, Cancer care, Temporal sequence analysis, Network medicine

Extended Abstract

Understanding how patients move through the healthcare system offers valuable insights into the complexity of medical care. Cancer patients, in particular, interact with many different parts of the system—from hospital stays to outpatient appointments and routine checkups. These interactions create a timeline of events that can reveal important patterns in how care is delivered and how it affects patient outcomes. By identifying these patterns, we can better tailor treatments to individual patients, allocate healthcare resources more effectively, and gain deeper insights into how multiple conditions interact in cancer care.

We analyzed comprehensive medical records from cancer patients at a large university hospital. Each patient's healthcare journey was mapped as a chronological sequence of medical events across different care settings. When patients had gaps longer than 21 days between visits, we marked these as "pause" periods to account for inactive phases in their care. We also standardized diagnostic information by converting various text descriptions into consistent ICD-10 medical codes.

To compare these patient journeys, we used a technique called Dynamic Time Warping (DTW), which has been successfully applied in earlier studies of patient disease trajectories [1]. This method measures how similar different trajectories are to each other, considering both the types of medical events and how often certain conditions appear together. We focused our analysis on typical cases by excluding the 10% shortest and 10% longest patient trajectories, which helped reduce potential bias from unusual cases. Using hierarchical clustering on the DTW distance matrix, we identified nine distinct groups of patients with similar healthcare pathways.

We then examined whether belonging to different clusters was associated with important health outcomes. The results were striking: patients in different trajectory groups showed significant differences in mortality rates as well as validated measures of mental health, including depression and anxiety levels. This suggests that the patterns we discovered capture clinically meaningful differences that are not apparent from standard demographic information or diagnosis codes alone. These findings demonstrate that how patients move through the healthcare system—not just their initial diagnosis—provides important clues about their overall health trajectory.

References

[1] Aikaterini Giannoula et al. "Identifying temporal patterns in patient disease trajectories using dynamic time warping: A population-based study". In: *Scientific Reports* 8.1 (2018), p. 4216.

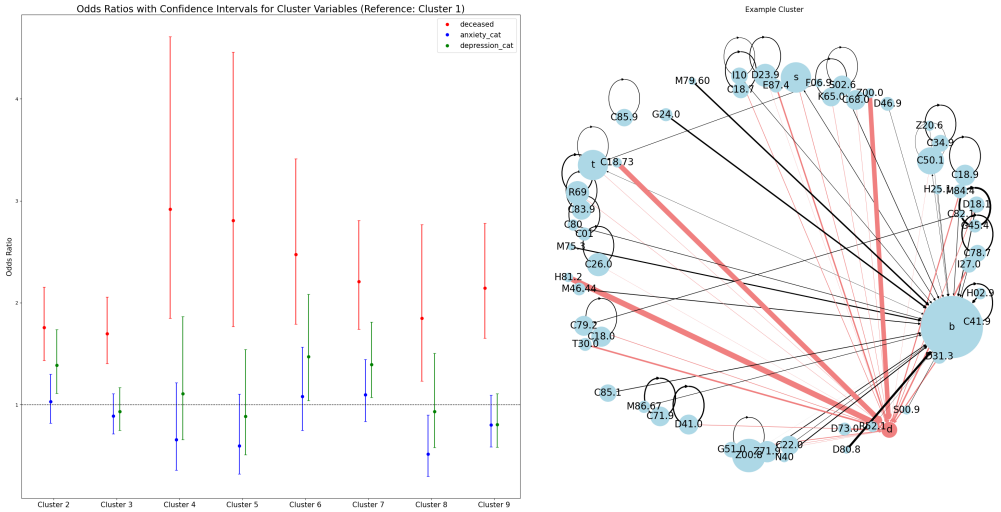

Figure 1: **Results.** Left: Regression results for outcome variables. Right: Example cluster with transitions between hospitalisations and diagnoses.