MANAGEMENT OF A SURGICAL CENTER: IDENTIFICATION OF WASTES*

Gestão em centro cirúrgico: identificação de desperdícios

Gestión en el centro quirúrgico: identificación de residuos

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ABSTRACT: Objective: To identify the hospital medical materials wasted in the surgical center and the causes of such waste in a public university hospital. **Method:** A descriptive, exploratory study with a quantitative approach, conducted in a midsize university hospital in Belém, Pará State, Brazil, from June to August 2014. **Results:** The most wasted materials were surgical head covers (15%), gauze (13%), pharmaceuticals (12%) and gloves (11%). Among the causes of the mentioned wastes are trainees (21.3%), inappropriate usage (16%) and quality of the material (16%). **Conclusion:** The results of this study confirm the existence (of structural and managerial characteristics) of material waste in the Surgical Center. As a consequence of this study, a change in the behavior of the professionals was observed, the materials distribution system for the surgical center was restructured, and a surgical kit was implemented.
Keywords: Hospital administration. Surgicenters. Health services.

RESUMO: Objetivo: Identificar os artigos médicos hospitalares desperdiçados no Centro Cirúrgico e as causas desses desperdícios em um hospital público e de ensino. **Método:** Estudo descritivo, exploratório, com abordagem quantitativa, realizado em um hospital universitário de médio porte em Belém, Estado do Pará, Brasil, no período de junho a agosto de 2014. **Resultados:** Os materiais mais desperdiçados foram turbantes (15%), compressas de gaze (13%), medicamentos (12%) e luvas (11%). Entre as causas dos desperdícios mais citadas estão os estagiários (21,3%) uso inadequado (16%) e a qualidade do material (16%). **Conclusão:** Os resultados deste estudo confirmam a existência (de ordem estrutural e gerencial) dos desperdícios de materiais no Centro Cirúrgico. Como fruto deste estudo, houve uma mudança comportamental dos profissionais, reestruturação no sistema de distribuição de materiais para o Centro Cirúrgico e implantação do *kit* cirúrgico.
Palavras-chave: Administração hospitalar. Centro cirúrgico. Serviços de saúde.

RESUMEN: Objetivo: Identificar los artículos médicos hospitalarios desperdiciados en el centro quirúrgico y las causas de ese desperdicio en un hospital público y de enseñanza. **Método:** Estudio descriptivo, exploratorio con enfoque cuantitativo, realizado en un hospital universitario de tamaño mediano en Belém, Pará, en Brasil, de junio a agosto de 2014. **Resultados:** Los materiales más desperdiciados eran turbantes (15%), gasa (13%), medicamentos (12%) y mangas (11%). Entre las causas de los desperdicios más mencionados son estudiantes (21,3%), uso inadecuado (16%) y calidad del material (16%). **Conclusión:** Los resultados de este estudio confirman la existencia (orden estructural y de gestión) de los desperdicios de materiales en el centro quirúrgico. Como resultado del estudio, hubo un cambio en lo comportamiento de los profesionales, una reestructuración del sistema de distribución de los materiales al centro quirúrgico y la implantación del kit quirúrgico.
Palabras clave: Administración hospitalaria. Centros quirúrgicos. Servicios de salud.

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INTRODUCTION

The management of material resources has become a major concern for healthcare organizations in both the public and the private sectors. In the public sector the concern is even higher owing to the limited budget, which requires greater control of materials consumption and costs so that professionals can provide the necessary assistance to patients[1].

The quantity of materials used for assistance and support in midsize public hospitals are considerable; most of them are used by the nursing team and consequently are the most wasted. This waste can lead to unnecessary spending on resources and inefficient processes, procedures, or services related to the assistance. Therefore, the performance of nurses in managing material resources is one of the greatest achievements in managerial decision-making, which reinforces their importance in the technical and administrative aspects inherent to the processes of care and management[2].

In many hospitals, the Surgical Center is one of the sectors that use larger quantities of material resources and also has a very complex logistical distribution system, which requires a large supply of materials, leading to high consumption and, consequently, making this area a major waste producer. Therefore, the Surgical Center represents a major challenge for the reduction of waste and elimination of material supplies.

The interest in conducting this study was due to the first author's observations made when acting as a nurse in the Surgical Center in regards to a considerable quantity of discarded medical materials, either by nonuse or from past expiration dates. These observations motivated this research in order to build the necessary parameters to assist health institutions in minimizing waste, achieving quality excellence, optimizing resources, and allowing for investments in other areas.

Given this context, this study intended to evaluate the following question: "How can identifying wastes contribute to the elimination of losses and reduction of costs"?

OBJECTIVE

To identify the hospital medical materials wasted in the Surgical Center.

METHODS

This was a quantitative, descriptive, and exploratory study. This study was carried out at a university hospital, which provides medical care exclusively by the Unified Health System (SUS). The hospital is located in the city of Belém in Pará State, and is known for clinical and surgical pulmonology and infectious and parasitic diseases. Additionally, it is a campus for graduate students and for multidisciplinary medical residents.

The study population was composed of nurses and nursing technicians who worked in the Surgical Center.

In the study period, from June to August 2014, the Surgical Center had two operating rooms and two post-anesthetic recovery rooms. The surgical center provides material and human resources to conduct the anesthetic and surgical procedures and provides assistance to patients from both the inpatient unit and the outpatient clinic. A daily schedule with elective, unscheduled elective, and emergency surgeries in various specialties is detailed, manually and in advance, by the surgical center nurse in order to prepare the surgical map.

In the study period, the surgical center worked with 180,726 items to address the various specialties need, and the annual cost of the consumables was R$ 5,194,394.05.

Data was collected in two stages. First, 195 surgical procedures were monitored from beginning to the end, during which wasted materials from those that were opened, but not used was observed. Materials stored in the various rooms of the surgical center were also observed.

During the development of the observational guide, variables related to the characterization of procedures (surgical specialty and surgery performed) and the surgery grades were included.

Data was recorded as follows: during the observation all the dispensed and not dispensed materials were registered, that is, those materials delivered and registered by the circulating nurse and those the residents withdrew from the drawers themselves because the materials were widely available and were not registered by the circulating nurse. At the end of the procedure the used materials and those opened, but not used were counted.

In the second stage, we administered a questionnaire with open-ended and closed-ended questions to the nursing professionals of the Surgical Center in order to identify, from the perspective of these professionals, wastes and

suggestions on how to avoid them. The variables related to the characterization of the professionals included in the construction of the structured instrument for data collection were the following: professional category, gender, age, length of experience, educational level, and role in the operating room.

The project was approved by the Research Ethics Committee (CEP) of the University Hospital João de Barros Barreto of the *Universidade Federal do Pará* (HUJBB/UFPA) (CAEE: 30993014.2.0000.0017 – Opinion No. 663,861), on 27 May 2014.

The objectives of the study were explained to the professionals involved in this study after approval by the CEP. The informed consent agreement was given to the participants to be signed after obtaining their verbal consents.

RESULTS

The study results should be considered within the context of some limitations, such as surgical suspensions and complications; however, the most important limitation is that the research was conducted in just one institution. Therefore, we cannot generalize the results found on the sources of wasted materials to other health institutions.

In the first phase of data collection, 195 types of procedures were monitored, and the largest numbers of wasted materials were identified (Table 1).

The materials were dispensed, wasted, and used in surgical pleural drainage, hernioplasty, open cholecystectomy, laparoscopic cholecystectomy, the insertion of central venous catheters, laparotomies, and thyroidectomy.

Table 1. Percentage distribution of consumables and medications which were dispensed and wasted, and actual consumption in surgeries during the data collection period. Belém (PA), 2014.

Materials/medications	Dispensed	Wasted	%	Utilized	%
Gauze 7.5x7.5 cm (package)	1,131	750	66.3	381	33.7
Hypodermic needles	678	15	2.2	663	97.8
Syringes	851	13	1.5	838	98.5
Surgical Gloves (pair)	568	10	1.8	558	98.2
Stopcocks	171	5	2.9	166	97.1
Endotracheal tube	56	1	1.8	55	98.2
Sutures	637	3	0.5	634	99.5
Butterfly needles	167	14	8.4	153	91.6
Crepe bandage	67	10	14.9	57	85.1
Procedures gloves	733	200	27.3	533	72.7
Head covers	2,487	390	15.7	2,097	84.3
Scalpel blade	171	2	1.2	169	98.8
Needles for anesthesia	61	4	6.6	57	85.1
Drains	76	2	2.6	74	97.4
Catheter for aspiration nº 14	188	2	1.1	186	98.9
Dimorf	44	1	2.3	43	97.7
Fentanyl	247	6	2.4	241	97.6
Midazolan	49	3	6.1	46	93.9
Ephedrine	76	3	3.9	73	96.1
Dipyrone	117	1	0.9	116	9.1
Atropine	226	2	0.9	224	99.1
Novabupi	70	1	1.4	69	98.6
Distilled water	267	1	0.4	226	99.6
Total	8,835	1,439	16.3	7,396	83.7

The 7.5x7.5 cm gauze was the most wasted material with 750 packages, which corresponded to 66.3% of the total dispensed – 1,131 packages. Therefore, only 381 (33.7%) were truly necessary for performing the surgeries. In the studied institution this material is packed with 10 gauzes per package, and improperly opening them was the main cause of the waste. The surgical head covers were also identified as the most wasted, with 390 units, which corresponded to 15.7% of the total dispensed – 2,487 units. Of this total, only 84.3% were required for the procedures. The waste was due to improper use because the head covers were used as shoe covers. The misuse was also identified with gloves, which were used as elastic to assist in venous punctures. In such cases, 200 units were wasted, 27.3% of the total dispensed.

The impact of the waste of materials on institutional finances was calculated considering the cost of wasted materials during surgical procedures and during the storage period owing to past validation dates. The currency used for the calculation was the Brazilian Real (BRL).

The cost of the total waste of materials and drugs used and stored in the Surgical Center was approximately BRL 6,695.73, according to Table 2.

The results showed that the wasted material with the highest cost were the sutures — 819 units, its waste is equivalent to BRL 1,818.18 due to expired validation dates during storage. The second highest cost from waste during surgical procedures was on the 7.5x7.5 cm gauze — 750 units, with a total amount of BRL 1,263.00. This waste was due to excessively offering the material to the surgeon, most often without the doctor's request.

With regard to the second phase of data collection, the results obtained by the questionnaires given to the Surgical Center nursing professionals on identifying of wasted materials and strategies to avoid them were presented.

The nursing professionals answered the question: "In your opinion, are there wasted consumables in the operating room? And what are the most wasted?" The answers were gauze pads with 13%; medications with 12%; and gloves with 11%.

With regard to the question "What are the main causes of waste of such materials in the Surgical Center?", the answers included the presence of interns with 19 responses (21.3%), improvisation and the quality of the materials with 14 responses (16%), followed by 13 responses (15%) on inappropriate use, 12 responses (13%) on the excess availability of materials in the units, 10 responses (11%)

Table 2. Cost of waste of the materials and medications which were used and stored in the period of two months.

Materials/ medications	Unit	Quantity	Unit value (BRL)	Total amount (BRL)
Gauze 7.5x7.5 cm	Package	750	1.68	1,263.00
Needles	One	15	7.00	105.00
Needles for anesthesia	One	80	10.97	877.60
Syringes	One	49	0.72	35.28
Surgical Gloves	Pair	10	3.18	31.80
Stopcocks	One	05	0.54	2.70
Endotracheal tube	One	11	10.40	114.40
Endobronchial tube	One	03	153.63	460.89
Sutures	One	819	2.22	1,818.18
Drains	One	52	3.00	156.00
Catheter	One	41	3.67	150.47
Probes	One	23	1.45	33.35
Hemostatic	One	5	160.00	800.00
Butterfly needles	One	14	1.38	19.32
Crepe bandage	One	10	1.18	11.80
Procedures gloves	One	200	0.70	140.00
Head covers	One	390	0.07	28.47
Scalpel blade	One	2	28.00	56.00
Fentanyl	Vial	6	2.27	13.62
Midazolam	Vial	3	13.50	40.50
Dipyrone	Vial	1	0.65	0.65
Atropine	Bottle	2	0.50	1.00
Novabupi	Bottle	3	16.60	49.80
Dopamine	Vial	23	1.76	40.48
Aminophylline	Vial	15	0.62	9.30
Furosemide	Vial	18	0.17	3.06
Amikacin	Vial	4	2.00	8.00
Dobutamine	Vial	4	14.71	58.84
Hydrocortizone	Bottle	3	2.77	8.31
Calcium gluconate	Vial	28	0.90	25.20
Reminfentanil	Bottle	6	46.00	276.00
Ringer lactate solution	Bottle	12	3.00	36.00
Glucose 25%	Bottle	4	0.32	1.28
Dimorf (morphine)	Vial	1	4.00	4.00
Distilled water	Bottle	1	0.28	0.28
Total		2,616	507.54	6,695.73

on the difficulty in controlling materials, and 7 responses (8%) on the lack of protocols.

Regarding the question, "What factors may contribute to the waste of materials?", the answers were 41% in organizational factors, 31% in management factors, and 28% in structural factors.

As to the question "What suggestions do you have to minimize the waste of consumables and medications in the operating room?", 13 respondents (25.49%) were supportive towards the implementation of surgical and anesthetics kits, 9 respondents (17.65%) suggested raising team awareness, 6 of them (11.76%) believed that there should be a work process evaluation and protocols established, 5 respondents (9.80%) suggested improving the input-output control of the materials, implementing daily dispensing and returning of excess, and creating satellite pharmacies.

DISCUSSION

The management of material resources in the health sector is becoming more important, due to not only advancements in technology, in raw materials in the pharmaceutical industry, in materials, and in equipment, but also to issues related to the administrative process of organizations, the absence of consumption control systems, wasted material and its costs, and fundamental aspects of care such as quality and safety[4].

The results show that the 7.5x7.5 cm gauze pad is the most wasted material with an exact quantity of 7,500 gauze units. However, this waste cannot always be avoided (for example, if a package of 10 gauzes is opened with some remaining, the gauze cannot be used further).

The head covers, which are part of the surgical scrub and intended to protect the heads of the Surgical Center multidisciplinary team as well as the patient's head to avoid surgical infections, are used as shoe covers in the studied institution owing to the lack of materials for this purpose. However, as these materials are not suitable for this purpose, they are used more often, which could be avoided with the use of exclusive shoes in the Surgical Center as recommended by the Health Surveillance Agency (ANVISA) and Regulatory Norm (NR) 32.

However, as the cost of this material is minimal, it is not given its due importance, and its value is only recognized when the stock ends. If there is no material in the hospital for protecting the heads of the professionals, the surgical procedures are suspended.

The same occurs with the gloves, which are also part of the personal protective equipment (PPE), since its use is important in all procedures performed with the patient, but not always used properly. The waste of this material was observed as a consequence of improvisation, as the gloves were sometimes used for tourniquets (an elastic to compress veins in order to puncture the venous access) and then discarded. This situation shows that, despite the waste and its costs (and considering that the actions goals are achieved), these materials are used to fulfill a different function from the one originally intended owing to the lack of specific materials[4].

The technique of improvisation in nursing is already considered historic and one of the strengths of care. However, with regard to managing resources, even if this technique is effective in many situations, the waste arising from improvisation must be evaluated against the costs and benefits[2].

Currently, the concern with healthcare costs especially in public institutions is increasingly present because patients are increasingly aware of their rights, leading healthcare institutions to implement habits of work efficiency, and to evaluate and to list the quantities of materials used, the production, and costs. However, this is only possible with health staff awareness to define and re-evaluate the work process[3].

Waste is intrinsic to the work process when dealing with services and in particular a public teaching hospital because although all the surgeries processes are defined and outlined, variations occur for each individual (surgeons, residents, nursing professionals, patient/pathology). Therefore, these wastes are inherent to the management process of materials consumption in surgeries[3].

The nurse has an important role as the communicator in these processes, as they share information with all professionals involved and act as the link between the different health professionals and administrative personnel, and between these professionals and the patients. Therefore, the nurse increasingly acts as a change agent in achieving the balance between the quality, quantity, and costs of surgical material[5].

With regard to the materials inventory, the studied hospital uses a traditional system of storage and dispensing of materials, which is a model that favors excesses in the workplace.

Excessive stocks are an investment with no return and pose a risk to the organization, as they increase the probability of losses via expiration date, deterioration and rework. The presence of large stocks of some materials and the scarcity of others within a hospital, as shown in the results regarding the sutures (wasted the most, generating a cost of BRL 1,818.18, due to past expiration dates in storage), is probably the issue that most concerns the professionals involved in the management process[6].

Large consumption of many materials and the high cost at the university hospital may be a consequence of an excess inventory owing to the lack of knowledge on the actual consumption and on the types of materials that are actually needed in certain surgeries[2].

Even if the control is efficient, losses of materials and medications may occur because of expiration dates, inadequate storage, and decreased inventory turnover because of the replacement of similar materials by the medical team[7].

Proven studies in public and private hospitals reveal that although the institutions have adopted institutionalized programs to eliminate such wastes, difficulties in implementing the identification process and the actions to avoid such losses are still found. Among the difficulties are the poor relationships between management and professionals, the lack of commitment of the team to the institution and vice versa, and the lack of administrative knowledge of the professionals[8].

The cost of the waste was low when compared to the total annual cost of consumption of materials in the institution (BRL 5,194,394.04). However, when we analyze the number of wasted materials, which was equivalent to 2,616, and the total cost for 2 months of approximately BRL 6,695.73, these values became significant when considered as the analysis for a single sector.

The impact of this waste on the financial health of the institution is significant, considering that the researched hospital is an academic center and a public organization dedicated to education. Thus, to maintain the proper flow of materials consumption is essential, so that the lack of materials does not compromise the care, teaching and learning, and the research processes in different areas.

The cost is the most important aspect for decision-making, requiring the implementation of cost reports for hospital survival, as managers need accurate and appropriate information to make strategic decisions and obtain operational improvements. Knowing the actual costs of services, institutions will be able to eliminate wastes, improve their services, evaluate quality incentives, and promote continuous improvement through activity-based management[9].

Therefore, every institution whose mission is to provide care to people must constantly worry about the efficiency of this assistance, and thus implement actions and programs to ensure quality and promote efficiency when providing services. Therefore, the interaction between administrative, technological, financial, healthcare, and educational and research areas is essential[10].

Especially in university hospitals, which are expensive organizations that depend on the equilibrium of costs and revenues to survive, balancing these finances by implementing actions for the detection of sources and types of waste of materials becomes more important[11].

It is important to mention the opinion of the survey participants when they attributed the major cause of waste to the presence of interns, improvisation, material quality, improper use, excess material in the units, difficulty of controlling material flow, and lack of protocols.

Among these different types of waste is the culture of abundance, especially in the absence of protocols and procedures for standardization of consumables. This situation is aggravated when the waste is not measured, as it becomes invisible and hinders opportunities to raise awareness of those involved as well as the actions to minimize losses[3,4].

As a strategy to avoid waste, implementing surgical kits was one of the most common suggestions from the respondents. The implementation of surgical kits results in optimal usage and a better oversight of materials, avoiding both excesses and shortages. The use of kits as a control strategy helps professionals anticipate necessary items and understand what was actually used from the inventory when services were provided[3,7].

This new delivery system should lead to better usage of materials, respecting their original purpose. The medical professional should reflect on its necessity because they need to justify its use, and because they are aware of the managerial oversight over the simplest, lowest cost materials to high cost materials that are classified as fundamental for the care of the surgical patient[7].

The ABC classification in assessing the importance of each of the materials also stood out as a strategy for waste control. Items are classified according to the following categories of importance:

- Class A: 20% of the items with the highest costs, accounting for approximately 80% of the amount consumed;
- Class B: items of intermediate cost, usually estimated at 30% of the total and accounting for 10% of the consumed amount;
- Class C: items of low cost, which represent 50% of all consumables and 10% of the total cost, which does not mean that these items should be ignored. However, the importance of Class A materials in regards to costs is higher[7].

Another important methodology for controlling materials is the XYZ, which evaluates the criticality or indispensability of the material in the performance of activities. However, the most common concept of criticality is how essential the item is for the organization. Certain materials paralyze hospital processes when they are out of stock; for example, if needles or syringes are missing, most procedures cannot be performed[7].

Therefore, standardization is an important management tool, which provides uniformity of actions, prevents dispersion, and also allows the professionals to perform their duties in a safe, guided manner[5].

The nurses, who are responsible for organizing the assistance and resources to facilitate the work of all professionals, are included in this context. As the managers of units that greatly consume materials, nurses are usually in charge of resource management at all levels of the organizational structure[11].

CONCLUSION

This research allowed for the identification of wastes and reinforced the need to implement awareness programs to promote behavioral change in the professionals involved in the process. Additionally, this study showed the cost of waste and presented strategies to minimize them.

Only after being aware of the actual service costs, the institutions will be able to eliminate wastes, to improve services, and to ensure quality care to the users through procedural standardization, which is extremely important in a teaching hospital.

As a result of this research, there was a restructuring in materials distribution for the Surgical Center. Prior to the study, the distribution occurred once a week; however, after the study, materials began to be distributed twice a week, reducing waste of materials that occur from past expiration dates.

Additionally, as a benefit from the research, the surgical kit for sterile materials was implemented by the Material and Sterilization Center, thus reducing losses and better organizing the work process in both the Materials and in the Surgical Centers.

Despite its limitations, the development of this study reinforced the need to apply new material management tools in hospitals.

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