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Identifying Transmission Dynamics and Infection Hotspots of Clostridioides difficile Infection in a Community-Based Hospital

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Background: Clostridioides difficile infection (CDI) represents a significant healthcare challenge, with the CDC estimating 500,000 annual cases in the United States, leading to substantial morbidity, mortality, and over $1 billion in healthcare costs.

Objective: This study aims to develop a methodology and algorithm to analyze the spatiotemporal movement of patients within a hospital, identifying transmission dynamics and infection hotspots of CDI.

Methods: Data from 623 patients at a California hospital, collected between August 2019 and June 2022, were analyzed. Variables included room locations, dates, and times of patient stays. The methodology will track patient movements to determine if non-infected patients stayed in close proximity to CDI-positive patients for a significant amount of time and later became infected.

Results: The study will develop an algorithm to analyze spatiotemporal patterns of patient movements, taking into account the duration in each location, total hospital stay duration, and the number of movements within the hospital. This analysis will identify the most common movement chains between hospital rooms and larger units, thereby pinpointing infection hotspots.

Outcome: The expected outcome is a visualization matrix showing patient movement patterns and proximity to CDI-positive patients, identifying high-risk areas within the hospital.

Conclusion: CDI remains a critical public health issue with high incidence and severe outcomes. This study aims to provide a novel approach to analyzing patient movements within hospitals, identifying high-risk areas and informing targeted interventions. The methodology developed can be applied to other nosocomial infections to identify transmission dynamics and infection hotspots, ultimately improving infection control measures and patient outcomes.

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