
TARGETED HEALTHCARE-NETWORK INFECTION CONTROL MEASURE
DERIVED BY THE MATHEMATICAL STUDY

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We consider a generalized SIS-type ODE system with impulses describing the spread of pathogens in the healthcare network. The model encodes into a network the structure of patients' transfers between hospitals and their admissions/discharges to communities. We investigate the basic mathematical properties of a model such as the existence of solutions, their non-negativity as well as the existence and stability of steady states. Furthermore, the existence of the non-negative τ -periodic solution of the considered system is shown. Our main result is a derivation of sufficient conditions guaranteeing network suppression of infection. The procedure, which combines the structural and dynamical properties of a model, indicates hospitals which are the most prone to high bacteria prevalence. Based on that results we propose the number of interventions that lead to the stability of a disease-free steady state. The derived measure of infectiousness of medical facilities is obtained based on spectral estimates. As an illustration of the results, we present a model of hospital-acquired multidrug-resistant bacteria transmission based on real patient hospital records provided by a German insurance company.

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