ENHANCING THE PATIENT ORIENTATION OF PUBLIC HOSPITALS THROUGH MORE EFFECTIVE OPERATIONAL PRACTICES AND RESOURCES UTILIZATION

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ABSTRACT

This study presents an applied research effort aimed at re-engineering the operational processes and practices of a public hospital in order to make its operations more patient oriented. Actual data captured from a public hospital in Portugal is used to simulate the outcomes of the proposed re-engineering effort. Specifically, the study at hands focuses on improving waiting time for patients to have a surgery, through more effective utilization of operating rooms resources and surgical teams. The simulation results derived from this applied research are positive. In general, they tend to point to practical operational and strategic potential benefits to the hospital and its patients.

INTRODUCTION

In recent times, more emphasis has been placed on customer service and satisfaction as means to improve the competitive standing of an organization. As such, organizations in the manufacturing sector have re-engineered their strategies, operational practices, and human resources in order to support a broader operational and strategic customer-orientation. In this context, many service organizations, including some healthcare organizations are attempting to improve the operational and strategic aspects of their performance in order to become more focused on the growing needs of customers.

Despite the unique strategic realities and operational constraints faced by healthcare organizations, especially those which are considered public domain institutions, these organizations are feeling more pressure to adopt a customer-orientation strategic perspective complemented by innovative organizational and operational practices. In many cases, the traditional business and operational models utilized in these healthcare organizations have failed to satisfy the increasing demands from patients for higher service quality, and less waiting time for medical procedures. Therefore, these organizations are looking for more innovative practices, which place the patient at the heart of operational practices. In this context, the feasibility of the effective adoption of innovative operational practices, very much, depends on the organizations willingness to view its performance from the perspective of the patient. Such performance perspective requires an organizational cultural shift toward a more balanced approach to organizational performance, where patient's satisfaction is viewed as important as clinical efficiency.

Motivated by the above discussion, this study presents an applied research effort aimed at re-engineering the operational processes and practices of a public healthcare organization in order to make its operations more patient oriented. Actual data captured from a public hospital in Portugal is used to simulate the outcomes of the proposed re-engineering effort. Specifically, the study at hands focuses on improving waiting time for patients to have a surgery, through a more effective utilization of operating rooms resources and surgical teams. Based on the results derived, the impact on operational resources utilization and waiting time for patients for a certain surgical procedure are addressed.

BACKGROUND

The healthcare industry has been under strong pressures to reduce cost, and improve operational effectiveness, including service quality and patient's satisfaction. In this context, the healthcare industry is not unique, as other service and manufacturing industries are encountering the similar pressures. However, the healthcare industry has rather unique operational realities, which are, at times, used as excuses to justify the apparent reluctance to implement proven operational practices utilized in other industries. Healthcare was, until a few years ago, considered as a social service exclusively provided by most governments. Nowadays, the healthcare industry has been transformed into for-profit, non-profit, and government-owned organizations, which, at times, compete for the same patients [5]. These organizations usually compete in the secondary and tertiary healthcare services market. However, the primary healthcare services sector is still not totally free from political interference.

In recent years, healthcare organizations have been facing increasing competitive pressures due to the drastic changes, which redefined markets, patients, customers, and operational technology. Due to the rapid change in medical technological and competitive realities, most healthcare delivery systems have been increasingly under more pressure to adopt corporate management practices [1], and to change their organizational cultures from a seller-orientation, to a customer-orientation [3][12]. In recent years, changing disease patterns, and advances in medical knowledge and technology have resulted in a steady increase in the costs of providing healthcare services [11]. The growing public awareness of new medical possibilities coupled with an aging population has resulted in an increasing demand for advanced medical care [15][18]. This increased demand has put more pressure on health care cost. Therefore, efforts to contain the increasing cost through better utilization of scarce resources are viewed as critical to the survival of the healthcare system as a whole.

Due to the increasing level of competition in the healthcare industry, organizations in this industry are becoming more aware of the need to customize services and improve service performance in order to be more consistent with the emerging requirements of the needs of the increasingly more sophisticated patients, and intensifying competitive pressures [17].

Operating rooms (OR) are considered high-cost and high-revenue service centers for hospitals. Therefore, it is essential to optimize the efficiency and effectiveness of the OR suite [9]. While operating rooms are viewed as the most critical resources of the hospital, nevertheless, they tend to generate the highest related operating costs for a hospital. Therefore, effective planning and scheduling of OR activities and resources have become among the major priorities for hospitals [13].

Operating suites are increasingly experiencing capacity constraints created by a combination of growing surgical volumes, fixed physical space, and human resources shortages. The impact of this supply-demand mismatch can result in long waiting lists for patients, forced overtime, and off-hours surgeries [19]. Therefore, efficient utilization of this costly resource is economically desirable. In addition to financial considerations, the current political pressures to reduce patients' waiting lists served to amplify the importance of better utilization of operating rooms resources and capacities [4].

Computer simulation has been used in several organizational operational environments [6][7]. In this context, simulation has been used in healthcare operational environments [8]. Due to the recent organizational changes in healthcare environments, and the risk to patients associated with such changes, the simulation methodology has been called upon more frequently in recent times to address capacity and scheduling related concerns in the healthcare operational environments [16]. Computer simulation has proven to be effective in improving various healthcare processes, including surgical processes [10]. Simulation can provide insights to healthcare decision-makers regarding the general and individual impacts on different forms of resource pooling under different demand scenarios [16].

CASE STUDY

Study settings

The studied block of operating rooms is part of the Hospital São Teotónio located in Viseu, in the central region of Portugal. This hospital has a long history, which goes back to 1842. In 1997, the hospital moved to new facilities, with 623 beds, and 40 cradles distributed into 23 medical and surgical services. This hospital currently has 2,000 employees, serving a population of more than 300,000.

Surgeries are accomplished in two areas of the hospital, namely the central operations block, and ambulatory operations block. The central operations block, analyzed in this study, includes eleven operations rooms (OR), organized in two sections (Figure 1). OR#10 is not used due to organizational constrains. On the other hand, OR#5 is dedicated to emergency services only, while OR#6 is dedicated to obstetrics. Due to the specific operational and organizational characteristics of these operating rooms, they were not included in the simulation model.

An analysis of the operating room block operational system and its related processes revealed a major operational problem, which is often found in other operating rooms blocks in similar Portuguese hospitals. The problem is manifested through a long list of patients waiting for different types of surgeries.

The simulation model

For the purpose of this study, a simulation model, allowing the assessment of the impact of changes made to the operating room block was developed. The choice of software used to construct the simulation model was made based on practical considerations, namely the availability of the professional version of the Awesim simulation software from the School of Economics-University of Coimbra.

The simulation model was designed and developed in order to make it easy to use, modify, and implement. Using the simulation model, different scenarios reflecting operational changes could be easily analyzed. Data needed to test and validate the model was collected from the hospital information systems and from direct observations. Data from a one year time period was obtained for the different type of surgeries performed. Information related to emergency surgeries and ambulatory surgeries was not used.

The conceptual structure of the model was consistent with the structure and activities of the studied operations. This structure facilitated the verification process that was performed throughout the programming process. Due to the specialization of today's surgeries, each surgical procedure has different requirements, which includes staffing, equipment, sterilizations, and anesthesiology. The main operation block supports about 11,000 surgeries per year, varying in length from, 10 minutes (ophthalmology), to more than 7 hours (neurosurgery).

In order to determine the statistical distributions representing activities duration, only surgeries within two standard deviations from average values were considered. The distributions of arrival and services processing were estimated using EasyFit. Utilizing this software, the best-fit statistical distributions and their relevant parameters were obtained. Data from the real surgery schedules during the same year was also used to construct the simulation model. This included the schedule of the operations rooms and schedule of the surgical teams.

In order to be creditable and then to be accepted and used for decision making purposes, the simulation model needed to be validated [14]. The validation process was achieved using statistical t-test to compare 15 replications of the simulation model, with 15 samples from one week obtained from actual operating data.

In this study, the simulation model was used to test and analyze three scenarios, as alternatives to a base scenario. These three scenarios represented different changes to the operations block schedule. The different scenarios are summarized below:

Scenario C0 – The scenario that reflects the as-is state of the operating room system studied.

Scenario C1 – The scenario that reflects the changes made, in a holistic and iterative way, to maximize the utilization of operations rooms during regular day-time schedule.

Scenario C2 – The scenario that reflects the utilization of the schedule obtained in Scenario 1 extended to one more four-hour period each day.

Scenario C3 – The scenario that reflects the utilization of the schedule obtained in Scenario 1 extended to the weekend period.

Results and discussion

Based on preliminary results, scenarios C2 and C3 were abandoned due to current economic and structural restrictions of the hospital facilities. The main structural restrictions included the number of surgeons available and number of beds available for the recovery phase of surgeries. Therefore, the following results are obtained based on the analysis of only scenarios C0 and C1.

Scenario C1 was constructed based on a holistic and iterative way, taking into consideration important factors that influence the surgery constraints, which included:

- Compatibilities between operating rooms specialties based on equipment available in each OR, and the requirements of different specialties.
- Surgeons' availability. The surgeons have an individual agenda which include examining patients in their office and in nurseries. They need also to include the planned surgeries and be available to urgent surgeries. Although personal agendas can be adjusted, it is sometimes difficult to obtain those adjustments.
- Time periods for surgical specialties can be different for each operating room.
- Post-surgical resources are limited and need to be shared by different specialties.

Various performance criteria were advocated in order to evaluate operating rooms planning and schedule. These include, among others, waiting time, throughput, utilization, leveling, makespan, patients' deferrals, financial measures and preferences [2]. Due to the lack of information, only the throughput was used to compare performance based on two scenarios. The throughput is a measure closely related to patients' waiting time [20], and therefore their satisfaction levels.

An ANOVA analysis was conducted using twenty random samples of one week obtained from the simulation model for each scenario. Based on the ANOVA results, significant differences for throughput were found in all cases. These results are examined below.

Based on Scenario C1, the capacity to deliver surgeries during one year was improved by 81%. However, this improvement was not balanced across all surgery specialties due to the different demand and different surgery teams' availability. A comparison of the number of surgeries that can be performed after implementing this new operations rooms' schedule, to the number of patients waiting for surgeries in the region served by S. Teotónio hospital reveals interesting results, which have strong managerial implications.

The results of the comparison showed that some surgery specialties will be in an over-capacity mode while others will be in an under-capacity mode. In this context, the over-capacity mode signifies the ability of the hospital to perform all of its surgeries and still has the potential to do more. The under capacity mode signifies the fact that the hospital has the potential to do more surgeries, however, due to current demand realities, and capacity constraints, the number of surgeries obtained in C1 is not sufficient in short-term to perform all its surgeries. The reasons for the sub-capacity mode can be attributed to surgeons/nurses restrictions and to the demand levels as reflected in the surgery waiting lists. Due to the economic crisis, and the inefficiency of the healthcare public services, the under-capacity mode of operations is difficult to overcome at the current time.

The reasons for the over-capacity mode can be attributed to the readily available surgery teams and ORs. In this context, the over-capacity mode can be effectively used to reduce the patients' waiting list of other Portuguese hospitals with fewer resources. In this context, this represents a favorable operational mode for the hospital under investigation, as it has the potential to generate more resources and revenues.

CONCLUSION

Due to recent environmental competitive changes, organizations are attempting to re-invent their operating models to improve resources utilizations and customer satisfaction. In this context, public healthcare organizations are no exception. The applied research effort presented in this study is aimed at improving the utilization of the critical operating rooms resources in a Portuguese public hospital. In the process, the impact of such improvement on the waiting list for surgical procedures is investigated. Utilizing a simulation model, the schedules of key operating rooms are simulated and analyzed. Based on the findings of this study, the following conclusions and their practical managerial implications are derived.

First, the simulation results clearly show that operating rooms schedules and the patients' waiting list for surgical procedures can be improved. To achieve such improvements, short-term re-engineering (scenario C1) of the operating rooms schedule is needed. This effort can be accomplished without the need for major operational changes. To achieve further future improvements, more long-term restructuring of operations is need (scenarios C2 and C3).

Second, during the data collection which was used to construct and validated the simulation model, the lack of operational data was evident. This clearly indicates that the information systems and capabilities of the hospital are in need of improvements.

Third, patients' satisfaction can be improved through better coordination within, and among public hospitals. Such improvements have the potential to reduce the long lists of patients waiting for surgical procedures in different hospitals throughout the entire public healthcare system. In this context, recent governmental initiative aimed at re-engineering the public healthcare service sector is encouraging and should be continued. Such initiative should be coordinated with participating hospitals to ensure maximum resources utilization across the healthcare system.

Finally, as healthcare organizations in the public sector are being asked to operate shrinking resources, it is critical to look for innovate ways to improve the utilization of existing resources. These improvements should be tied to funding and resources allocations of public hospitals. In this context, indicators of operational and clinical efficiency and quality must be integrated with clear patients' satisfaction targeted benchmarks. As such, a performance-oriented culture, which views the patients as the critical factor of medical operations, should be fostered. Such healthcare organizational culture should be fueled by a continuous improvement operational philosophy and a patient-oriented organizational strategy.

The study presented in this applied research is a modest step toward such worthy end. While this study utilized simulation to understand and improve the utilization of critical hospitals' resources, other operational methodologies may prove very useful for police-makers and hospitals' administrators as they attempt to re-invent the public healthcare services system.

References, tables, figures, and exhibits available upon request from Mahmoud M. Yasin