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REDUCING HANDOFFS AND IMPROVING PATIENT FLOW IN THE ED

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ABSTRACT

Over 145 million people visit US Emergency Departments annually. The diverse nature and overwhelming volume of patient visits make the ED one of the most complicated healthcare settings. In particular, handoffs, the transfer of patient care from one physician to another during shift transition are a common source of errors resulting from workflow interruptions and high cognitive workload. This research focuses on developing a hybrid agent-based discrete event simulation model to identify physician shifts that minimize handoffs without affecting other performance metrics. By providing overlapping shift schedules as well as implementing policies that restrict physicians from signing up a new patient during the last hour of the shift, we observed that handoffs and patient time in the emergency department could be reduced by as much as 42% and 17%, respectively.

1 INTRODUCTION

The Emergency Department (ED) is an essential patient entry point into the healthcare system that contributes approximately 50% of hospital admissions. As society's healthcare safety net, patients with no other options for medical care access the ED because the federal government mandates an ED to provide screening and stabilizing care to all patients regardless of their ability to pay. This results in ED overcrowding, increasing the chances of medical errors, patient wait times, patient length of stay, and mortality. Similarly, handoffs also increase the chances of medical errors, length of stay and have other negative impacts on patient safety (Dahlquist et al. 2018; Maughan et al. 2011). Although researchers have focused on addressing the negative impact of overcrowding on patient safety, very few have focused on addressing the impact of ED handoffs on patient safety. This research utilizes a hybrid simulation model for identifying shift policies that can minimize the number of handoffs and improve the patient flow in the ED, advancing our prior work (Prabhu et al. 2019). Our prior work used a publicly available data set, and the modeling approach did not account for the variation between subsequent patient visits.

2 METHODS

Input data for the model, including the number of beds, physician shifts, patient arrivals, ESI level of the patients, patient time in the ED, and the number of interactions, were gathered from the PRISMA Health Greenville Memorial Hospital (GMH), Greenville, SC. Additionally, observations were conducted, and meetings were held with the stakeholders to account for any remaining physician-dependent activities in the ED to include in the model.

In this study, unlike the conventional discrete event modeling adopted by most of the prior studies to represent an ED, we utilize a hybrid modeling approach. In this hybrid agent-based discrete event simulation, both patients and physicians are modeled as agents, each with unique parameters. This approach provides the flexibility to replicate a physician's actions in the ED, such as searching and signing up a new patient based on their time remaining in the shift and patient's ESI level, performing patient handoffs, and ordering tests, labs, and charting. Many of these would be challenging to replicate if physicians were modeled as traditional resources. In this model, we capture physician and patient activities in the ED from patient arrival until their departure (in hospital admission or discharge). Some of the key activities include a newly arriving physician checking a leaving physician for patient handoffs, evaluating a patient at the bedside, ordering labs and tests from the physician's station, and then revisiting the patient until their departure or the end of physician shift, in which case the patient is handed off.

3 RESULTS

To test a variety of policies, we first validated the model output for the current PRISMA health policy against the data from the ED, using the patient length of stay (LOS) as the measurement. The difference between the simulated data and actual data was less than 7%, and on conducting statistical tests, there was no significant difference (p-value > 0.05). The model was simulated for a three-week schedule with an additional two-day warm-up period. A total of 60 replications were performed, such that the margin of error on LOS was ± 10 minutes (at α=0.05). On comparing the baseline policy (P1), which is a non-overlapping eight-hour shift, to restricted policies where a physician is not allowed to signup new patients (P2-P4), we observed a significant (p-value < 0.05) decrease in the number of handoffs. Moreover, on comparing the baseline policy to a 9-hour shift with 1-hour overlap (P5-P8), we observed a significant (p-value < 0.05) decrease in the number of handoffs and LOS. However, it should be noted that a 42% and 31% decrease in handoffs and LOS comes at the cost of a 12.5% increase in full time equivalents, calling for a cost-benefit analysis.

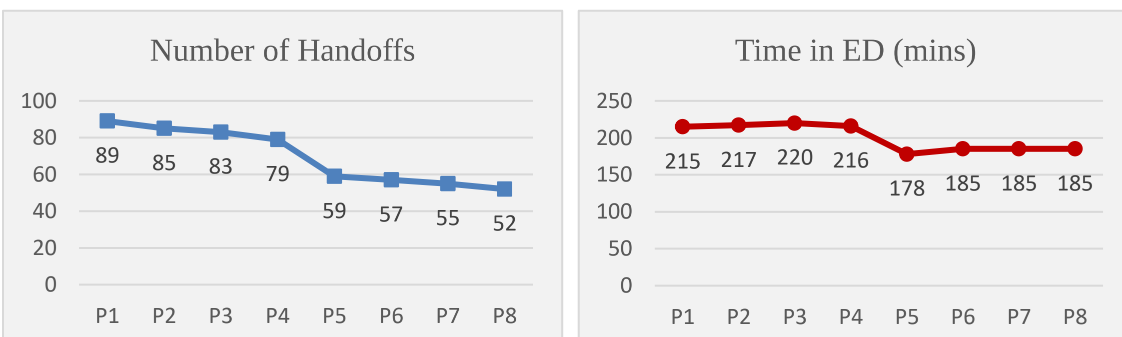

Figure 6: Number of handoffs and time in ED under different policies.

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