



Singapore Healthcare Management 2018

Development of a DES-based Decision Support System for Operating Theatre Optimization

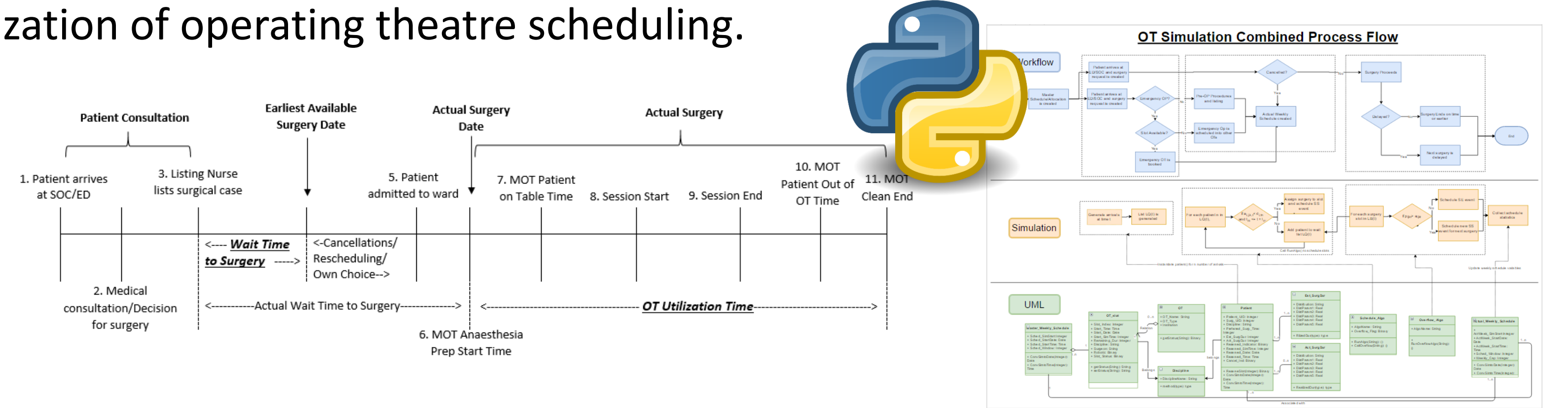
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Background

Operating Theatres (OTs) are essential facilities that allow surgical cases to be performed safely and effectively. Performing surgical cases involves the coordination of several resources, making the scheduling of such surgical cases a complex process. The aim of this study is to develop a decision support system which consolidates such information for the optimization of operating theatre scheduling.

A discrete event simulation (DES) model on the operating theatre scheduling process was developed using Python 2.7 and used to address various policy and planning problems. Operational data was used to determine current parameters for the DES model and for the surgery duration predictive model.

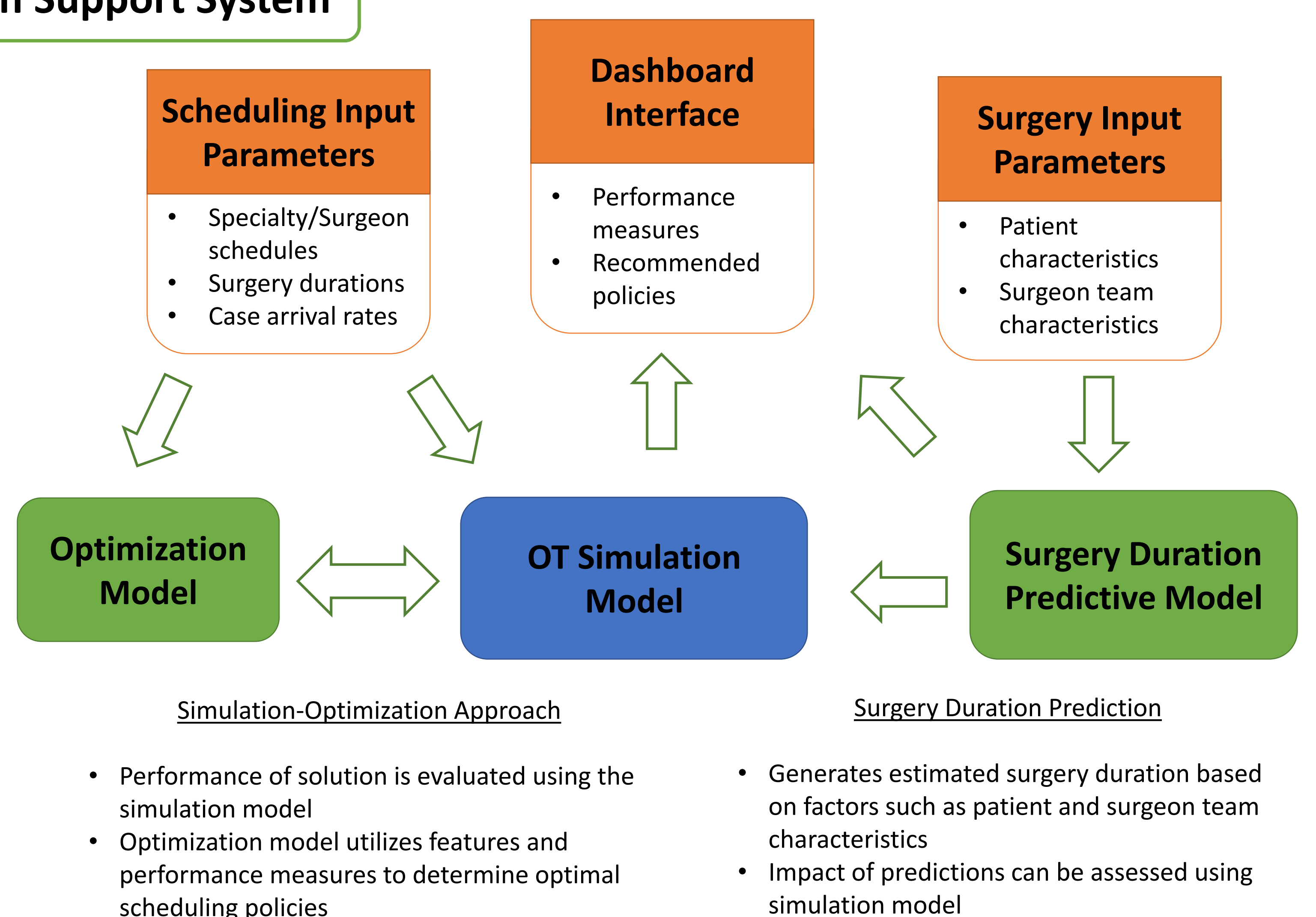


Decision Support System

The simulation model can be coupled with an optimization model and a surgery duration predictive model to provide recommended OT scheduling decisions in a **Decision Support System (DSS)**. The outputs from the models are visualized in a dashboard to examine the results of the recommended policies.

The DSS can be used to:

- Provide a virtual environment to evaluate scheduling policies or sensitivity analyses on performance measures
- Generate suitable scheduling policy recommendations using simulation-optimization approaches
- Generate predicted estimates for surgery duration based on surgery and patient characteristics
- Visualize recommended policies and results on a dashboard interface

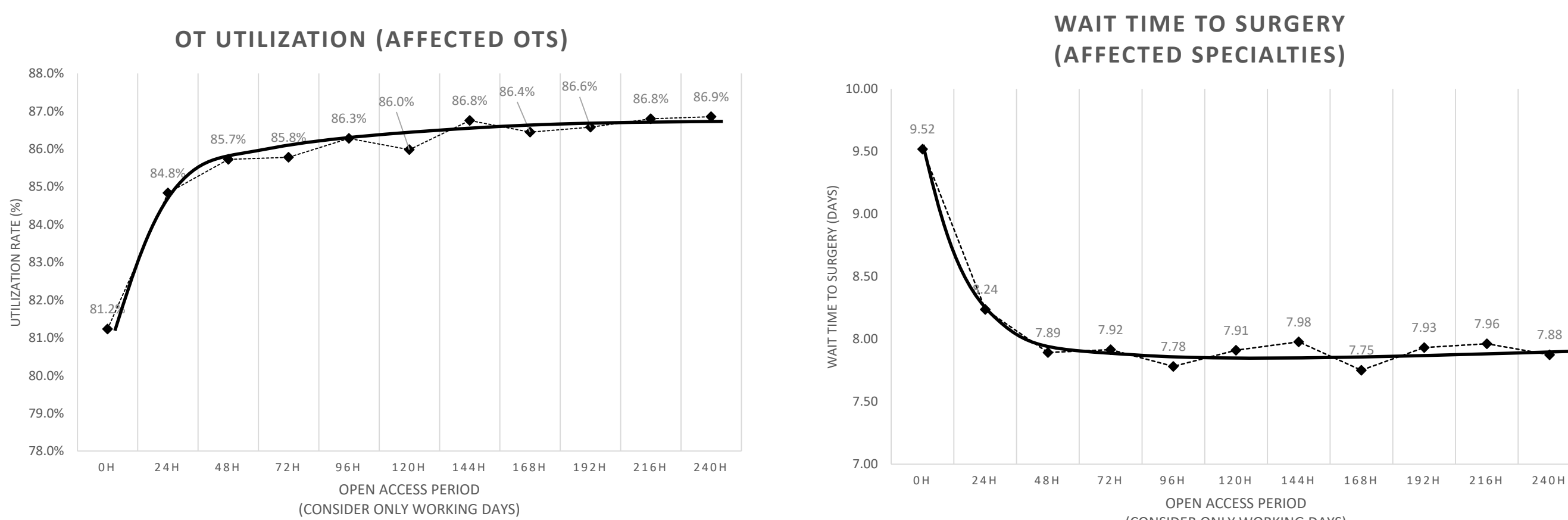


- Performance of solution is evaluated using the simulation model
- Optimization model utilizes features and performance measures to determine optimal scheduling policies
- Generates estimated surgery duration based on factors such as patient and surgeon team characteristics
- Impact of predictions can be assessed using simulation model

Scenario Evaluation

The simulation model was used to evaluate the effects of different lengths of the open access period on overall OT utilizations and patient waiting time to surgery for OTs and Specialties currently involved in the open access policy.

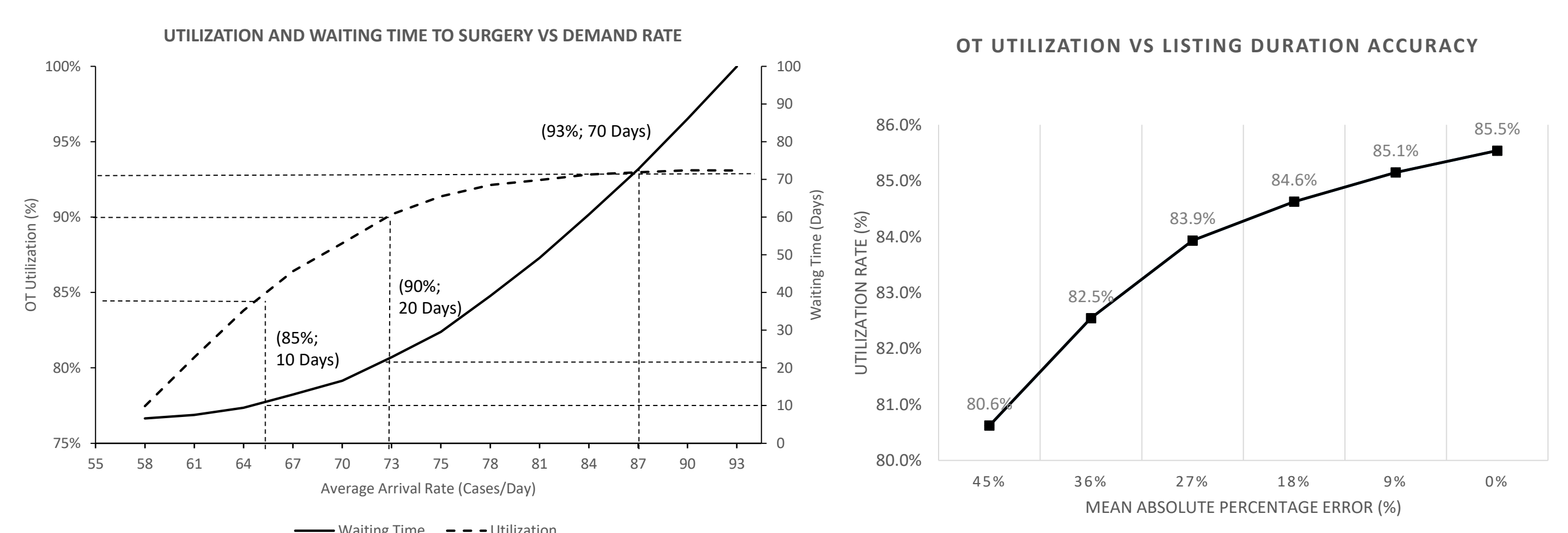
- Increase in utilization for affected OTs
- Decrease in wait time to surgery for affected specialties
- Reduced impact on utilization and wait time to surgery as open access period increases



Sensitivity Analyses

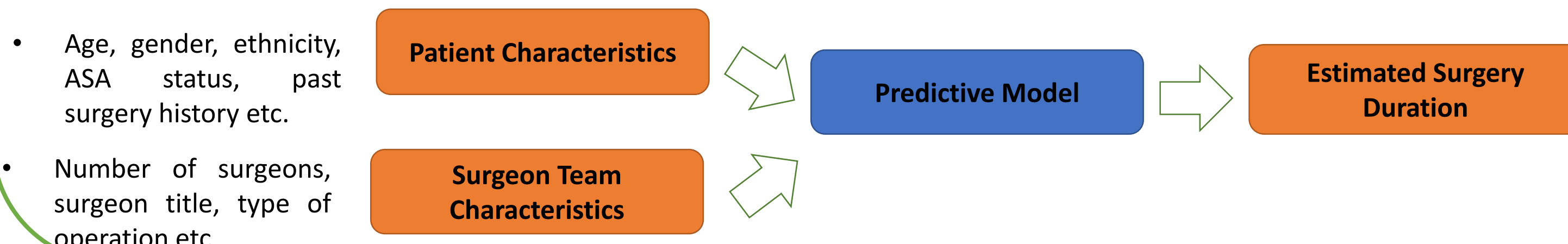
Sensitivity analyses can also be conducted using the simulation model to determine the effect of changes in system parameters, such as demand rates on key performance measures.

Two system parameters, **(1) Surgery case arrival rate** and **(2) Surgery duration listing accuracy** were varied in fixed intervals to determine their effects on OTU and WTS.



Surgery Duration Predictive Model

Good predictability of surgical durations is essential in order to optimize the use of OT resources and to avoid congestion during peak periods through improved scheduling of surgical cases. Several factors are known to impact surgical time, such as patient and surgeon team characteristics, which can be used in a predictive model to generate estimates for surgery durations.



Conclusion

This study reports the development of a high-fidelity DES model and the potential of a DSS for OT management.

- Evaluate various policies and analyses in a virtual environment prior to actual implementation, providing informational support to key decision makers.
- Providing recommended policies and estimates to support operational processes