

EXAMINING RESIDENT ASSIGNMENT IN DERMATOLOGY OUTPATIENT CLINIC USING DISCRETE-EVENT SIMULATION

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ABSTRACT

Residents are one of the key resources in healthcare settings as their participation affects patient care activities. They are not only student in training, but also provider for medical services. The competing mission in a residency programs require assignment policies that is parallel with the clinic performance goals. This paper evaluate resident assignment by determining ideal number of residents to physician for different patient volumes using discrete event simulation. Results show that while resident assignment can be made based on patient volume, it also depends on the goals of the clinic as well as provider utilization in the clinic.

1 PROBLEM DESCRIPTION

The Association of American Medical College (2016) highlighted two parallel missions in residency programs; 1) to educate tomorrow's doctors, and 2) to provide care for today's patient. The competing mission force clinics with residency program to provide the best learning experience for residents. While studies on residents have considered optimal scheduling (Dittus et al. 1996; Hong et al. 2018), the ideal number of residents to physician in clinic session is rarely discussed. 1:1 resident to physician ratio may seem the best case to embark on the program's mission, but such assignment might not be relevant with the growing number of residency applicants and increasing demand in outpatient services. By enabling residents to perform patients' diagnosis, they directly impact patient satisfaction and clinic processes. Therefore, it is important for clinics to have set of guidelines or rules to determine ideal number of residents required for each physician in a clinic session.

Additionally, in typical clinic with resident involvement, patient will be seen either by the physician alone, or by resident and physician together. Prior to the latter, resident will see patient independently in the room, and then discuss his or her findings with the physician outside of the exam room. Intuitively, this process leads to longer patient's time in room, as it includes the time resident waits for the physician to enter the room together. Motivated by this problem, and compounded by the fact that resident is the next generation of clinical care, this paper seeks to determine the ideal resident assignment in meeting target patient satisfaction (wait times and length of stay) as well as to improve their utilization in the clinic.

2 CASE STUDY

The clinic under study is one of the top dermatology clinic in the country that offers both diagnosis and treatment for wide range of conditions. The clinic served more than 20,000 patients per year, with average of 508 patients per week. As part of primary teaching hospital for a university, the clinic provide residency program where residents are exposed to both general and specialty clinics. In each clinic session, the physician can have between 0 to 2 residents per session. Analysis from data collection shows that there are

no specific distinction on number of residents assigned per physician, specifically in the number of patients scheduled per session.

A discrete-event simulation model is built based on two-weeks comprehensive data collection on patient movement and extensive discussions. Validated model is used to run scenarios to determine the impact of patient volume and number of residents to wait time and length of stay (LOS). The scenarios are designed based on 5 sets of patient volume; base volume, 10% increase, 20% increase, 10% decrease, and 20% decrease which captures 80% of the frequency of patient scheduled per session. Each patient volume category is tested with 0,1, and 2 residents for each physician. Results from each scenarios are analyzed to determine patient wait times, length of stay (LOS), and provider utilization.

3 DISCUSSION

Results show that with increasing patient volume, wait times and LOS decreases as number of residents increases. The effect on number of residents are shown significantly in Wait Time in Room (WTR) as the difference between 1 and 2 resident case for base volume is 44.9%. While Wait Time in Waiting Area (WTWA) decreases as number of residents increases, the impact is much lower with only 10.9% improvement. This show that while WTR is driven by number of residents, WTWA is driven by patient volume, and more specifically the number of rooms allocated per physician. In terms of LOS, the most interesting analysis is in the 20% decrease patient volume scenario, where the difference in LOS between 0, 1, and 2 resident is less than 7%, which indicates that 0 resident will suffice if less number of patients are scheduled in the session.

Further analysis include examining best resident assignment for different set of goals. A clinic can determine which performance measures are more important. For example, a clinic may be more interested in minimizing wait times than LOS. We identified two set of goals for the clinic; 1) wait times at each location must be less or equal than 15 minutes, and 2) LOS for different patient volume must be less or equal than LOS reported in the base case scenario. With different goals, different set of resident assignment are identified. Resident assignment reported for all patient volume scenarios are similar, except for 10% increase and 10% decrease patient volume. When wait times are the goal, the clinic can operate with 1 resident for 10% decrease patient volume, but when LOS is the goal, the clinic can perform without resident. As for 10% increase patient volume, to achieve the specific wait times, the clinic requires only 1 resident per physician, but need to assign 2 residents to meet target LOS. This further suggests that resident assignment do not only depend on patient volume, but also on clinic's goals.

In terms of provider utilization, physician and resident definition for the measures are different. For physician, utilization is defined by the percentage of time in a clinic session where physician is engaged in direct patient clinic. On the other hand, utilization for residents are calculated through percentage of the time in a clinic session that residents are engaged in learning, which includes direct patient care, and discussion with physician. Thus, this measure must also be taken into consideration when examining ideal resident assignment.

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