

Modeling hospital-acquired infections

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Overview

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Introduction

- In 2011, 75'000 patients died in the US due to hospital-acquired infections.
- 1 out of 25 hospital patients in the US end up with hospital-acquired infections
- Contraction of hospital-acquired infections depends on hospital bedding arrangements
- 1, 2, or 3 bed wards exist in hospitals
- Currently there is no robust way of preventing hospital-acquired infections epidemics

Motivation

- Better understanding of spread of the infections
- Facilitating better hospital systems design and management to insure safer hospital environment

Objective

- To design and implement an agent-based model to simulate spreading of hospital-acquired infections
- To obtain the optimal ratio between patients and staff
- To obtain sufficient number of sanitary facilities given number of staff and patients

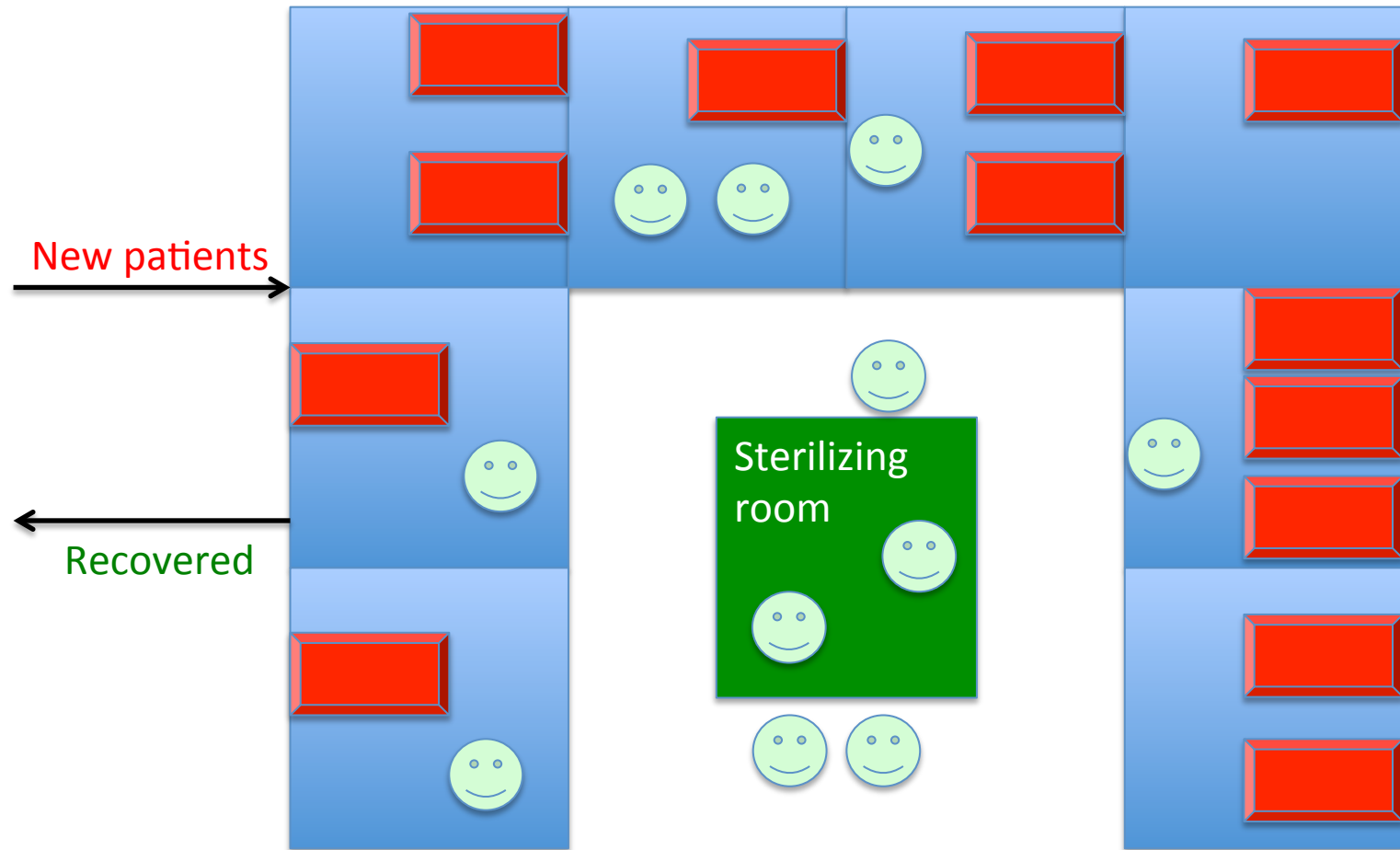
Model description

- A model based on the SIR(Susceptible, Infectious, Recovered) model
- To include a stochastic approach addressing uncertainty involved in data for model parameterization

General assumptions

- Hospital is modeled as a grid of rooms containing 1, 2 or 3 patients and varying number of staff
- Infection spreads to susceptible patients or staff through interaction
- Staff moves between rooms, patients stay immobilized
- No interaction between separate rooms
- Recovered patients become susceptible eventually
- Staff carries infections
- Staff should attempt to go through sanitary process

Environment of hospitals



Mechanisms

- Contract the disease
- Recovery takes place on time-dependent basis with a given probability
- Become susceptible after recovery on time-dependent basis with a given probability
- Staff get cleaned in sterilizing room

Summary

- Hospital-acquired infections are a serious problem of hospitals.
- We aim to develop a model to better understand spreading of hospital-acquired infections
- The approach we will use is the SIR model