

Hospital Shortens Patient Stays with Emergency Department Simulation

Arena® Simulation Software Validates “System-Driven” ED Operations to Improve Overall Performance

Challenge

- Decline in service
- Loss of market share
- Unacceptable patient wait times
- Lack of formal protocol
- Redundant processes

Solutions

Rockwell Software
Arena Simulation Software

The project team developed a model of the Emergency Department. With this model, they were able to run what-if scenarios to evaluate process/operational changes and determine which would significantly impact the patient time in the system.

Results

- Validated necessity to adopt “system-driven” ED
- Resource levels were adequate
- Combining two similar departments under one structured protocol had positive impact on system effectiveness
- Improved patient satisfaction



Background

In an effort to improve patients’ experiences and to increase the system throughput in the emergency department (ED), a large urban hospital in central Staten Island, New York, turned to a successful health care consulting company to assist them in identifying key issues and to recommend changes in their system. At the time, the busy emergency department (ED) served about 200 patients per day. The high volumes, coupled with the chaotic service practices, contributed to the frustration of both the patients and the hospital staff.

Challenge

Hospital officials were concerned about a decline in ED service and realized that negative patient experiences had led to a loss of market share and an adverse impact on the hospital’s reputation. Contributing to this decline were large patient wait times, lack of formal protocols for nurses and doctors, and unacceptable door-to-door patient times. Initial evaluations indicated that the process could be improved by implementing system changes to restructure nurse staffing and emergency department functional tasking in order to eliminate redundancy and to unify the procedures for better service and improved patient flow.

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To quantify the assumptions made about the projected process improvement, the team needed a decision-support tool that would validate the initial recommendations. By developing an emergency department simulation model using healthcare simulation software, the system analysts would test their theories and use the tool to identify key bottlenecks and problem areas and ultimately seek a solution that would maximize the existing resources and reduce the duration of the patient stay.

Using Arena healthcare simulation software, Rockwell Automation Arena consultants created an emergency department simulation model of the existing ED to aid in the system analysis. By incorporating individual ED process spreadsheets, the analysts could evaluate a number of “what if” simulation model scenarios that allowed the hospital teams to visualize their departmental processes and interactions before making any significant system changes. Among the greatest challenges to the study was the considerable disparity in the decision making processes being used by the hospital staff. It was difficult to collect healthcare predictive analytics that accurately reflected the overall process as each patient moved through the system. It was also difficult to convince the hospital officials that the emergency department simulation model truly represented the operation of their facility.

Solution

Coupling an integrated excel user interface with the Arena emergency department simulation model allowed the team to easily change various input requirements and review specific output values. The interface gave the team the flexibility to change the patient mix flowing through the ED and analyze Arena generated reports for quantified results. Additional changes to process delay times and resource schedules allowed for the creation of multiple scenarios. The team could then compare key performance indicators (KPIs) among the alternative scenarios. Arena-generated reports provided the team with quantitative data for review. Average door-to-door patient times in the system, resources utilizations, and throughput statistics were of particular concern to the hospital officials.

The team was eager to see how the input factors affected the time each patient was spending in the ED. The project team created several scenarios with varying staff levels in order to determine whether increasing resources would significantly impact the patient time in the system. Additional scenarios allowed the project team to analyze the effect of decreased processing times on the service levels.

Results

The compelling results of the emergency department simulation study convinced the hospital officials that the key problem was due to an extensive amount of processing times and not insufficient resources. The healthcare simulation software validated and quantified the impact of incorporating a “system-driven” ED rather than a one with overlapping functions and differing methods and procedures. It proved that increasing efficiencies within each process would have the effect of increasing throughput and significantly reducing the patient time in the system.

Although service levels could be improved within the current structure, the project team developed another emergency department simulation model to analyze the impact of merging the Main 1 and Main 2 EDs into a single ED. The two areas had been functioning as separate emergency departments with very distinct resources and processes. With the help of Arena healthcare simulation software, the project team validated the perception that a single department with pooled resources and consistent protocols would dramatically improve the overall system effectiveness and, ultimately, enhance the patient experience.

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