

Imaging Resource Utilization Optimization

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Company Overview

From optimizing asset utilization to mapping your ideal future state, Array Advisors has the expertise to help position healthcare organizations for future success. We work beside our clients with tools tailored to their strategic challenges. Simulating scenarios using Simio enables us to quickly provide custom, data-driven solution. Array Advisors can help solve strategic business problems and develop methods to improve efficiency and utilization.

The key value of Array Advisors lies in the formation of long-term relationships with our clients and the creation of a dynamic toolset that provides information critical to strategic decision-making. Integrating Simio simulation models into this toolset gives Array the opportunity to present the impact of several options, empowering clients to make informed decisions.

Background

The imaging department team at a patient-centered outpatient spinal surgery center is interested in increasing the number of MRI patients they see in a day. Currently, the MRI is utilized about 75% of the time. The client will be moving from their current location to a new facility, where the imaging department will span a larger area. Staff are worried this might impact patient navigation and want to consider adding a roomer to increase the amount of time techs are spending operating the imaging equipment.

Staff worked together to map the future state of the imaging process as it will exist in the new facility. In the process map, there are two

options: patients go directly to the MRI after their X-ray or they change and wait before returning to the imaging department for the MRI.

Due to the complex interactions between the staff resources and the imaging machines, we decided to use a simulation to provide a safe environment for our client to change the quantity and responsibilities of different staff resources, allowing them to see the impact of each scenario they created.



Figure 1: Paths, nodes, queues and objects can be seen overlaid on the floorplan in the Simio model. This is the actual process logic, not just the animation.

Approach

A data collection form that reflects the detailed process was created because the client did not have the appropriate level of detail captured in their electronic medical record (EMR). The collected data was analyzed and applied to the simulation model. Using the small number of records collected manually, Simio input parameters allowed us to create distributions from the table values. Based on the actual data, these distributions proved to be more valuable

than attempting to fit the data to a theoretical curve.

The model started with a floor plan, and different paths were added to simulate patient movement throughout the facility, as seen in **Figure 1**. Combining transfer nodes with stations and process logic led to a fully customized model that represented the actual system. While developing the model, animation steps were incorporated into the process logic so that patients would move about the space in a realistic manner.

After building and validating the model, we tested different options for staffing. Simio provides an experiment function that allows users to test different configurations of various properties defined in the model. We tried several scenarios to see which option would provide the most effective utilization of staff and imaging resources.

The first scenario operates like the current clinic, with a small change of using a first in, first out MRI queue rather than scheduling patients for a later MRI. The second scenario utilizes an additional MRI tech as a roomer to escort patients from the waiting room to the changing rooms, where they perform a final metal screening.

Results and Recommendations

The simulation study revealed that adding an MRI tech was not the most effective use of resources. Instead, a new scenario was added, in which the X-ray tech was used to escort patients from the waiting room to the changing rooms and to perform the final metal screening.

The 3D animation in Simio, seen in **Figure 2**, provided the client with a clear visualization of how the model worked. The animation, along with explanation of process development and application of actual data from their clinic led to quick endorsement of the model, which we know is crucial for client acceptance of recommendations that are based on the model outcomes.

High-level results from the simulation study we presented to our client include the following:

- There is not a statistically significant difference in average waiting times across scenarios

- Adding one roomer does not help relieve the MRI tech from a significant amount of work
- X-ray tech utilization is higher when they are used to transport and screen MRI patients

Based on these results, we recommended the following:

- Since the average waiting time for an MRI is about 30 minutes, we recommend using a first in, first out system for processing MRIs. In this system, patients should be told that their wait could be 30 minutes to an hour, and that they will be notified 15 minutes prior to their MRI
- Decoupling the MRI tech from the task of rooming would increase capacity of the MRI, allowing for more MRIs to be done in one week. However, the resulting low utilization of an employee dedicated to rooming patients might not justify the cost of hiring a new employee. We recommended that the client explore the possibility of incorporating the rooming task into another role and evaluating the trade-offs between cost and value of a new employee.

Simio provided a safe environment for us to test different staffing options, allowing us to make several recommendations to our client, who could see the impact of each before choosing one to implement into their workflow.



Figure 2: Simio provides a user-friendly interface that allows for rapid development of impressive 3D animations that don't require extra work to create.