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MANAGING PATIENT FLOW AT A NEW YORK CITY FEDERALLY QUALIFIED HEALTH CENTER

Pravin Santhanam
High School Student
Yorktown High School
Yorktown Heights, NY 10598, USA

Hema Santhanam
Anjali Consulting Services
1771 Central Street,
Yorktown Heights, NY 10598, USA

ABSTRACT

This study addresses the concerns about patient waiting times and fluctuations in provider utilization at a Federally Qualified Health Center in New York City. The variety of patients and the breadth of services provided create specific challenges in managing patient flow. Using actual de-identified patient data from an Electronic Medical Record system for one year, we model the clinic operations by day of the week and by three types of patient populations via discrete event simulation. Detailed simulation shows that the primary reason for long waiting times could be inadequate time allotted for appointments. Even a five-minute increase in the appointment duration times resulted in significant increases in provider utilization rates and patient waiting times. These results support the observation that due to the unique patient demographics, providers tend to address multiple needs of the patients in each visit, often exceeding the allotted appointment durations.

1 INTRODUCTION

With the passage of the Affordable Care Act (ACA) by the US Congress in 2010, millions of people who had previously not qualified for health insurance will be eligible starting January 2014. This will place increased demands for healthcare, especially at Federally Qualified Healthcare Centers (FQHC). Consequently, it is critical for healthcare organizations to be as efficient as possible, while preparing for new patient loads. In addition, the ACA has mandated that all healthcare organizations convert to an Electronic Medical health Record (EMR) system by 2014. EMR systems keep records of data on appointments, appointment durations, procedures performed, etc. Many centers including the one studied in this paper, were early adopters with a fully implemented EMR system, that collects data on every day processes. This easy access to process information makes the time ripe for the use of computer simulation to analyze the performance of healthcare organizations.

2 THE CHALLENGE

The specific clinic we are modeling, referred to in this paper as DHC, is a FQHC in New York City. DHC has characteristics that are not commonly seen in other health centers. As an FQHC, DHC is a non-profit organization that cares for the medically underserved. Most patients receive public assistance, or do not have health insurance; DHC cannot turn patients away**.** Patients consist of three types: 1) The *'Residential patients'* who live in temporary residential treatment centers for a variety of reasons such as legal infractions, drug abuse, etc. These patients have appointments prior to the visit and they are transported by a van to the DHC. Since the van has to return all the patients to their residences, individuals cannot leave until the last person in their van has been seen. Consequently, the clinic has some flexibility in scheduling them. 2) 'C*ommunity patients'* are from the surrounding area, who can schedule appointments and leave after their appointments as they please. 3) "*Walk-in*" patients are those that show up on a given day without prior appointment and are seen when the health care provider is able to accommodate them. Common characteristics across these three populations are tenuous and temporary housing conditions with limited means of communication with the clinic. Consequently, there is a general concern

about no-shows, meaning patients who do not show up for their appointment without prior notification. Due to concerns about limited engagement with patients, the providers address as many needs as a visit allows. This paper addresses how specific patient demographics and the current method of scheduling have led to long patient waiting periods and large fluctuations in provider idleness.

3 METHODS

The first step is to create and validate a patient flow diagram through discussions with the clinic staff. From the EMR report, we extract de-identified data for one year, containing 50141 patient records with details of each visit, such as service provided, scheduled appointment time and duration, etc. We identify various input parameters for the model through statistical analysis of the EMR data. Each day of the week is modeled separately because of differences in services provided, provider schedules and differences in patient behavior. We also model the three patient types separately because their numbers, the services they need, and the percentages who actually receive care are significantly different. We then model the patient flow using the Discrete-Event Simulation software program ARENA, and run 500 replications for each day. We validate the outputs of the model against the actual data using statistical tests. We obtain patient waiting times and provider utilization statistics from the outputs of the model to estimate the current efficiency of the clinic. The final step is performing "what-if" scenarios to explore possible changes to process and scheduling that can improve waiting times and provider idle time.

4 RESULTS

We obtained several important insights through the statistical analysis of the data, even before the simulation. The no-show rate for all patients at the clinic was determined to be 15%, a much lower rate than was anticipated by the clinic administrators. Cancellations and reschedules accounted for an additional 30%. Through a detailed analysis of provider logs in the EMR, we find that the actual amount of time taken with the patients often exceeded the allotted time. This could easily lead to longer waiting times than anticipated. In the first simulation, using actual scheduled times for nine providers, we obtained average utilization rates in the range, 0.2816 - 0.4879 and 70% of patients were seen within 30 minutes and 89% were seen within an hour. With just a five-minute increase in scheduled appointment durations, average utilization rates range increased to 0.3419 - 0.6501 and only 57% of patients are seen within 30 minutes of their arrival at the clinic, and only 78% are seen within an hour. This significant degradation resulted from simply increasing each appointment's duration by five minutes! Given the demographics of the patient population we discussed above, this observation makes sense because the providers are trying to address as many needs as reasonable during one appointment, often exceeding the allotted appointment times.

This paper simulates the patient flow at a complex health center in New York City with a wide range of services and challenging patient demographics. One year of data from the EMR system, both in breadth and depth, were extremely crucial in conducting this study, without any additional data needs. The results provide new insights in understanding provider utilization and long patient waiting times.

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