

# MANAGEMENT INDICATORS OF THE SURGICAL SCHEDULE IN A UNIVERSITY HOSPITAL

*Indicadores gerenciais do mapa cirúrgico de um hospital universitário*

*Indicadores de gestión del mapa quirúrgico de un hospital universitario*

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**ABSTRACT: Objectives:** To analyze the surgical productivity in a university hospital, correlating the management indicators of the surgery schedule with planning aspects, and propose strategies for developing the surgery schedule. **Method:** This is a quantitative and qualitative study of descriptive, documentary, and cross-sectional nature, performed at the surgical center of a university hospital, from April to June 2018, based on the analysis of surgery schedules. **Results:** In the quarter, an average of 400 monthly surgeries were assessed. We identified that magnitude II (55.9%) surgeries were the most frequent, and urology (18.7%) was the predominant specialty. The cancellation rate evaluated the planning performance index, which was 16.9%. **Conclusions:** The surgical productivity and the cancellation rate found were close to those of other university hospitals in the country, and the weaknesses detected are related to planning failures, leading to institutional costs. We recommend the implementation of a schedule review, a preoperative nursing visit, and patient confirmation as a planning strategy. **Keywords:** Operating room nursing. Health management. Hospital planning. Hospitals, university.

**RESUMO: Objetivos:** Analisar a produtividade cirúrgica de um hospital universitário relacionando os indicadores gerenciais do mapa cirúrgico com os aspectos do planejamento e propor estratégias para elaboração do mapa e agendamento cirúrgico. **Método:** Trata-se de uma pesquisa quantitativa, descritiva, documental, transversal, realizada no centro cirúrgico de um hospital universitário, de abril a junho de 2018, por meio da análise dos mapas cirúrgicos. **Resultados:** Analisou-se no trimestre uma média de 400 cirurgias mensais. Identificou-se que as cirurgias de porte II (55,9%) foram as mais frequentes, sendo a urologia (18,7%) a especialidade mais recorrente. A taxa de cancelamento avaliou o índice de desempenho do planejamento, que foi de 16,9%. **Conclusões:** A produtividade cirúrgica e a taxa de cancelamento encontrada aproximam-se da realidade de outros hospitais universitários do país, e as fragilidades apontadas são pertinentes às falhas no planejamento, gerando custos institucionais. Recomenda-se, como estratégia de planejamento, a realização do bate-mapa, a visita pré-operatória de enfermagem e a confirmação do paciente. **Palavras-chave:** Enfermagem de Centro Cirúrgico. Gestão em saúde. Planejamento hospitalar. Hospitais universitários.

**RESUMEN: Objetivos:** Analizar la productividad quirúrgica de un hospital universitario contra los indicadores de gestión del mapa quirúrgico con los aspectos de planificación y proponer estrategias para la elaboración del mapa y el calendario quirúrgico. **Método:** Esta es una investigación cuantitativa, cualitativa, descriptiva, documental, transversal, realizada en el quirófano de un hospital universitario, de abril a junio de 2018, a través del análisis de mapas quirúrgicos. **Resultados:** Se analizó un promedio de 400 cirugías mensuales durante el trimestre. Se encontró que las cirugías de tamaño II (55.9%) fueron las más frecuentes, siendo la urología (18.7%) la especialidad más recurrente. La tasa de cancelación evaluó el índice de desempeño de planificación, que fue de 16.9%. **Conclusiones:** la productividad quirúrgica y la tasa de cancelación están cerca de la realidad de otros hospitales universitarios en el país y las debilidades identificadas son pertinentes a las fallas de planificación, generando costos institucionales. Como estrategia de planificación, se recomienda realizar el toque de mapa, la visita de enfermería preoperatoria y la confirmación del paciente. **Palabras clave:** Enfermería de quirófano. Gestión en salud. Planificación hospitalaria. Hospitales universitarios.

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## INTRODUCTION

Planning perioperative care services requires an information flow capable of integrating some sectors and services. Some aspects are essential to ensure proper surgical productivity, such as: adjusting the physical infrastructure, sizing human resources, estimating and providing material resources and equipment, and support from the services that act directly or indirectly in the execution of surgical procedures<sup>1</sup>.

In this context, the Surgical Center (SC) Unit stands out for its technical, procedural, and multidisciplinary complexity, as it involves a set of elements intended for the performance of anesthesia-surgical procedures, as well as patient recovery<sup>2,4</sup>.

The full integration and organization of services of hospitalization, storeroom, pharmacy, blood bank, laboratory, radiology, material and sterilization center, laundry, clinical engineering, intensive care units, as well as orthoses, prostheses, and special materials, are essential to implementing these surgical procedures.

The surgery schedule is a crucial instrument in this planning, since it allows an overview of operating rooms (ORs) and scheduled procedures, in addition to providing patient data, such as name, age, record, origin, type of surgery, surgical magnitude, surgical teams, anesthesiologists, nursing staff, and critical support services<sup>5</sup>.

The perioperative nurse is considered a qualified professional to manage anesthesia-surgical procedures because this position demands specific training and is responsible for nursing interventions. Also, this professional acts in the prevention of complications resulting from planning failures. The best manager is the one who thoroughly knows the activities carried out in their unity<sup>2,3,6</sup>.

SC efficiency can be quantitatively represented by results, situations, incidents, and events related to its operation. Quality indicators constitute an essential element for decision making since they enable the staff to monitor events more successfully and provide information for correction and standardization measures. These data comprise a management strategy to evaluate productivity<sup>7</sup>.

This research is justified by its management aspects in the analysis of the surgery schedule, exposing outcomes directly connected to patient safety during the performance of surgical procedures, particularly in the reality of a university

hospital (UH). Thus, we formulated the following research questions: analyzing the surgery schedule, which indicators result from planning? What strategies should be adopted before surgical productivity?

## OBJECTIVES

To analyze the surgical productivity of a UH through surgery schedule indicators and develop strategies to plan and schedule surgeries.

## METHOD

This is a quantitative and qualitative study of descriptive, documentary, and cross-sectional nature, performed at the SC of a high-complexity UH, in the state of Rio de Janeiro, which stands out as a training, education, and research site.

The research covered the period from April to June 2018, when the SC had 10 working ORs, with an average of 400 monthly surgeries.

The surgery schedule consisted of elective surgeries performed during the daytime, from Monday to Friday, with fewer patients on Saturdays.

The schedule planning used a previously filled appointment book of surgical specialties, displaying the days of the week between shifts for the distribution of ORs.

Printed and manually filled records were used to create the schedule, which provided information about the patient, the procedure, the support services, and the surgical team.

The specialties were responsible for checking the availability of beds for hospitalization, as well as the support services needed for the procedure. Next, the medical management received the prototype of the schedule and forwarded it to anesthesiologists and nurses to compose the teams for each OR.

The document analysis followed a semi-structured guideline and evaluated the surgery schedule, the printed urgent requests, the patient reception form, and the record book of SC nurses.

The description of qualitative data involved field observation, which aimed mainly at recording the information relevant to the schedule flow.

The eligibility criteria consisted of surgeries registered on the schedule, including urgent surgeries and those performed through projects that received external funding from the Ministry of Health, research funds, or private companies.

Ophthalmic and endourological surgeries, as well as those not carried out on the premises of the SC, were excluded.

This study complied with the regulations of Resolution no. 466/2012 of the National Health Council, and the Research Ethics Committee of the UH Pedro Ernesto approved the project, which received a favorable report (Certificate of Presentation for Ethical Consideration – Certificado de Apresentação para Apreciação Ética – CAAE 82754217.6.0000.5259).

## RESULTS

From April to June 2018, 1,481 surgeries were planned in the UH, of which 282 were canceled. Table 1 shows that 186 urgent surgeries were requested. Among the surgeries registered in the surgery schedule, 1,079 had no financing from projects, while 402 were funded by projects.

In the period studied, the quarterly average was 400 surgeries per month, which represented a rate of 1.3 surgery per OR per day.

The elective surgeries performed without funding from projects corresponded to 81.1% (n=875), and those funded by projects, to 88.1% (n=354). Out of the urgent requests, 83.9% (n=156) of the surgeries were performed.

The overall cancellation rate was 16.9% (n=282). Among the cancellations, the procedures without projects had a frequency of 18.9% (n=204), those with projects, 11.9% (n=48), and urgent surgeries, 16.1% (n=30).

The elective surgeries performed had their medical specialties organized according to surgical magnitude, following the classification of surgical time, in which magnitude I represented surgeries that lasted up to 2 hours, magnitude

II – 2 to 4 hours, magnitude III – 4 to 6 hours, and magnitude IV – more than 6 hours<sup>1</sup>.

Urology had 14.4% (n=177) of magnitude II surgeries and 2.8% (n=35) of magnitude III. General surgery stood out among magnitude II procedures, with 6.7% (n=82), while reaching 2.0% (n=25) among those of magnitude I. Pediatric surgery represented 5.6% (n=69) of magnitude II surgeries and 2.7% (n=33) of magnitude I.

Most specialties presented higher frequencies in surgeries of magnitudes I, II, and III; however, cardiac surgery and neurosurgery predominated among magnitude IV surgeries, with 6.7% (n=82) and 2.4% (n=29), respectively (Table 2).

The support services requested in the surgery schedule were X-ray; blood bank; intensive care unit; intensifier, which provides high-resolution images; and laparoscope.

Laparoscope had the highest frequency – 30.8% (n=472), followed by blood bank – 26.4% (n=398), and C-arc images – 23.8% (n=293). The least required services in the OR were X-ray – 21.8% (n=272), intensive care unit – 15.7% (n=234), and laboratory – 7.1% (n=113), as shown in Table 3.

The surgical specialties with more urgent requests were general surgery – 22.6% (n=42); urological – 19.9% (n=37); neurosurgery – 10.2% (n=19); cardiac – 9.1% (n=17); vascular – 9.1% (n=17); and thoracic – 7.5% (n=14) (Table 4).

The overall cancellation rate was 16.9% (n=282) among elective and urgent surgeries. The main reasons were the lack of blood – 13.5% (n=38); the lateness of the hour – 12.4% (n=35); patients not clinically fit, 11.3% (n=32); patient not hospitalized – 9.9% (n=28); stand-by – 9.9% (n=28); lack of bed in the intensive care unit – 8.5% (n=24); patient without exams – 7.8% (n=22); lack of material/equipment – 6.4% (n=18). Frequencies were lower for patients who had eaten – 6% (n=17); other reasons – 5.7% (n=16); blank – 3.5% (n=10); absence of medical staff – 3.2% (n=9); and change in therapeutic approach – 1.8% (n=5), as presented in Table 5.

**Table 1.** Production of scheduled, urgent, and canceled surgeries, with and without projects, from April to June 2018.

Surgeries	Scheduled/Requested		Performed		Canceled	
	n	%	n	%	n	%
Elective without projects	1,079	64.7	875	81.1	204	18.9
Elective with projects	402	24.1	354	88.1	48	11.9
Urgent	186	11.2	156	83.9	30	16.1
Total	1,667	100.0	1,385	83.1	282	16.9

## DISCUSSION

Using some indicators of SC procedures, we could assess the quality of perioperative care services by measuring management processes, the productivity rate, and the surgery cancellation rate. Among the productivity rate aspects, we analyzed those related to the OR utilization rate per day and the number of surgeries per month and teams<sup>2</sup>.

The surgical productivity in the quarter for elective and urgent surgeries was close to the results of research carried out in a UH in Minas Gerais, with a sample of 1,895 surgeries, of which 1,542 were elective and 353 were urgent, revealing a characteristic of UHs regarding elective care<sup>8</sup>.

In the present study, the cancellation rate (16.9%) was close to that of UHs in Sergipe and Paraná, whose rates were 19.5 and 18.45%, respectively. On the other hand, a study conducted in a UH in the south of Minas Gerais identified a frequency of 27.4%, while in a hospital in Pernambuco, this value was 30.6%, almost double the one found here<sup>9,12</sup>.

However, despite the national average being close to the cancellation rate of the UH, another public teaching hospital in the inland of São Paulo reached 6.79%, a result associated with the preoperative visit<sup>13</sup>.

The most frequent reasons for surgery cancellation in this study were connected to planning inefficiency related

to avoidable issues, such as lack of blood and the lateness of the hour<sup>14</sup>.

A communication failure in the SC between its users and the support services, associated with low blood bank supply and patients being admitted less than 24 hours before the procedure hindered the identification and availability of the fluids, affecting the results<sup>14</sup>.

The surgery schedule is a document that allows the flow of elective patient care in the sector. An effective scheduling system favors the work of surgeons, anesthesiologists, nursing professionals, equipment, and ORs<sup>15,16</sup>.

The clinical fitness of the patient is an interdependent variable in surgery cancellation, because, as doctors are

**Table 3.** Request for support services in the surgery schedule, from April to June 2018.

Support services	Request in the surgery schedule n	%
Laparoscope	472	30.8
Blood bank	398	26.4
Image intensifier (C-arc)	293	23.8
X-rays	272	21.8
Intensive care unit	234	15.7
Freezing laboratory	113	7.1

**Table 2.** Surgical productivity per specialty and magnitude, from April to June 2018.

Surgical specialty	Magnitude I		Magnitude II		Magnitude III		Magnitude IV		Specialty ranking	
	n	%	n	%	n	%	n	%	n	%
Urological	18	1.5	177	14.4	35	2.8	-	-	230	18.7
General	25	2.0	82	6.7	18	1.5	-	-	125	10.2
Pediatric	33	2.7	69	5.6	9	0.7	-	-	111	9.0
Plastic	23	1.9	54	4.4	31	2.5	-	-	108	8.8
Cardiac	-	-	3	0.2	18	1.5	82	6.7	103	8.4
Neurological	12	1.0	27	2.2	33	2.7	29	2.4	101	8.2
Colorectal	18	1.5	52	4.2	12	1.0	-	-	82	6.7
Head and neck	09	0.7	27	2.2	46	3.7	-	-	82	6.7
Orthopedic	14	1.1	42	3.4	10	0.8	-	-	66	5.4
Gynecologic	7	0.6	54	4.4	03	0.2	-	-	64	5.2
Thoracic	17	1.4	32	2.6	12	1.0	-	-	61	5.0
Vascular	12	1.0	29	2.4	05	0.4	-	-	46	3.7
Oral and maxillofacial	-	-	27	2.2	03	0.2	-	-	30	2.4
Craniofacial	8	0.7	12	1.0	-	-	-	-	20	1.6
Total	196	16.1	687	55.9	235	19.1	111	9.0	1,229	100.00

responsible for scheduling these procedures, this aspect can change in some patients due to decompensated chronic diseases, such as hypertension, hypoglycemia, infections, and other afflictions<sup>8</sup>.

Similar results were found in other contexts, such as in the UH of Minas Gerais, with 19.1%, and Recife, with 20.8%<sup>8,12</sup>.

**Table 4.** Urgent request per specialty, from April to June 2018.

Urgent request per specialty	n	%
General	42	22.6
Urological	37	19.9
Neurological	19	10.2
Cardiac	17	9.1
Vascular	17	9.1
Thoracic	14	7.5
Colorectal	9	4.8
Pediatric	8	4.3
Head and neck	7	3.8
Obstetric center	5	2.7
Plastic	5	2.7
Gynecologic	2	1.1
Craniofacial	2	1.1
Orthopedic	2	1.1
Total	186	100.0

**Table 5.** Reasons for surgery cancellation, from April and June 2018.

Reasons for suspension	n	%
Lack of blood	38	13.5
Lateness of the hour	35	12.4
Patient not clinically fit	32	11.3
Patient not hospitalized	28	9.9
Stand-by	28	9.9
Lack of bed in the intensive care unit	24	8.5
Patient without exams	22	7.8
Lack of material/equipment	18	6.4
Patient had eaten	17	6.0
Other	16	5.7
Blank	10	3.5
Absence of medical staff	9	3.2
Change in the therapeutic approach	5	1.8
Total	282	100.0

The preoperative visit is a strategy for the early identification of issues related to the clinical fitness of the patient since it prevents the inclusion of this individual in the schedule and, consequently, the cancellation<sup>11</sup>.

The non-admission of the patient is another factor detected in the hospital in Recife (24.3%). The practice of calling the patients on the day before the surgery was a strategy that reduced the non-admission rate (8.96%), as research conducted in a UH in the inland of São Paulo reveals<sup>12,13</sup>.

Cancellations lead to numerous losses for the hospital, since it prepares the logistics of materials, equipment, instruments, and specific teams for the procedure. Public hospitals are reimbursed by the public health system (*Sistema Único de Saúde – SUS*) based on a single table, with values for each procedure performed, and these values do not depend on the patient's length of stay in the hospital or the actual hospital costs<sup>8,17</sup>.

A study conducted in a large hospital in São Paulo, approved by the National Accrediting Organization (*Organização Nacional de Acreditação – ONA*) and recognized by the Joint Commission International (JCI), introduced the strategy of schedule review as a quality management tool to reduce surgery cancellations and delays<sup>18</sup>.

Besides endangering the safety of the patient, failure in some work processes can lead to surgery delay or even cancellation<sup>16</sup>.

This study elaborated an Ishikawa Diagram to map the weaknesses, identifying several factors, among which the main one was the lack of products to meet the demands of elective, urgent, and emergency surgeries<sup>18</sup>.

After detecting and analyzing the issues, three action fronts were established to solve the problem. One of them is the schedule review, which corresponds to daily meetings with interdisciplinary members involved in perioperative care, from SC sectors, material center, hospitalization, clinical engineering, and others, to identify and minimize the weaknesses of the service and propose improvements to surgical patient care<sup>18</sup>. The distribution of surgeries by magnitude is important to sizing the nursing staff, since this classification allows the organization of ORs according to the daytime surgery schedule, considering the cleaning time and room preparation between surgeries<sup>1,5</sup>.

Most surgeries were of magnitude II (55.9%). This type of surgery lasts from 2 to 4 hours, and most of them were urological, justified by the running of the project. Magnitude III (19.1%) surgeries lasted from 4 to 6 hours<sup>5</sup>.



## CONCLUSION

In a study conducted in the UH of Cascavel, Paraná, the rates of magnitude I, II, III, and IV surgeries were 64, 31, 4, and 1%, respectively. The characteristics of hospital care directly interfere in the performance of the procedure and its magnitude, that is, they determine the planning and outcomes achieved<sup>19</sup>.

Another important aspect is the evaluation of support processes that influence the SC management quality, taking into consideration critical and restricted areas, as well as their need for integration, in order to promote an organizational dynamic to the surgery schedule<sup>20,21</sup>.

Among these services, laparoscopic surgeries – a minimally invasive alternative compared to conventional surgery – had more requests in the analyzed surgery schedule.

This study considered the blood bank, the use of image intensifiers and X-rays, the intensive care unit, and clinical laboratory analysis as facilitators of surgical procedure regarding time optimization for planning the surgery schedule.

Also, the number of urgent requests increased with the substitution of some patients who, due to some factors, were not listed in the schedule.

General surgery was the most frequent specialty among urgent requests during the studied period, a fact justified by the general on-call care. Some patients who needed urgent care after the diurnal period were treated by general surgery, resulting in the data of this study, as well as by the urology service, which has an institutional project.

We underline the lack of participation of nurses in planning the SC, allocating procedures in the OR, providing and estimating materials and equipment, and cooperating with support services aiming at patient safety, better SC efficiency, and practices that express the results of its processes and guide the monitoring, measurement, and evaluation of quality<sup>2</sup>.

Nurses are the professionals with autonomy and connection with the teams and services to monitor and carry out the interventions they deem necessary when scheduling surgeries so as to improve management and control of work processes, optimize the ORs, and offer quality care to patients in the perioperative period<sup>8</sup>.

The lack of efficiency indicators and SC productivity rate were limitations of the present study, as we had no reference to compare the data collected and the incorrect filling of data in the printed material, hindering their stratification.

The management indicators analyzed in this study were surgical productivity and surgery cancellation and its causes, since they stand out as performance indicators. We assessed organizational aspects, such as surgeries per room and specialty, surgical magnitude, and support services requested in the surgery schedule.

The surgical productivity identified corroborates the reality of teaching hospitals regarding the average of treatments performed.

We found a cancellation rate similar to that of other UHs, and the most frequent reasons for cancellation were inherent in the planning, revealing inefficiency.

The surgery schedule lacks information, leading to unpredictability and contributing to the cancellation rate and low production found, considering the rate of 1.3 surgery per working OR.

We could identify and build the care profile of the UH investigated in this study by how it conducts its projects, which determined the prevalence of magnitude II procedures. As a strategy to reduce the surgery cancellation rate and, therefore, increase surgical productivity, we suggest adopting the schedule review as a management tool aimed at identifying potential problems related to surgery suspension, as well as the preoperative visit, the planning according to surgical magnitude, and the control of human resources and materials/equipment for intraoperative care.

We expect that the present study can contribute to the identification and discussion of SC performance indicators, especially in UHs, as a way to stimulate the development of actions targeted at better planning of resources and as optimization strategies in the management of all resources for a quality care provided by both the perioperative nurse and the manager of this service.

We also emphasize that the limiting factors of this study were based on the quality of the completion of forms, the lack of digital data, and the impossibility of checking diagnostic situations in urgent cases, in order to improve the reliability of the conditions presented.

We recommend the development of further studies to obtain SC productivity rates and efficiency indicators, so as to expand the topic by comparing data and results.

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