Reducing the Spread of Drug-resistant Bacteria in the Healthcare Network Using Mathematical Modelling Approach

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We compare the effectiveness and estimate the costs of selected intervention strategies designed to reduce the spread of multidrug-resistant bacteria in a regional network of healthcare facilities. The proposed model is based on our previous research [1]–[5] and combines intra-hospital pathogen transmission with direct and indirect inter-hospital transfers and readmissions of patients. Additionally, we distinguish three patient groups: a class of patients with a single hospital stay and two classes with low and high patient susceptibilities to colonisation with multidrug-resistant bacteria. The considered facility-level intervention strategies are applied to either all patients or to selected patient groups. While it is just the individual facilities or patient groups in facilities that undergo interventions, they are selected specifically to lower the prevalence in the whole network. The simulations, based on German anonymised insurance data, suggest that strategies aimed at selected patient groups may significantly reduce the system-wide prevalence and be more cost-effective than those aimed at the whole hospital population, up to a certain cost.

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