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SIMULATING THE PATIENT MOVE: TRANSITIONING TO A REPLACEMENT HOSPITAL

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ABSTRACT

One of the more complex maneuvers a hospital system can perform is moving an entire patient population from an old facility to a replacement facility. All patients must be transported via ambulance or van to a new replacement hospital. This requires massive resources, permits, cooperation of local government, and often assistance from neighboring hospitals. This study utilized simulation to determine optimal resources, routing, and timing for the movement of almost 600 inpatients from two different facilities to a new replacement facility. Potential resource constraints of specialized move teams, ambulances, and other staffing constraints were explored to predict and reduce the likelihood of complications during the two day patient move.

1 INTRODUCTION

1.1 Project Background and Scope

A large county hospital has been operating out of two free-standing inpatient facilities serving different patient populations and is merging into a single facility. Throughout the move, emergency services and the required supporting departments must remain open to service patients that arrive to the old facilities for emergency medical help. In some departments such as the sending and receiving units, staff will be required in both facilities to "pack" and "unpack" patients. Once a patient is received within their new unit, nurses require time to properly "unpack" the patient and thus each unit can only receive patients at certain intervals. Additionally, entire units cannot be moved all at once because there is concern for complications and the variable unpack time required with each patient.

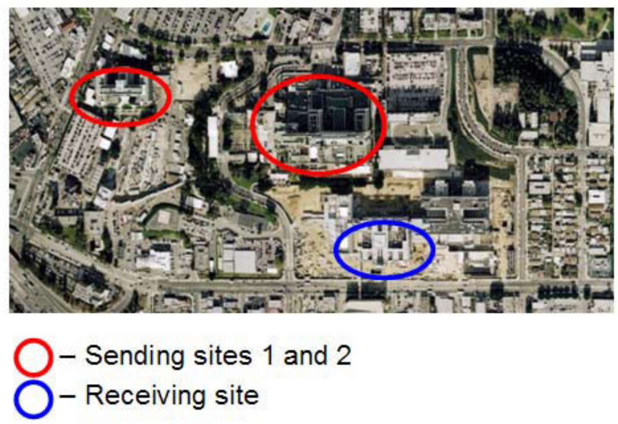

Figure 1: Sending and receiving hospital sites for patient move

Given the scope of this move and the large number of patients to be transported, this move will require two days of efforts by all parties involved. Complicating matters even more so is that old units do not directly map to the new units creating mismatched sizes. This required unique routing for every patient as sending units may be routing patients to multiple new units.

Traditional constraints like the number of resources like ambulances, vans, and gurneys were also potential rate limiting items and scrutinized. The method in which these resources are utilized and options to release their inherent constraints were also explored.

The nature of a hospital move requires that this multitude of logistical challenges must be combated as other hospital relocation activities, such as medical and office equipment moves, occur simultaneously. (Romano 2005) While patient safety remains the primary goal of the move, this demand for space and resources heightens the need for planning. Simulation "brings the statistically robust solution and associated confidence to meet the customers' expectations", and is paramount in determining the quickest and most efficient manner of transport (Miller, M., D. Ferrin, and J. Szymanski, 2003).

2 THE MOVE PROCESS

2.1 The Old Facilities

The first challenge presented was the facility's old elevators. The buildings were built in the 1920s and almost all elevator shafts are original. The elevators, though not original, were incredibly slow and the stairs were a popular alternative to waiting several minutes. Unfortunately, no suitable workaround was available or possible to counter this. The delay can be mitigated somewhat by devoting elevator groups to patient transport only, which will reduce traffic and queuing.

Secondly was the geographic location of the transport loading site. All patients to be transported need to go through a narrow corridor in the emergency department to the single loading area. To combat this, part of the existing ED will be closed to ease congestion of patient move traffic.

Lastly, was the physical "packing" of the patients. Patients are to be transported from their old unit to the floor of their new unit on a wheel chair or gurney, which differs from your typical hospital bed. Floor nurses require time to "pack" patients onto in addition to preparing any equipment the patient is hooked up to for transport. The goal is to have a patient ready to ship upon the arrival of the transport team, however given the limited amount of gurneys, floors can only keep so many patients waiting in queue. Consequently determining how many patients need to be packed in queue and the effect on the move was made a key objective for the project.

2.2 The Transport

In some moves, large geographic distances between facilities dictates that the transport teams and a specific ambulance work together for the entirety of the patient move. When a transport team leaves an ambulance to deliver a patient, the ambulance driver would then wait for the team to return.

However, in this move the close proximity of the facilities, less than ten minutes, permits a different approach. For the purposes of this move, transport teams and ambulances are considered separate resources. Ambulance drivers are to be used essentially as taxi drivers and would drive a patient and transport team to the new facility, stopping and waiting only until it could carry a returning transport team and gurney back to the old facility. This "cab" approach allows for less ambulance idle time.

2.3 The New Facility

Even with its faster elevators the new facility offers its own set of challenges. Foremost was the limited amount of locations for unloading at any one point. The old facility had the ability to load twenty ambulances at its single loading location, however the new facility had fewer than ten at any one location. Several entrances were identified as potential drop off points in the new facility, but the number of patients that could be routed to these entrances was uncertain. It was decided to route patients of higher acuity to the locations closest to the most ideal elevators, however the capacity of these routes needed to be found through experimentation.

Once inside the facility, the availability and demand for dedicated elevators needed to be determined. Only certain elevator shafts were large enough for patients on gurneys, others can only fit patients on wheelchairs. Because many other moves were occurring simultaneously (Beyers 1999), the ability to free up elevators while minimizing the move time became imperative. By experimenting with simulation and monitoring the queues for the elevators, the effect of dedicating more or less elevators could be viewed.

2.4 The Resources

The availability of resources like ambulances, wheelchairs, and gurneys is the most common location for bottlenecking in any simulation, and this process was no different. A special focus was placed on removing or loosening any resource restrictions and any idle time for the resources the resources was scrutinized.

In the case of the aforementioned ambulances, it was found that the number of transport teams could be larger than the number of ambulances. Because transport teams needed to spend time within the facilities without the ambulance being tied up, there were always a number of teams that did not need an ambulance at the moment. This "float" was the difference in transport teams and ambulances required. Knowing the number of move teams available was fixed, excess ambulances could be cut from planning to decrease cost.

The one resource required for almost every activity in this process was a gurney or wheel chair, depending on patient acuity. The method used to combat this constraint was to start with all the gurneys in the old facilities and to have the move teams simply pick up the "packed" patient on the gurney and drop off the patient while they were still "packed". The move team will not wait for the nurses to complete their activities, and if an empty gurney is available, the move team would take this back with them. This swapping approach added efficiencies to the move team utilization. Nurses need only be told to set the gurneys aside for the move teams, and an empty gurney could be swapped for a full one. Additional time can be shaved off the process by cleaning the gurneys in the ambulance during transit.

3 KEY PERFORMANCE INDICATORS

3.1 Establishing Appropriate Metrics

The number one goal during a patient move is to minimize the opportunity for complications and the impact on patient care. This motivation lead our team to look at specific metrics that impacted the time when a patient's access to care was limited and the time the patients spent "packed" in transit or in queue.

Second of concern is the cost involved within a move. Dozens of ambulances, specialized move and EMT teams, additional floor staffing and even security personnel make patient moves a very expensive endeavor. Because of the aforementioned primary goal of hospital administration, a tendency exists to over plan and over allocate resources. The ability of simulation is to determine what configurations and amount of resources yields diminishing returns. That is, at what threshold is the next ambulance or gurney non value added (Shapiro 2002).

3.2 Patient Care Metrics

Because patient moves encompass all patients, even those patients in the ICU and other intensive care units must be moved. These patients present the largest challenge because of their inherent risk of complications. Although these patients are commonly accompanied by physicians this risk is of largest concern while in transit when not all resources are available to the physician. By experimenting with multiple scenarios, and monitoring the amount of time spent in transit it is believed this risk can be mitigated.

Although of less importance than time spent in transit is the time spent in queue. Some patients have conditions or injuries that create extreme discomfort and extended periods of time spent "packed" on a gurney instead of being in a bed only magnifies this discomfort and makes the move experience less comfortable for the patient.

3.3 Resource and Time Metrics

In addition to the costs associated with the move, the ability to free resources will positively impact other move activities. Some resource metrics relate to patient care like wait time for an elevator or wait time for a gurney. While other resource metrics, like elevator utilization and total duration of the move provide glimpses at the amount of resources and time required to complete such a task.

4 CONCLUSION

Not only is there a demand for prudent planning in patient moves from both the patient safety and cost perspective, but the additional perspective of the public heightens the necessity for a flawlessly executed move. Patient moves are large endeavors that are almost always attended by members of the local press. Any slip up or unplanned event can be politically costly. The use of simulation is invaluable in predetermining not only the resource and time commitments required but the impact on cost, political risk, and patient risk, which are all characteristic to any patient move.

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