






Evaluation of quality indicators in the management of an operating room at a tertiary-level hospital

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ABSTRACT

Introduction: As a complex sector that results in a large part of the costs in a hospital, the operating room demands a continuous evaluation of its activities, with the objective of providing an improvement in its efficiency and in patient safety. An interesting strategy to carry out such an evaluation is using a set of pre-established quality indicators, by the division of the service's attributes into structure, processes and results, which can provide a broad perspective of the activities developed and facilitate decision-making by the hospital manager. In this analysis process, it is necessary that the service has a well-structured data source, where the Internal Regulation Center plays an important role. **Objective:** The objective of this study was to analyze, through the measurement of data related to quality indicators, the management indexes of the operating room of a tertiary-level hospital specialized in elective surgeries. **Methodology:** This is a descriptive observational study that was conducted retrospectively at a public teaching hospital. In this research, 18 indicators, related to the period from 06/01/2019 to 12/31/2019, were measured based on consultations to different administrative sectors of the hospital. The results went through a descriptive statistical analysis at the end of data collection. **Results:** The main results found were as follows: the fulfillment rate of the surgical schedule was 95.8%, the cancellation rate was 4.1%, the occupancy rate was 47.9%, the turnover time was 23.1 minutes, the mean delay time in the start of surgeries was 32.8 minutes, length of stay in the post-anesthesia care unit was 37.4 minutes, the professionals' absenteeism rate was 8.94%, and the rates of surgical site infection, operative mortality and work accident were all 0%. **Conclusions:** Despite the high fulfillment rate of the surgical schedule, the occupancy rate was below the ideal, suggesting that scheduling of surgeries can be improved. In addition, it was shown that the "reserve surgeries" strategy adopted at the hospital helped to reach the goal of scheduled surgeries and to increase the occupancy rate.

Keywords: Operating room, Hospital administration, Quality indicators, health care.

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INTRODUCTION

The Operating Room (OR) is a complex hospital sector, which involves the occurrence of unpredictable events and low tolerance to errors, and comprises a large part of the hospitals' costs and revenue¹. In this sense, it is a fact that there is a continuous search for greater efficiency of this environment, as this not only brings about financial benefits, but also an increase in safety and satisfaction of patients and staff alike². In the public health context, the concept of efficiency should go beyond the cost-benefit ratio, and must also be understood as an adequate search for answers to social demands³.

In the process of searching for the ideal efficiency in the functioning of the OR, an important strategy, and which gives the manager the possibility to better plan, organize and coordinate the sector, is the use of Quality Indicators (QIs) for the evaluation and control of the activities developed there⁴. Quality indicators cannot be translated as a direct measure of what happened, but as a set of quantitative factors that assist in a continuous health care improvement process⁵.

One way to do this is by classifying the attributes, as well as the QIs, of the service analyzed into three categories: structure, processes, and results. The structure can be understood as the attributes related to the place where the service is provided, which includes material and human resources - and their qualifications - and the organizational structure. The process category, on the other hand, denotes what is actually done when offering patient care, whether it is providing a diagnosis or offering the necessary treatment. And, by results, it is possible to understand that they are the products and effects caused by the care processes in patients and populations⁶.

In addition, in order to perform the analysis, it is essential to have access to reliable data referring to the evaluated unit⁶, in order to show the reality experienced in the service. In this sense, the Internal Regulatory Center (IRC) plays a key role, as one of its duties is to record information related to the activities developed in the hospital⁷; in this way, it enables studies such as this one to be carried out and to contribute not only to the development of the hospital analyzed, but also to the determination of comparison parameters in the scientific literature.

The main objective of the current study was the analysis of management indexes of the OR of a tertiary-level hospital specialized in elective surgeries through the measurement of data referring to pre-established QIs.

METHODOLOGY

This is a descriptive observational study conducted retrospectively in a public teaching hospital specialized in elective surgeries and located in the inland of the state of São Paulo. The hospital analyzed focuses on the areas of surgical rehabilitation of craniofacial anomalies, with 5 Surgery Rooms (SRs) operating 12 hours daily from Monday to Friday.

We studied the data on the OR dynamics for the period from 06/01/2019 to 12/31/2019, which could be analyzed from the QI perspective, as proposed in the literature⁸. Among the QIs proposed, those referring to processes and results were used.

A total of 18 QIs related to the OR were analyzed and, to measure them, the surgical charts of the period under study, the IRC records, the information recorded in the Hospital Infection Control Committee (HICC), and the Human Resources (HR) sector of the hospital were consulted. The QIs analyzed were organized as follows:

Process indicators:

- Number of surgeries performed;
- Rate and reasons for cancellations of surgeries;
- Surgical schedule compliance rate;
- Size of the surgeries performed (by duration);
- Mean turnover time in the SR (including only times below 60 minutes⁹);
- Mean length of stay in the Post-Anesthesia Care Unit (PACU);
- OR occupancy rate;
- OR occupancy rate in relation to the anesthesiologists' workload;
- Mean number of surgeries per SR-day;
- Ratio between the number of SRs in use and the total number of SRs existing per day;
- Mean delay time in the start of surgeries (with only times longer than 20 minutes being considered as delays by the IRC);
- Mean time for cleaning the SR in the interval between two surgeries;
- Number of surgeries performed per month-team.

Result indicators:

- Surgical site infection rate;
- Operative mortality rate;
- Workplace accident rate;
- Number of unscheduled surgical reinterventions;
- Absenteeism rate.

It is important to highlight that, in the calculation of the mean SR turnover time, in this study understood as the interval between the end of anesthesia in one patient and the beginning of anesthesia of the next patient in the same room, times longer than 60 minutes were excluded, according to guidelines included in the literature⁹, which describe that excessively long times should be considered as delays, not as turnovers.

It is also noteworthy that the hospital under study standardizes additional patients to those scheduled daily to be operated on in cases of unexpected cancellations, the so-called “reserve surgeries”.

Data collection was initiated after the project was approved by the hospital’s Research Ethics Committee (*Comitê de Ética em Pesquisa, CEP*) (CAAE: 23511819.9.0000.5441). To record and measure the data collected, a Microsoft Excel spreadsheet was prepared with an organization related to the QIs mentioned. At the end of collection, a descriptive statistical analysis was performed with the numbers obtained in the survey.

RESULTS

A total of 137 working days of service and a total of 1,673 procedures performed were analyzed (Table 1). In the period studied, there were 1,650 surgeries scheduled, 68 (4.1%) were cancelled and, among the cancellations, 67 (98.5%) were for patient-related reasons and one (1.5%) due to extra-patient hospital factors (absence of the anesthesiologist). The hospital’s surgical schedule compliance rate was 95.8%, as 1,582 surgeries were performed out of the 1,650 scheduled for the period.

Table 1. Number of surgeries performed in the study period

Surgeries performed	N
Scheduled	1,582
Urgencies and reviews	49
“Reserve surgeries”	42
Total	1,673

The surgeries performed were classified according to the surgical size, taking their duration as a reference. Surgeries lasting up to two hours are considered as Size I; from two to four hours are considered as Size II; from four to six hours are considered as Size III, and surgeries lasting more than six hours are considered as Size IV¹⁰ (Figure 1).

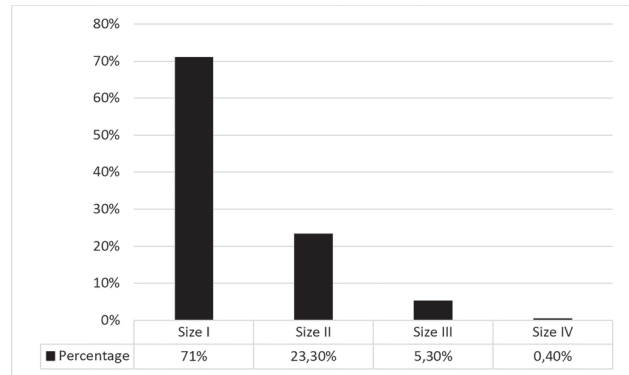


Figure 1. Classification of the surgeries performed according to size (duration)

Regarding the delayed start of surgeries, those surgeries that were initiated 20 minutes or more after the scheduled time were considered as delayed. Thus, in the study it was found that 39.3% of the surgeries were delayed, and the mean delay time among these surgeries was 32.8 minutes.

As shown in Table 2, the mean SR turnover time was 23.1 minutes, and 324 (34.3%) of the times counted were excluded from the calculation of the mean value because they were longer than 60 minutes⁹. Additionally, it was measured and recommended that the cleaning time for the SR is 15 minutes in this service. In addition, it was possible to identify that the mean length of stay in the PACU was 37.4 minutes.

Table 2. Turnover time and length of stay in the Post-Anesthesia Care Unit (minutes)

Indicator	Mean ± SD	Median
Turnover – interval between two surgeries	23.1 ± 13.8	20
Length of stay in the Post-Anesthesia Care Unit	37.4 ± 18.2	35

The OR occupancy rate in the period analyzed was 47.9% (±12.6), and 46.8% when the “reserve surgeries” were excluded from the calculation. Furthermore, it was identified that, during the days of the week, the occupancy rate suffered variations, as shown in Table 3.

Table 3. Operating Room occupancy rate regarding the day of the week (%)

Day of the week	Mean \pm SD	Minimum	Maximum	Median
Monday	44.2 \pm 8	27.9	57.5	44.3
Tuesday	54.4 \pm 12.1	29.1	73.6	55
Wednesday	52.2 \pm 9	33.1	70.9	55.1
Thursday	55.9 \pm 8.5	39.4	67.9	58.7
Friday	31.7 \pm 7.2	7.2	44.7	31.6

Also in relation to the occupancy rate of the hospital's OR, it was analyzed that, when this rate is calculated taking as a reference the workload of all the anesthesiologists working in the OR, the result is 76.0% occupation of the time they have available to participate in surgeries.

In the period analyzed, the mean number of surgeries per SR-day was 2.4 (\pm 0.7) and the ratio between the number of SRs in use and the total number of SRs available per day was 0.89 (\pm 0.14). In addition, the mean number of surgeries per month-team working in the hospital was calculated (Table 4).

Table 4. Mean number of surgeries performed per month-team

Team	Mean
Plastic Surgery	96.8 surgeries
Otolaryngology	62.2 surgeries
Orthognathic/Graft Surgery	48 surgeries
Craniofacial Surgery	11.4 surgeries
Dentistry	10.5 surgeries
Pediatric Surgery	0.85 surgeries

In addition to the process QIs described above, as an outcome QI, it was analyzed that in the period studied there were 8 unscheduled surgical reinterventions and that the rates of surgical site infection, operative mortality and occupational accidents were all 0%. Finally, in this period the expected attendance of the employees involved in the OR activities was 69,936 hours and the absences totaled 6,257 hours and 20 minutes, representing an absenteeism rate of 8.94%, with variation among the function groups (Table 5).

Table 5. Absenteeism rate among the Operating Room employee groups (%)

Employee Group	Number of contracts	Rate
Nurses and Nursing Technicians	34	14.09
Physicians	24	5.87
Dental surgeons and assistants	20	4.32

DISCUSSION

In the context of public teaching hospitals, which often operate with scarce resources, it is essential that the management process of these health units is efficient and that costs are rationalized. This allows for a better return on public investments and, consequently, greater coverage of these services, which will serve a larger number of people and with more quality¹¹.

In the search for efficient management, it is important to perform a broad analysis and with varied indicators. In the current study, it was possible to observe that the hospital in question presented good fulfillment of the surgical schedule in the period analyzed (95.8%). Despite this, the OR had an occupancy rate (47.9%) lower than the one found in other services, which ranged from 71.91% to 80.41%^{12,13,14}.

It is noteworthy that calculation of the occupancy rate was performed using as reference the 5 SRs available for 12 hours a day. Keeping the same volume of surgeries performed in the period of this study, it would be possible that only 3 SRs would be used daily instead of 5, which would result in an occupancy rate of 80.0%. This strategy can be useful for saving human resources and structure, as 2 SRs would be inoperative.

Also in relation to the occupancy rate, it was highlighted that this rate would be 76.0% when calculated using the available workload of anesthesiologist physicians as reference. This allowed for a calculation suggesting that the overall occupancy rate of the hospital's OR could increase from 47.9% to 63.1% if the time established in the anesthesiologists' contracts had been fully leveraged, which could bring about an increase of more than 1,200 hours in surgeries performed in the period analyzed.

Furthermore, considering that these professionals had all their workloads used, in order for the OR to reach an occupancy rate of 80.0% with the 5 SRs operating for 12 hours a day, it would be necessary to hire new anesthesiologists that, together, would add 50 working hours per week to those that the hospital had already hired during the study period.

Regarding cancellation of surgeries, the rate found in this analysis is close to that observed in a tertiary-level elective surgery hospital in Beirut (4.4%)¹⁵ and is consistent with the indication in the literature⁹ that it should be less than 5% for the OR to have a good operational dynamics.

Regarding the delay in the start of surgeries, the rate observed in this study (39.3%) is similar to that of a Brazilian hospital (38.86%)¹³, which also considered as delays those times longer than 20 minutes. However, another study¹⁶, which considered times longer than 5 minutes as delays, showed that, after an intervention, the delay rate of surgeries was 32% and the mean time of these delays was 7 minutes, differently from what was found in this analysis, which was 32.8 minutes. However, it should be noted that, as times less than 20 minutes were not considered as delays, the mean time found may be falsely higher, because minor delays were excluded from the calculation.

An adequate turnover time implies better management of hospital resources and better utilization of the surgical team and, for this to occur, successful work by the multiprofessional team is necessary. One study⁹ proposed a classification of turnover times into 3 categories, as follows: 1 - high performance (times less than 25 minutes); 2 - medium performance (times between 25 and 40 minutes); 3 - poor performance (times greater than 40 minutes). Based on this classification, the rate found in this study (Table 2) can be considered as high performance, differing from the mean time found in another Brazilian hospital⁵. However, it is relevant to highlight that more than 300 times in this study were longer than 60 minutes and, thus, were excluded from the sample.

The mean length of stay in the PACU observed in this study, which was not categorized according to the type of anesthesia and surgery, is close to that found in a Chinese¹⁷ hospital, which was 38.89 minutes, although it reached 81.65 minutes in patients with adverse respiratory events. Also showing this variability of the times found depending on the patient's conditions, another study¹⁸ evidenced that the mean value among all children evaluated was 31 minutes, but the mean among children with moderate or severe obesity was from 50 to 55 minutes.

Regarding the QIs referring to results, it was found in the literature that the surgical site infection rate may reach 4.85% in neurosurgical¹⁹ procedures and 3.7% in pediatric patients undergoing otorhinolaryngologic surgeries²⁰, which differs from the rate of 0% found in this study.

It is worth mentioning that, in addition to most of the surgeries performed being of Size I, they were not characterized in relation to their potential for contamination, which may be limitations of this study and influence the null rate found.

Also about the QIs of results, a multicenter study in tertiary-level teaching hospitals, lasting 1 year and 8 months, showed that the mean mortality rate in otolaryngology services was 1.1% (ranging from 0.2% to 16.7%) and considered as high those rates which were higher than 3%²¹. This highlights the 0% rate found in the 7 months of analysis of this study as a positive indicator.

Regarding occupational accidents in the evaluated sector, the rate of 0% differs positively from that found in a Brazilian general public university hospital, which showed 23.6% incidence of accidents with sharps among the professionals involved in the OR²².

Finally, in one study²³, the absenteeism rate of employees working in the OR was found to be 2.94%, which differs from the value found in this research (8.94%). Absenteeism in this type of service is a problem that affects the public coffers and brings about harms to the patients²⁴.

CONCLUSIONS

The evaluation shows that, despite the high compliance rate with the surgical schedule, the occupancy rate was below the ideal, which indicates that the surgery scheduling process can be improved, reducing the excessively long intervals between surgeries and increasing the occupancy of this sector.

Additionally, when the occupancy rate analysis is performed from the perspective of the availability of anesthesia physicians in the hospital, it is possible to conclude that there is a deficiency in the number of these professionals when the objective is to reach the ideal goal of the overall OR occupancy rate.

In addition, it is possible to conclude that the strategy of "reserve surgeries" adopted in the hospital helps to meet the goal of scheduled surgeries and to increase the occupancy rate. Finally, it should be noted that the hospital has achieved good outcome QI indexes.

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