DECISION SCIENCES INSTITUTE

Modifying Resource Allocation for Transition of Emergency Department (ED) Visits to Urgent Care (UC) Visits

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ABSTRACT

Hospitals need to ensure patients are utilizing the appropriate level of care. Roughly only a half of the patients seen in an emergency department (ED) have an emergent need to be cared for in an emergency setting. The other half of the ED patients, in fact, could be treated in the urgent care (UC) service. This study utilizes discrete event simulation (DES): 1) to simulate the change in volumes for each service; and 2) to determine how to staff each location to meet appropriate levels of service and financial stewardship. The outcome of the study has to support the hospital administration who wants to reduce the overall staffing costs within the emergency department to make up for the reduced revenue.

KEYWORDS: Discrete Event Modeling, Resource Allocation, System Redesign, Simulation, Decision Making in Health Care

BACKGROUND

Many believe most of the visits to a hospital emergency department(ED) are truly emergent, however only around half of the patients seen in an ED have an emergent need to be cared for in an emergency setting. An ED visit is very expensive due to the cost of providing care and therefore has a high charge to the patient and their insurer. Studies have shown hospitals non-emergent ED usage can range from 12 to 56 percent .[1] Some examples of non-emergent reasons for utilizing the ED would be fever, toothache, and minor lacerations.

Many insurance plans have noticed this trend of non-emergent patients utilizing the high cost emergency services and have decided to make some changes to their payment structure. Some insurance plans will be reducing their payments for non-emergent visits and others will not pay at all. Washington is one of the states denying all forms of payment.

Two of the multiple state funded insurers for the hospital will be reducing payments for non-emergent diagnoses by 82%. The rate will go from a $144 ED rate to a $26 Urgent Care rate, or a difference of $118 per visit. The state funded payers in question account for 66% of the non-urgent patient population or approximately 24 patients per day. This reduction in payment will equate to $1,033,680 in reduced revenue out of a projected $1,261,440. This number will increase if other insurers begin the practice of reducing payment for non-emergent visits. In many of these cases the hospital will never re coup the difference from patients. Due to this change, hospitals need to ensure patients are utilizing the appropriate level of care.

A layperson would believe that the hospital should simply turn away non urgent patients and direct them to an urgent care or their physician’s office. However the Emergency Medical Treatment and Labor Act (EMTALA) states *any patient who "comes to the emergency department" requesting "examination or treatment for a medical condition" must be provided with "an appropriate medical screening examination" to determine if he is suffering from an*

"emergency medical condition". If he is, then the hospital is obligated to either provide him with treatment until he is stable or to transfer him to another hospital in conformance with the statute's directives.[2] This means a physician must at least see the patient and provide an examination. At this point a patient has registered, seen a nurse, and a physician which is 75% of the process. For efficiency and satisfaction purposes, the physician usually provides treatment.

Many of the non-emergent ED visits could be handled by a lower cost physician office or urgent care type facility. Diagnostic testing is often more expensive within the ED environment than the Urgent Care environment. Hospitals send many specimens through the hospital laboratory at a higher cost vs. Urgent Cares that utilize lower cost point of care testing. The average difference in cost for point of care testing is $17.83 per test, with each non urgent patient averaging 1.4 tests per visit.

The hospital will begin a targeted public awareness campaign to reduce the number of non-emergent patients coming to the ED and redirecting them to a physician office or urgent care. The campaign will focus on education of what types of conditions should be seen in an urgent care. Billboards, flyers, and attending community events will occur across the community over the next few months. Patients who come to the ED with non-emergent conditions will also be educated on the appropriate use of the ED and provided with a flyer about the urgent care.

The anticipated change is a reduction of 3 visits per hour in the ED during urgent care hours, and an increase of 30 to 36 patients per day for the urgent care. By redirecting these non-emergent patients, the ED volume will decrease and the urgent care volume will increase therefore staffing for each site will need to change.

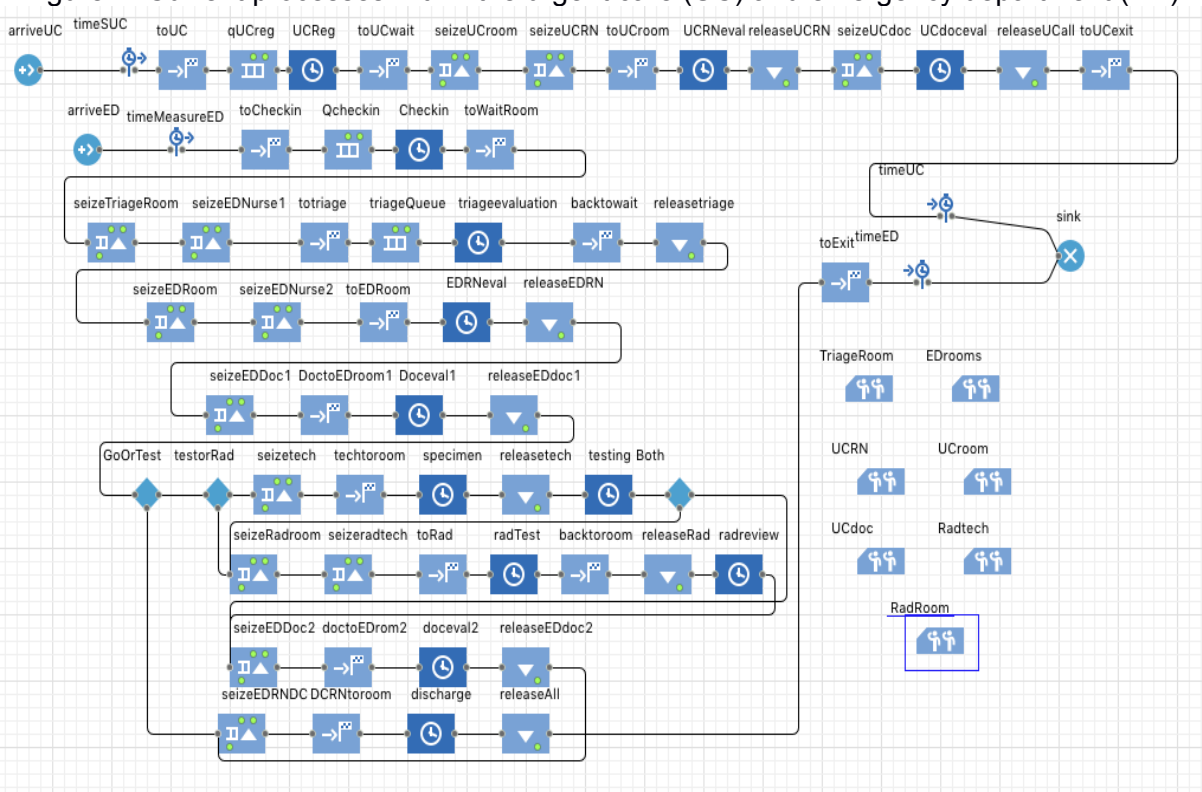
This study utilizes discrete event simulation (DES) by AnyLogic 1) to simulate the change in volumes for each service; and 2) to determine how to staff each location to meet appropriate levels of service and financial stewardship. Hospital administration is hoping to simply transfer staff from the emergency department to the urgent care to maintain their current staffing level expenses as well as looking for ways to reduce the overall staffing costs within the emergency department to make up for the reduced revenue.

CURRENT PROCESS

The hospital simulated for the study is based on a hospital in the Midwest region. The hospital is a level 2 trauma center with 23 ED rooms. The emergency department currently sees around 168 patients per day (7 patients per hour) and the urgent care sees 48 patients per day (4 per hour). The urgent care is not directly connected to the emergency department. The location of the Urgent care is in another building on the same campus as the emergency department.

Figure 1 shows the current operational processes within the urgent care and the emergency department using the discrete simulation blocks. The process shows two separate processes for the ED and the urgent care (UC) facilities. The urgent care process is at the top. The process for the urgent care is rather simple as it mainly has registration, nurse evaluation, and physician evaluation steps. The ED has many more processes, as there are many more options for diagnostic testing. A more complicated patient may need laboratory testing or may need a radiologic exam. Each of these types of tests can have a wide range of timing for completion. For example, a blood sugar could take 3 minutes for completion as compared to a troponin blood test that needs a comparison draw 4 hours later.

Figure 1: Current processes within the urgent care (UC) and emergency department (ED)

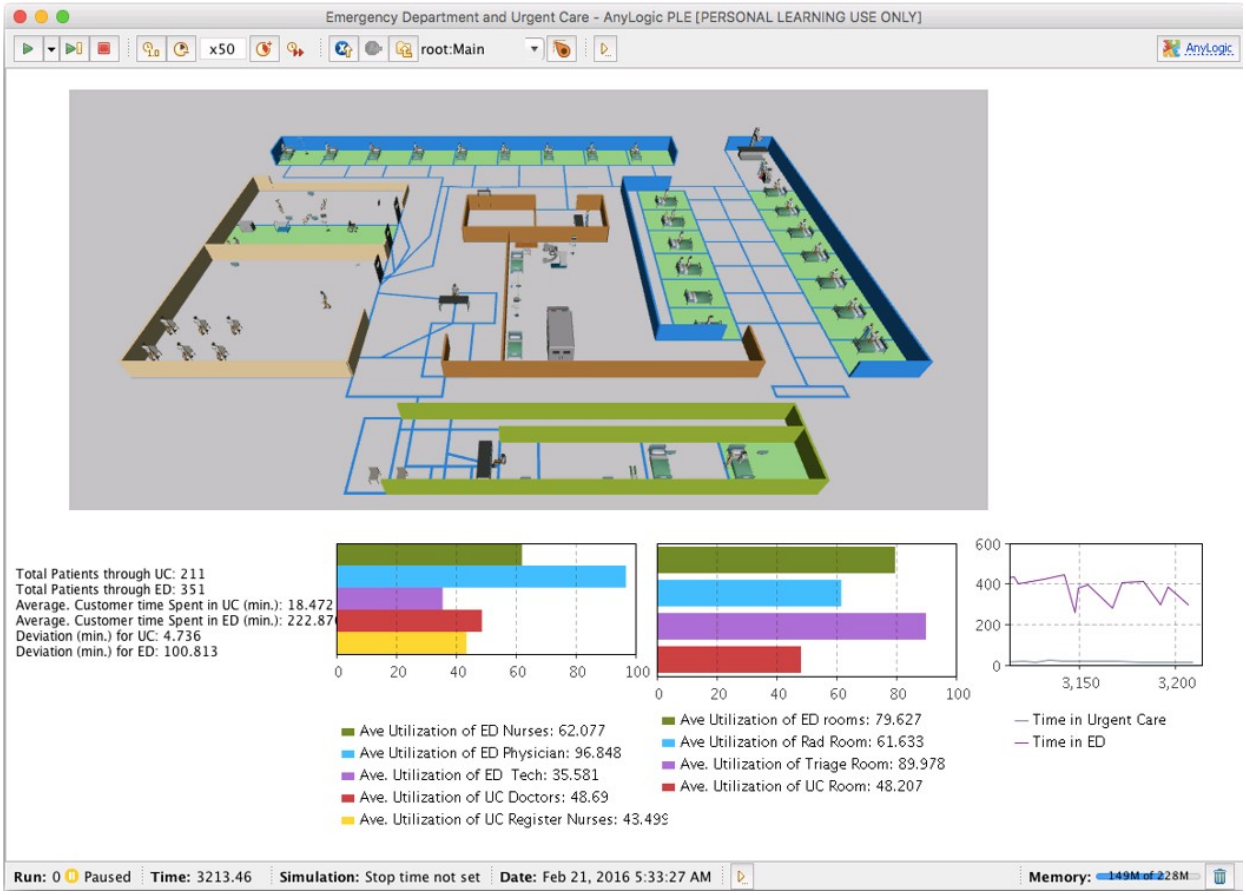


Arrival rates and process times were obtained from time stamped process reports or direct observation by an internal consultant. The ranges of times were entered as triangular distributions within the software to allow for the variation in the length of process steps. Trauma events were not included in the study as they are not frequent enough to quantify.

The ED processes are more complex as it includes a nurse triage step and many more steps for radiology or laboratory testing. The radiology and laboratory testing steps are dependent on the patient's condition, and have quantified percentages in place for probability of the steps.

The DES modeling outcome (Figure 2) shows the current level of service and productivity prior to any volume or staffing changes. The model shows long overall service times (222 minutes) in the emergency department(ED) and shows shorter times (18 minutes) within the urgent care (UC).

Figure 2: Discrete event simulation outcomes on the current level of service and productivity



Utilization of staff is good overall in the current process models. ED physicians are currently close to being maxed out at 96%, this is the result of cost cutting measures to only have 2 physicians staffed at a time. Tech and nurse staffing look low, but there are other tertiary duties which do not follow a straight process path and have not been included in the model.

By setting up the current process model we have proven the modeling software can replicate the current service levels within the ED. Proving the model is accurate in the current state was crucial for obtaining the confidence of administration.

CHANGE IN ARRIVAL RATE

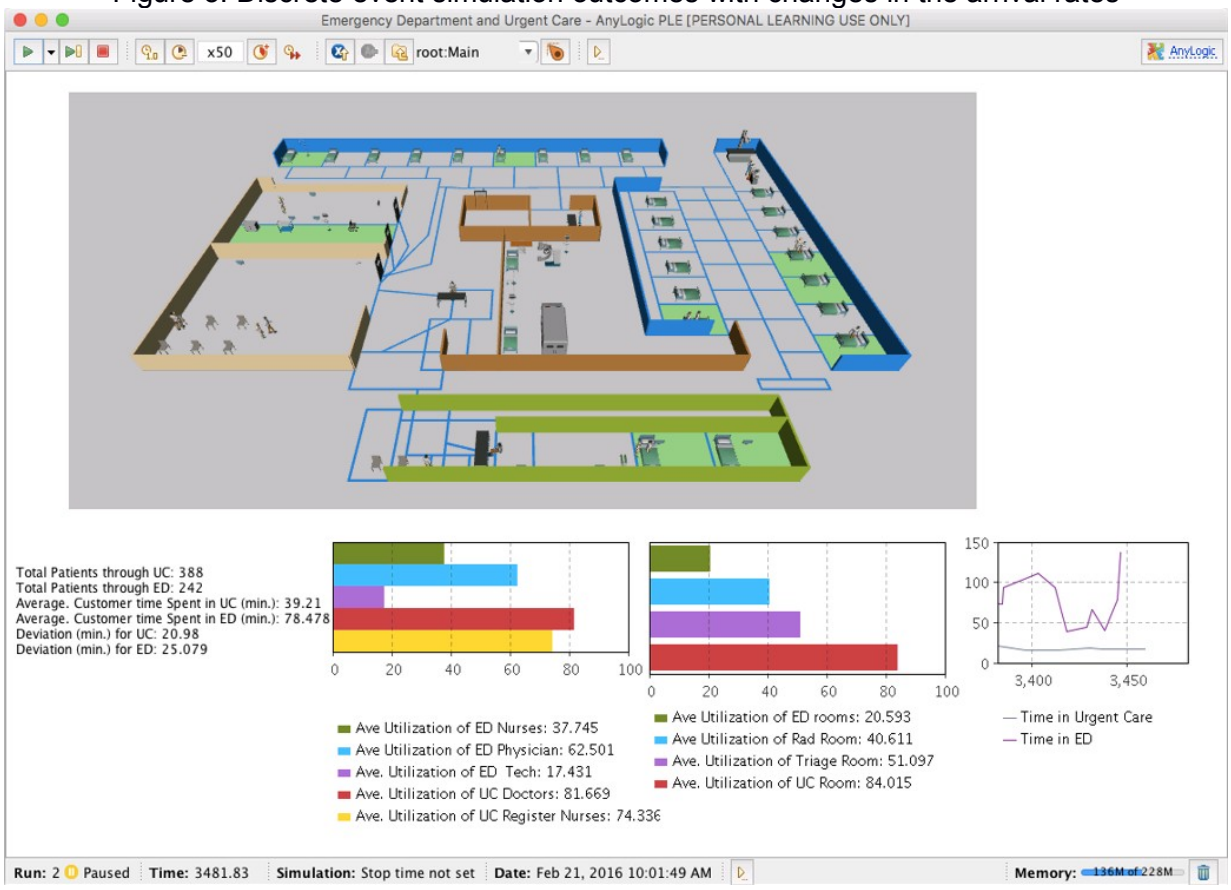
As described in the background we will model a shift in the amount of patients arriving at each facility. There will be a shift from 7 ED patients per hour to 4, and the urgent care will go from 4 to 7 patients per hour. The processes and staffing levels will stay the same for the simulation. Figure 3 below shows what happens to length of visit and staffing utilization when this shift occurs.

We need to model out the volume change to show managers what will happen to service times and production levels with the projected volume change. The volume change will have a significant impact on how managers will staff the emergency department and the urgent care. If staffing changes are not changed appropriately, service levels will not be acceptable to patients within the Urgent Care and staffing costs will be too high within the ED. The staffing changes will allow us to recoup the revenue loss created by the state insurance companies.

Results

With the volume change, the model in Fig. 3 is telling us the service length at the urgent care more than doubled up to 39 minutes. The ED time has dropped significantly down to 79 minutes. The standard deviation for the urgent care increased to 20 minutes from 4 minutes with the volume change. If service levels are not significantly better at the urgent care than the emergency room, patients will not choose the urgent care over the emergency department. If the patients still chose the emergency department the project will be unsuccessful, and the revenue loss within the emergency department will be seen.

Figure 3: Discrete event simulation outcomes with changes in the arrival rates



The ED nurse and tech utilization has dropped significantly to 37% and 17% respectively. The room utilization for the urgent care is high(84%) and could be causing some of the increased length of service. The UC doctor and registered nurse utilization is also reaching high levels of utilization(74% and 81%).

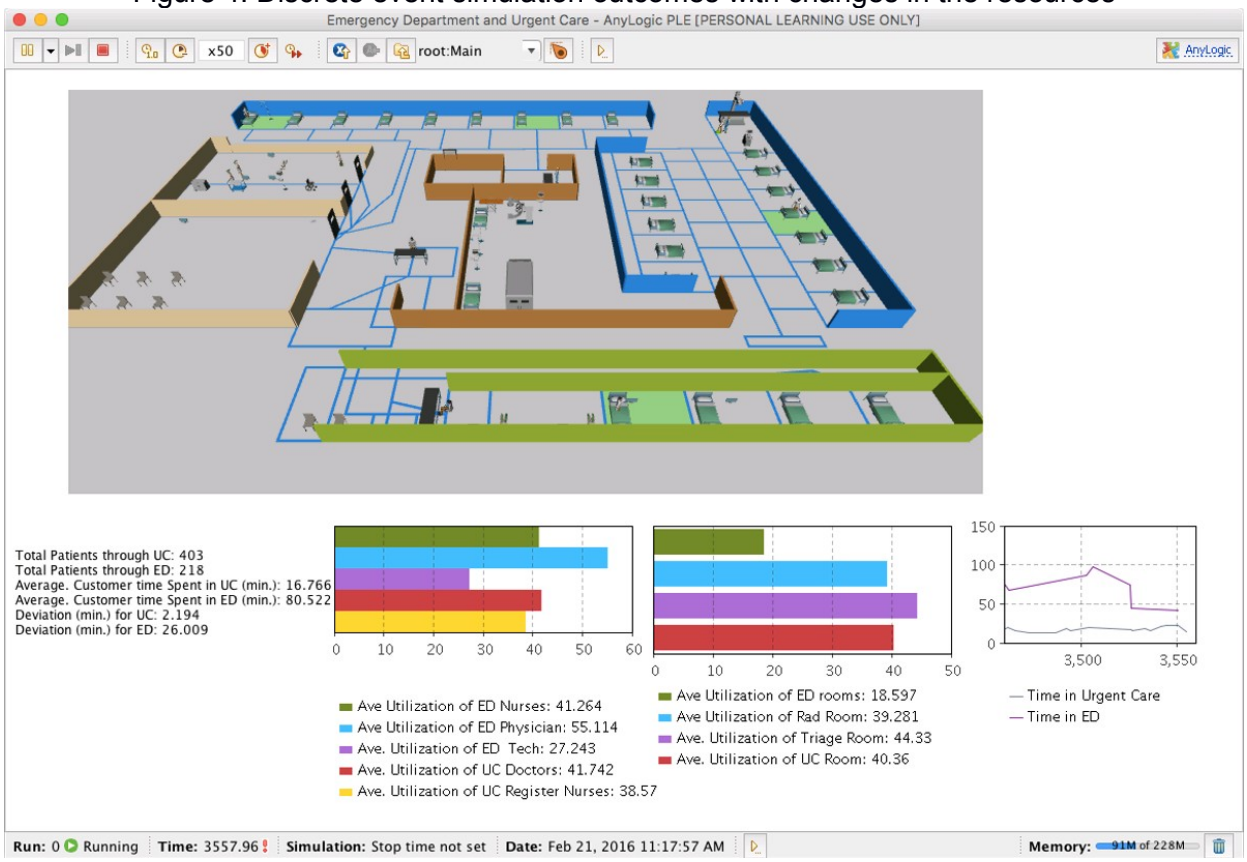
The results indicated that we needed to make further changes to staffing and room additions as described in the analytic solution.

RESOURCE (STAFF) ALLOCATION

With the new high utilization of the urgent care and low utilization of the emergency department, staffing needs to be adjusted. Upon review there is a need to reduce a nurse and tech within the emergency department. At the same time we will need to add a nurse and a physician to the urgent care to accompany the new volume. The nurse from the ED was transferred over to the urgent care.

Upon running the model, the urgent care saw no improvements in service times despite adding staff. This was due to a lack of available rooms to utilize. Two rooms were remodeled to become exam rooms and were able to be utilized to see patients. A typical physician office model has a physician and nurse combination working out of 2 rooms per team. Figure 4 shows the statistics from the model with the above changes.

Figure 4: Discrete event simulation outcomes with changes in the resources



Results

Upon our analytic solution model change we were able to show a reduced length of service in the urgent care (16 min) and maintained a similar level of service within the emergency department (78 min). The overall variability is also reduced in both service locations, especially in the urgent care where we saw the standard deviation drop to 2 minutes. Room utilization was improved to 40% within the urgent care by adding the 2 rooms.

By reducing the ED nurse and tech in the ED, we are still sitting low in overall utilization of ED nurses and techs at 41% and 27% respectively. Without making any physician changes in the

ED, we still see a 55% utilization rate. This tells us, they are still rather busy even with the reduced volume. This is due to the complexity of patients within an ED.

The overall change in expense was the addition of the urgent care physician at a rate of $220,000. This was slightly offset by the reduction of a tech in the ED at a combined cost of $45,000. The change in expense overall would be $175,000 for the hospital.

With the addition of the physician and reduction of ED tech, it now makes the overall change to the budgeted net revenue for the project down even further to $1,208,680.

DISCUSSION

Ideally the hospital had hoped to shift one ED physician over to the urgent care, however upon modeling, the service times increased drastically when only 1 physician was available. The risk of having only 1 physician in the ED was also considered since if a trauma arrived or acuity spiked, the hospital could set themselves up for liability.

There is a potential to reduce 1 more nurse from the ED, but that could come as a shock to the overall culture initially. The culture of nursing is to ensure you have adequate staffing for safe patient care, and a drastic change in staffing could result in low morale and low support of the change. The change could be made but would not happen immediately.

Reducing another nurse could come with a process change of eliminating the triage step. Since there will be less patients coming in, the need for triage should be eliminated as room utilization is no longer an issue. With two nurse reductions and the reduction of another tech, this would add another $185,000 to the staffing reduction bringing the total staffing reduction to $230,000. This has been modeled out to ensure proper productivity and service levels as seen in Figure 5.

Figure 5: Discrete event simulation outcomes with elimination of triage process and tech role

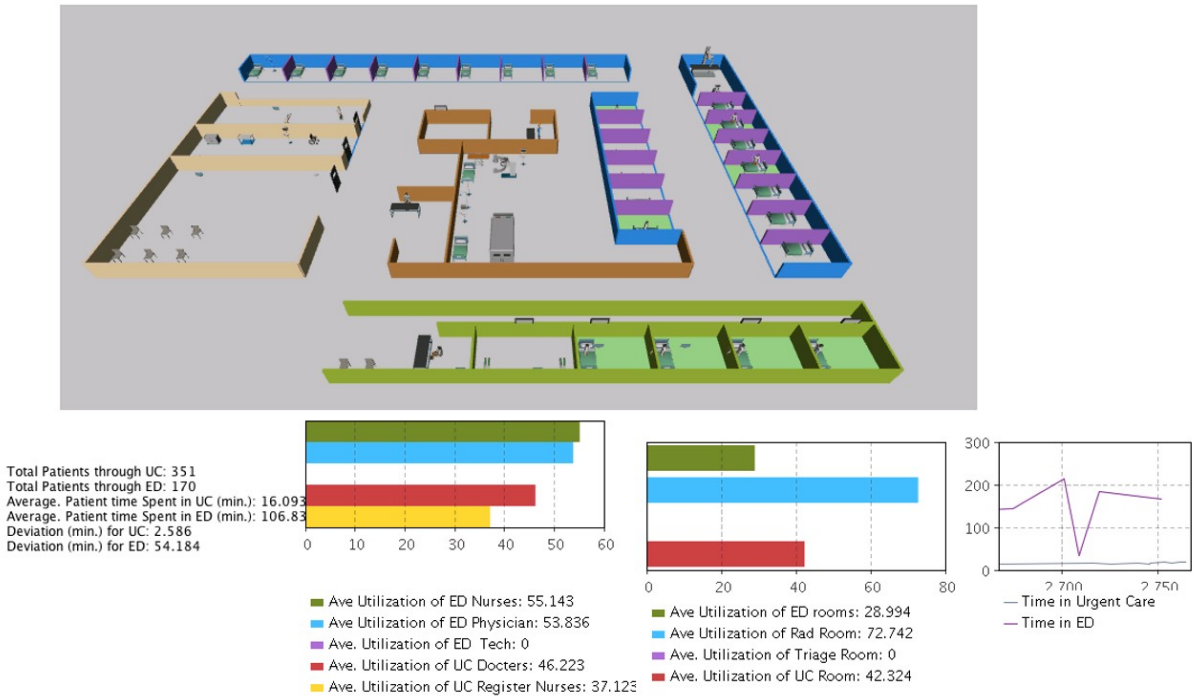


Figure 5 shows the process metrics with the elimination of the triage process and the tech role. With the triage process removed the nurse utilized for that process is now removed. The tech utilization was very low and was only utilized to gather specimens. Nurses could gather specimens and perform many of the tech duties with a lower volume of patients. The nurse productivity is now 55% which will allow for the other tech duties that were not captured by the model. The average service time increased to 106 minutes, but it is still much better than the original of 222 minutes.

There is a potential of underutilization of physicians for the urgent care. There is a strong potential to utilize a mid-level practitioner at a lower cost than a physician, as they will be seeing lower acuity patients within the urgent care setting. A mid-level practitioner purpose is to care for lower acuity cases we are targeting for the urgent care. A mid-level practitioner would only cost $110,000 and could make for an overall reduction in staffing expense for the change to $120,000. This model would allow the hospital to be recoup some of the lost revenue and increase levels of service within the emergency department.

In regards to service times within the ED, there will be a need to reevaluate the overall times when the lower acuity patients are no longer a larger portion of the process. Patients with higher acuity will require longer service and the percentage of patients needing diagnostic testing will increase as well. This can be modeled out at a later time, although it should not affect the proposed staffing reduction.

There is a concern that if we start to see much lower service times within the ED, patients will revert back to utilizing the ED. Volume and service levels will need to be monitored regularly.

CONCLUSIONS

The simulation showed if non urgent patients utilized the urgent care appropriately, it would improve the overall efficiency of the ED. Financially, there will be the ability to reduce staffing by $120,000 by reducing ED staff to recoup some of the loss of revenue by shifting patients from the ED to the Urgent Care.

The reduction of testing costs within the ED vs. the urgent care will reduce $218,667 in costs for the ED. Combining the staffing reductions and testing cost reductions will save the hospital $338,667. While this does not cover the entire loss in revenue from the state insurance policy change, it converts a $1,033,688 loss in revenue to a $695,021 net loss.

One of the biggest unanswered questions will ultimately be if the volume change from the ED to the urgent care will be as large as anticipated. There is a culture change to make and it is unknown what the rate of change will be from the ED volume to urgent care. It will not happen overnight and could take several months to see the level of volume change anticipated. As the transition occurs longer service times will be seen and may become costly to staff.

LIMITATIONS

Since this is a simulation it is not always possible to include trauma scenarios where an ED physician could be utilized for a single patient for a length of time. The process times were entered as a general flow of ED and urgent care patients.

Nursing and tech responsibilities do not always follow a process path and can be variable. There are other metrics that state how many worked hours an ED should have per patient within the ED. Those metrics would be followed as the actual model is in place.

Below are a list of variables that could be accounted for to improve the simulation.
Arrival rates vary across every hour of the day, therefore an average was chosen to run the simulation. Arrival times can vary from 1 patient per hour to 12 patients per hour depending on the hour of day and day of week.

Staffing of physicians, nurses, and techs in the ED is also variable throughout the day. Staffing is currently based on peak times of days. Overnights and early mornings are staffed lightly while mid days and evenings are at full staffing levels.

The ED is open 24 hours, but the urgent care is only open for 10-12 hours of the day. The urgent care is open during the peak hours of the day, but there will be times when non-emergent patients will be seeking care when the urgent care is not open. The ED will be utilized by these patients during this time.

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