

Given the current pandemic, the perils of infectious viruses have been made evident to the world. The consequences of these viruses are further exacerbated when they spread rapidly within an immuno-compromised population. One prime example of this is the spread of viruses within hospital wards. As such, our group has decided to use an agent-based model to simulate this spread of infections between patients and healthcare workers in a healthcare setting, and how the distribution of hospital resources can affect it. These resources include the number of beds per ward and the number of healthcare workers. The model aims to improve decision-making in hospital management, specifically targeting budgeting and resource allocation so as to minimize the spread of infections while maintaining cost-effectiveness. The model would prove significantly useful in light of future outbreaks, especially after what the world has seen with COVID-19.

In this model, we examine and identify the resource availability factors that play a role in controlling the spread of infections within the hospital setting. Given the high footfall and large distances covered by healthcare workers daily, across different wards and rooms, these workers come into contact with a high number of individuals present in the hospital. Although safety measures and hygienic practices are in place, healthcare workers still run a risk of being infected or acting as a carrier of infections when interacting with patients' and contact surfaces. As such, given the high number of interactions between these hospital staff and patients, it is possible that these agents propagate the spread of infections. This is a concern particularly for unknown and emerging pathogens which do not have treatments yet.

In addition, COVID-19 has taught us that appropriate and efficient handling of infections is vital to prevent resource depletion and ensure that hospitals are not oversubscribed, which would be detrimental to both the healthcare system and population-wide control of infectious diseases. Hence, we aim to allow users to simulate the possible consequences of their resource management strategies, and thus be able to make better resource-related decisions. In our model, insufficient resources can lead to an overflow of patients at waiting areas across varying infection rates, thus depriving these patients of much-needed treatment. On the other hand, an excess of resources can lead to wastage and higher costs. Delayed patient care, as shown by the build up of patients at waiting areas, has often been associated with higher mortality rates and a lower quality of life. Thus, it is imperative that hospitals streamline their resource allocation to improve the lives of their patients through more informed decision-making.