Chapter 12
Reducing Patient Waiting Time at an Ambulatory Surgical Center

David Ben-Arieh
Kansas State University, USA

Chih-Hang Wu
Kansas State University, USA

ABSTRACT

This chapter describes a methodology to reduce patient waiting time in a for-profit ambulatory surgical center. Patients in this facility are scheduled in advance for the various operations, and yet operations start late, last longer than expected creating undesired delays. Although this facility is limited to ambulatory surgery, it provides a large number of different surgeries, which are scheduled using "block" scheduling approach. The methodology presented generates a more accurate schedule by creating better time estimates for the operations and with lower variability. The effect of sequencing the surgeries, such that the ones with lower variability are performed earlier in the day, is also discussed.

INTRODUCTION

This chapter describes a methodology that reduces patient waiting time in a for-profit ambulatory surgical center. Patients in this facility are scheduled in advance for the various operations, and yet operations start late, or last longer than expected creating undesired delays. The facility is of small size having the potential capacity of 30 hours of surgery scheduled in any given day.

Currently, surgeries are scheduled by a scheduler using the "block" scheduling approach. Although the facility is limited to ambulatory surgery, we counted about 300 different surgery types, with a staff of quite a few surgeons. Using the block scheduling approach each group of doctors who utilizes the surgery center are assigned one or more half-day blocks in which they can schedule any

DOI: 10.4018/978-1-60960-872-9.ch012

procedure at anytime, given that no other doctor is using that time slot. As the doctors call in and request an operation room, the scheduling nurse allots an amount of time for each surgery based on previous experience. However, the combinations of surgeries and physicians are quite large, adding to the variability that is a part of the process, making the nurse's estimates quite inaccurate.

The objective of this chapter is to present a method that will create a more accurate scheduling by increasing the accuracy of the operations' time estimates, reducing the variability in the operations and sequencing the operations in a more effective manner.

Background

When scheduling surgeries one has to deal with three types of surgeries: elective, urgent or emergency. Elective surgeries can be delayed or scheduled with the least priority, while urgent operations need to be done as soon as possible, many times on a short notice. Emergency surgeries have the highest priority and many times introduce a dynamic scheduling approach by changing the planned schedule as the need for emergency operations arises. This chapter deals with the first category of elective surgeries only, which usually simplifies the analysis.

Scheduling operating rooms is a complex problem that has to be solved both at a strategies level and a shorter term tactical level. At the strategic level there are three common planning strategies (Fei, et.al, 2009): Open schedule, Block schedule, and Modified Block schedule. The open schedule allows the surgeon to choose and time slot for a case, while a block schedule assigns blocks of time and an operating room to each surgeon. Within that block the surgeons can schedule their cases as they see fit. The Modified Block schedule allows more flexibility by keeping some operating rooms unassigned to a block.

Most research work defines the operating rooms scheduling problem as the problem of which the overall objective is to allocate the patients to the various blocks and sub-specialties, during the planning period (Testi and Tandani, 2009). This objective usually uses a 2 step process: the first to allocate the blocks to the surgical sub-specialties (MSSP: Master Surgical Schedule Problem) and then to allocate the patients to each block (termed as SCAP: Surgical Case Assignment Problem). This planning problem is solved using a 0-1 Linear Programming with the objective of minimizing the damage caused to the patients by waiting for the operation. Another method using a two step approach for operating rooms scheduling is presented in (Jebali etl al, 2006).

A slightly different approach is presented in the planning of cardiothoracic surgeries (Adan et. Al, 2009). In this case, also, the problem is defined in a two-levels hierarchy: The tactical level that creates a master surgical schedule that operates on a given number of patients and optimizes the utilization of the resources required at the operating theater. The detailed level assigns patients to rooms and time slots. This approach also has been solved using mixed integer programming while the patients length of stay can be assume deterministic (as for example in Vissers et. Al, 2005) or stochastic (Adan et. Al, 2009; Denton et al, 2007).

Some operation scheduling approach the problem as a three stage problem: stage one assigns the operating room time to the various specialties. The second stage allocates time to the various blocks and assigns the specialties to each block. The third stage deals with the detailed schedule assigning individual patients to the available time slots (Santibanez at. Al, 2007). A similar three phase approach is analyzed in (Testi et. al, 2007). A common solution approach uses a mixed integer-programming model (for example Blake et. Al, 2002; Visser, 1998).

Various constraints are considered as the limiting factor on the schedule, usually the limiting factors are the operating rooms themselves as well as the human resources such as specialists,

Related Content