

Optimizing inter-facility patient transfer decisions during a pandemic: A queueing network approach

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Engineering



Background

Geographical mismatch between demand for care and availability of healthcare resources has been a major challenge during the COVID-19 pandemic.

Inter-hospital patient transfers have emerged as a key aspect of the pandemic response in many countries including Canada.

In Ontario, more than 3000 acutely ill hospitalized patients were transferred during the pandemic. The transfer decisions were made by expert opinion and without a systematic approach.

Methodology

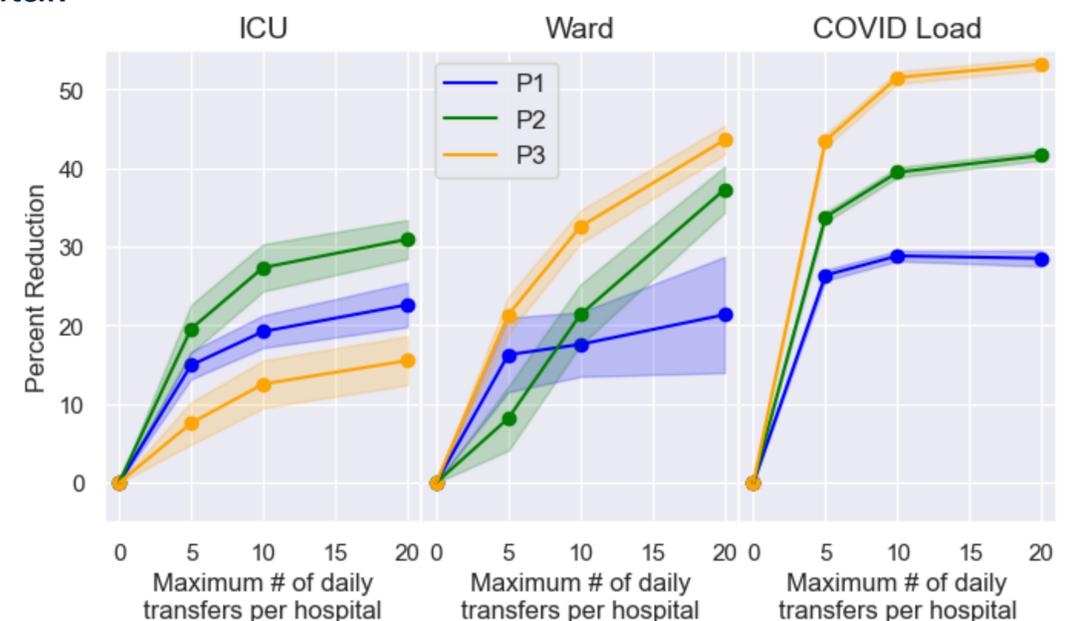
A queueing network model of patient flow within and between hospitals of a health system.

A fluid control problem to find approximately optimal transfer decisions that minimize over-occupancy in wards, ICUs, and balance COVID load in the network.

Case study using data from 21 hospitals in the GTA and three distinct periods (P1, P2, P3) during the COVID-19 pandemic.

Results

The proposed transfer policy leads to significant reduction of the Performance metrics compared to no transfers. Most of the benefits were achieved using a maximum of 5 daily transfers per hospital.



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