# Discrete Event Simulation to Improve Services at The Pharmacy

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The outpatient pharmacy is usually the last stop of a patient's outpatient visit in a hospital. The generic workflow in pharmacy includes four steps: 1) receive and confirm prescription, 2) pick and pack medications, 3) check and dispense medications, and 4) payment. A smooth experience in pharmacy is crucial to the patient's satisfaction of his/her visit.

There are many initiatives to improve service levels, enhance accessibility and reduce waiting time in the pharmacy. For instance, setting up satellite pharmacies next to specialist outpatient clinics would provide a better service experience and reduce patient travelling time. One-stop billing that combines consultation and pharmacy fees would simplify the payment procedure. Deploying automatic pick and pack machines can accelerate the processing time and reduce error rates. All these initiatives need to be evaluated to ensure their operational efficiency before applying them to actual practice.

Discrete event simulation (DES) is a simulation technique of constructing a simulation model of a real system mainly for two purposes – the first is to understand the behaviour of the current system, and the second is to test various what-if scenarios. The following case study illustrates how DES can be applied to outpatient pharmacy planning.

The pharmacy department in Tan Tock Seng Hospital planned to set up satellite pharmacies on each level of specialist outpatient clinics to create a better service experience for private patients. A DES analysis was conducted to evaluate different scenarios of satellite pharmacy setup in terms of patient waiting time and manpower configurations. DES models were constructed to simulate different scenarios of satellite pharmacy setups – to pack at centralised pharmacy or satellite pharmacy; to pack upon confirmation or pre-pack before confirmation.

Data was then collected to estimate the model parameters including daily prescription load; timing of receive, confirm, pick and pack, check, dispense, billing; timing of tube system; rework rate, etc. Different manpower configurations were then tested to ensure that the 95th percentile patient waiting time was within 15 minutes.

Sensitivity analysis was conducted on the tube system and rework rate to detect the system bottleneck. Simulation results showed that more manpower would be needed in the satellite pharmacy to maintain the same patient waiting time in the centralised pharmacy. It was not suggested to pack at the centralised pharmacy if the tube system becomes the bottleneck. Pre-packing was suggested to streamline the process if the rework rate was relatively low.

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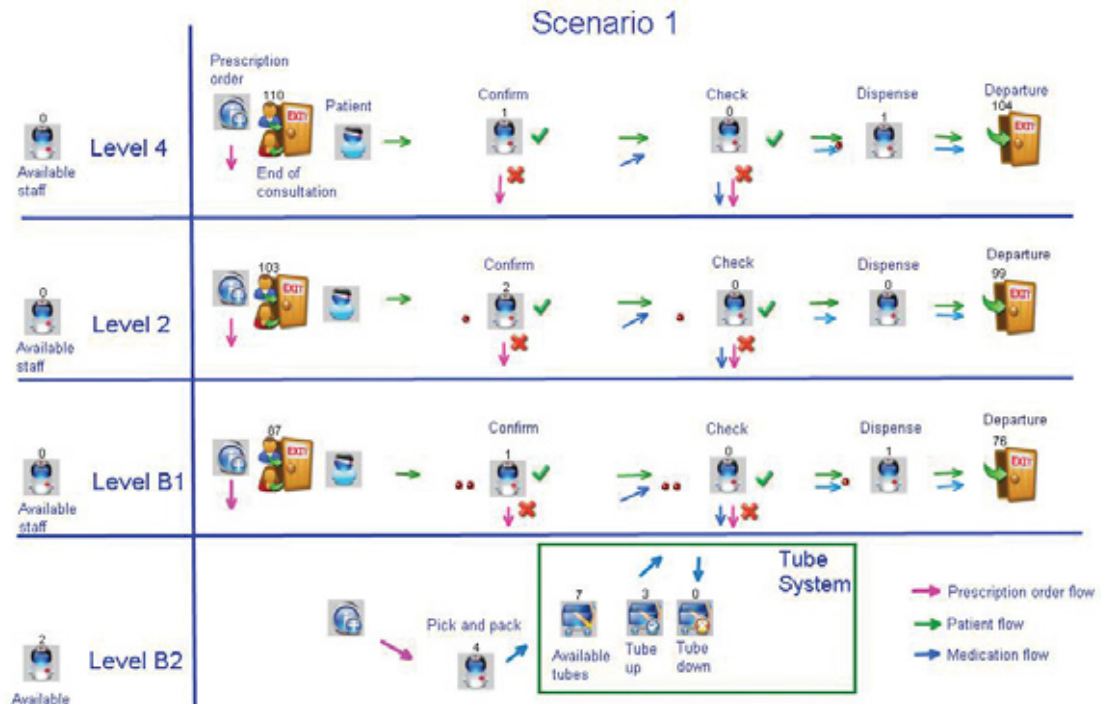


*Example of a scenario of satellite pharmacy setup in the simulation model*