Multistate Model of Chronic Wound Disease Using a State-wide Patient Registry

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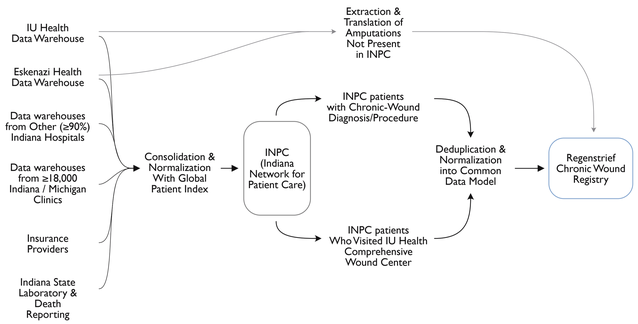
Introduction

- Chronic wounds are a global health issue that cost the US alone at least $25 billion annually.[1]
- Understanding their epidemiology can be facilitated by health information exchanges (HIEs), which aggregate patient data from multiple facilities.
- The **Indiana Network for Patient Care** (INPC) is one of the U.S.'s largest HIEs, which covers over 17 million patients across Indiana.[2]
- We used the INPC to create the new **Regenstrief Chronic Wound Registry**, a registry of **152,237** people with chronic wounds:



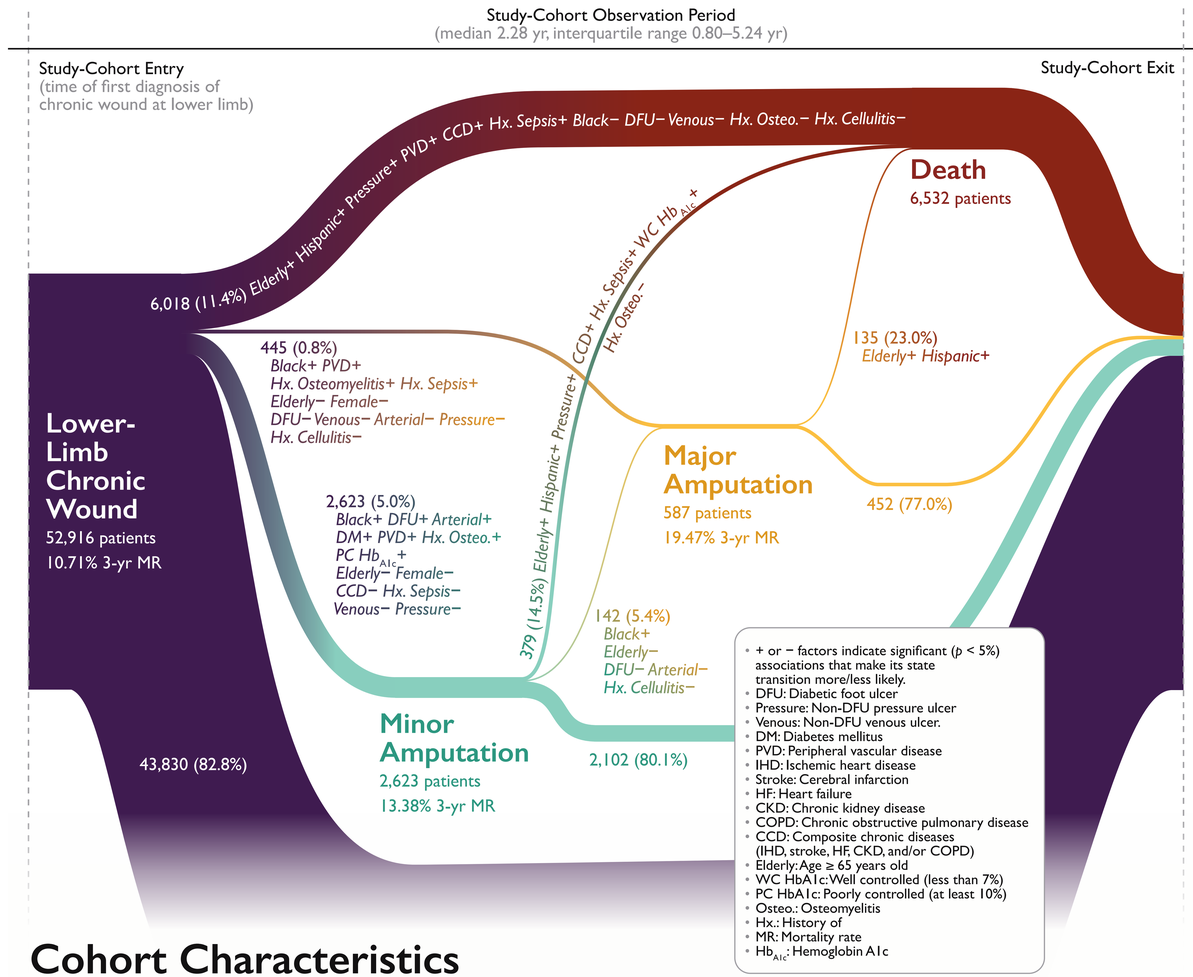
- We examined the progression of lower-extremity chronic wounds to outcomes such as amputation and death using a **multistate model**.
- We also predicted **individualized patient risks** for several simulated patients.

Methods

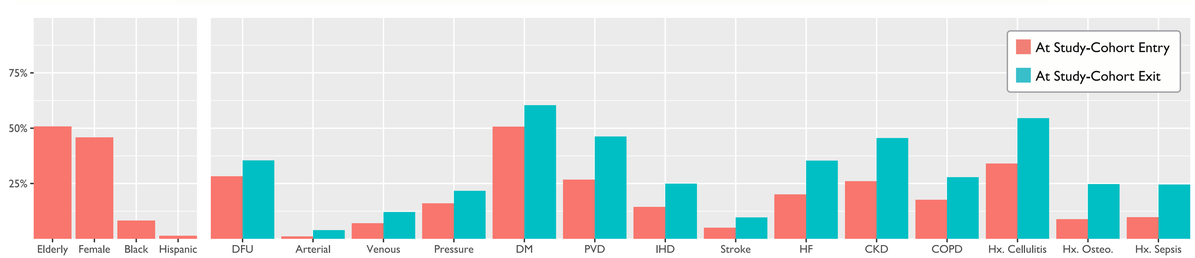
- We retrospectively studied a cohort of the Registry who were first diagnosed with lower-extremity chronic wounds at age 18–100, during **2011–2021**.
- The multistate model tracked disease progression from initial diagnosis to three other possible states: minor amputation, major amputation, and/or death.
- Cox proportional-hazards models evaluated associations between each transition and 17 factors for age, gender, wound type, diabetic control based on hemoglobin A_{1c}, comorbidities, and infection history.
- Individualized transition probabilities were predicted for 16 simulated patients with varying factor values using the Aalen–Johansen estimator.

Multistate Model & Significant Transition Factors

- **52,916** cohort patients flowed through the multistate model during their observation periods.
- Model showed positive associations between Black race; Hispanic ethnicity; history of osteomyelitis, sepsis, or PVD; and several types of transition to the amputation or death states.

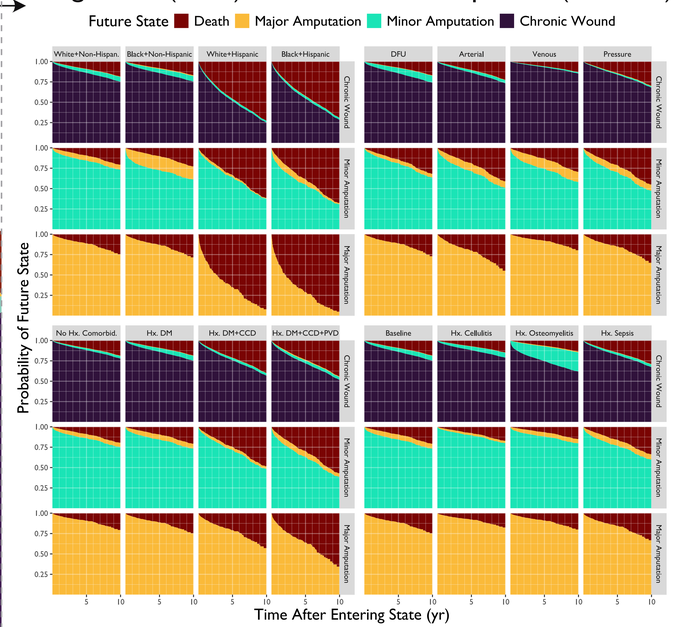


Cohort Characteristics



State Probabilities

- Overall 5-year mortality rates were 10.71% after wound diagnosis, 13.38% after minor amputation, and 19.47% after major amputation.
- Stacked cumulative transition probabilities from entering states (rows) for each simulated patient (columns):



Conclusions

- The Registry's large dataset enables new insights into chronic-wound disease progression.
- Our individualized risk predictions can enhance clinical decision making, potentially leading to better-targeted interventions and healthcare resources.

References

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