

Commercial Software Application Specifically Designed for Patient Flow Simulation

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ABSTRACT

Most discrete event simulation software programs are capable of simulating patient services if put in the hands of a skilled modeler. It's well known in the field of simulation that patient service models are among the most complicated and difficult to construct. This is partly due to the amount and complexity of the data needed to define the models, partly due to the diverse services provided to patients in a healthcare setting, and partly due to the complex way in which resources are allocated when providing these services.

Although many aspects of patient service models are somewhat similar to those found in manufacturing, there are a number of important differences. Unlike the production of goods within a manufacturing facility, patients enter a healthcare facility at both scheduled and random times. Upon arriving, patients often require an unknown and varied number of services. Each patient arrives with their own unique set of problems, which although differ in severity, must compete for common resources such as beds, equipment, nurses and physicians.

Flexsim Software Products Inc. has become familiar with the unique challenges associated with modeling patient services through their consulting work within the healthcare industry over the last several years. Recently, hospitals have taken an interest in conducting their own patient flow studies and then monitoring improvements as implement continuous improvement concepts. There is a huge motivation to optimize the utilization of hospital resources so as to cut costs and improve patient satisfaction. Even when hospitals have staff who are dedicated to these process improvement initiatives, traditional simulation studies are seldom conducted, due to the difficulty and time involved.

Flexsim Software Products Inc. has developed a patient simulator called Flexsim Healthcare™ to specifically address the historically difficult task of simulating patient services. This new software tool has been designed specifically for non-technical healthcare personnel. In a

friendly and very visual 3D environment, anyone with a general knowledge of patient flow can quickly and easily construct a realistic computer model, and immediately begin learning practical ways to improve performance as they test a number of possible scenarios.

Flexsim software has found wide application in manufacturing, logistics, and supply chain analysis, as well as in traditional business applications related to marketing, management, finance, and academic areas. It is from this vast experience that Flexsim Healthcare™ was born.

WHY USE SIMULATION TO IMPROVE PATIENT FLOWS

Most healthcare delivery systems can be characterized as complex and random. The more complex and random a process is, the greater the need is to employ computer-based tools to study and improve the system. While spreadsheets perform many complex calculations, their use of average numbers to represent patient arrivals, examination and waiting times, and resource availability do not allow them to account for the randomness and interdependence that always characterize healthcare delivery systems. Simulation, however, does allow end-users to include randomness and interdependence. As a result, patient delivery systems, such as an emergency room, surgical center, or imaging department will always benefit from simulation, where “benefit” is generally defined as serving more patients per unit of time while maintaining or even reducing costs.

Simulation provides a tool where an end-user can input new conditions into a model and see how the system functions with the new conditions. Simulation allows the end-user to test, prove, and justify ideas for improving a system before they are ever implemented. In addition to finding solutions to improve patient flow, simulation helps us avoid making decisions that might make an existing system worse! It would be ridiculous for a hospital or large clinic to make changes to the rules that determine how their patients are serviced and treated without first testing whether a new idea or program improves the system. Yet, we often see untested and unproven ideas implemented with no more than a hope that the idea might reduce patient waiting time, reduce operating costs, or better manage a staff’s time and skills? When too many “new” programs are tried and later fail, it becomes more difficult to gain buy-in on future changes no matter how probable they are to improve the system.

Healthcare organizations that have been well managed over time are always looking for methods, people, and tools to improve what they do and how they do it. To this end, simulation may be the single most pragmatic tool to improving patient flows. In fact, because of its low cost and immediate benefits, simulation has the potential to generate a ten, hundred, or thousand-fold return on its investment – sometimes even on a first simulation model.

WHY USE FLEXSIM TO IMPROVE PATIENT FLOWS

Until the release of Flexsim's Healthcare Simulator, healthcare, patient, and hospital modeling has been done primarily with 2D manufacturing simulators. The developers of these simulation tools often included a healthcare icon or two to give their software the appearance of being a "healthcare simulator," however, in reality these software tool remained simply manufacturing simulators with their underlying technology and modeling rules designed to model manufacturing process. This doesn't mean the older simulators were not capable, most were (and many still are) good products; what it does mean is that they were difficult to learn and apply to healthcare settings, especially by non-engineer end-users. Because of their design, they often required frustrating workarounds to build even simplest of healthcare models. Using these manufacturing simulators to model a healthcare delivery systems was like pushing the preverbal "square peg through a round hole;" yes, simulation models were eventually created and completed but they took longer than expected and left end-users feeling frustrated. It was these "frustrated end-users" who first contacted Flexsim to share their knowledge of modeling healthcare systems and to encourage us to develop something new for them.

As a result, rather than use Flexsim's existing discrete-event simulators as a base upon which to develop a new healthcare simulator, we decided to start with a clean slate. We formed a healthcare development steering committee made up of hospital managers and analysts to help us design a new healthcare simulator that would model only healthcare patient flows. Not only was the purpose of the Flexsim Healthcare simulator clearly defined, so was its end-user who, like the members of the steering committee, were hospital managers, administrators, and analysts. As we developed our healthcare simulator, several alpha versions were created to determine the best and easiest way to model patient flows within a variety of settings (emergency rooms, surgical centers, imaging departments, etc.). The effort has taken nearly two years to complete; the result is the Flexsim Healthcare Simulator.

Flexsim's Healthcare Simulator is an easy-to-learn and use 3D patient flow simulator (see Figure 1) where models are created by dragging and dropping resources onto your computer screen as if you are laying out the floor plan (of your emergency room or imaging center, etc.). Flexsim's model-building resources (called "objects") include waiting rooms, examinations rooms, equipment, nurses, doctors, patients, etc. Each object has drop-down menus and pick-lists that make the object function like the waiting room, nurse, or piece of equipment the object is supposed to represent. Perhaps the single most innovative component to Flexsim's Healthcare Simulator is the "Patient Track®," which allows the end-user to define a patient profile, which ultimately determines how the patient flows through the model and when and where the model's resources are called and used to services the patient. Once a Patient Track® is defined, it may be reused and even shared with other Flexsim end-users.

With Flexsim's Healthcare Simulator, the end-user can quickly and easily create 3D models that behave like the actual healthcare systems they represent. Ideas for improving an emergency room, outpatient surgical center, or imaging department can be tested, analyzed, justified before they are ever implemented in the system. In addition, ideas for improving a system can be communicated graphically through 3D animation and through statistical reports and graphs,

which are all excellent for communicating a model's purpose and results to those who will be involved in implementing the desired changes.

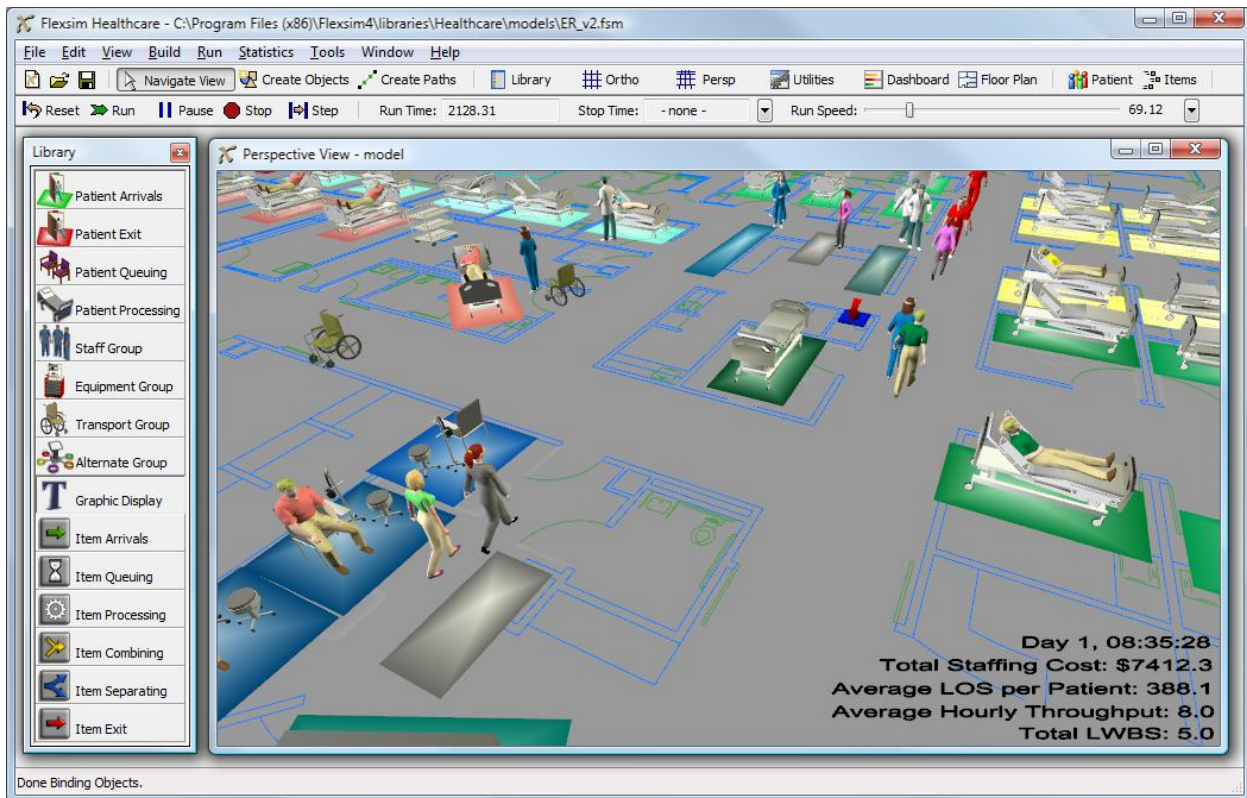


Figure 1. Flexsim Healthcare Screenshot