

## HEALTH MANAGEMENT IN PERSPECTIVE OF ASSISTANCE MATERIAL WASTE AND ITS COST: An Integrative Review

**Sarah Lopes Silva**

*Mestranda em enfermagem na Universidade Federal do Estado do Rio de Janeiro*  
E-mail:[enfasarah@gmail.com](mailto:enfasarah@gmail.com)

**Annibal José Scavarda**

*Pós-doutor em administração da produção e operações pela FGV. Professor adjunto do departamento de Engenharia de Produção da Universidade Federal do Estado do Rio de Janeiro*

**Vivian Schutz**

*Doutora em Enfermagem. Professora adjunta da Universidade Federal do Estado do Rio de Janeiro*

### ABSTRACT

*Due to health cost increase and the constant search for efficiency and effectiveness, health managers have worried more and more about better allocating resources, balancing costs and resources and reducing the unnecessary. This concept highlights waste, cost measurement and containment ways. The goal in this study was to identify the knowledge being produced over the last ten years about health waste and its cost. An integrative review was made to subsidize the analysis of the knowledge produced around the theme. Publications based on Lilacs, Medline and BDEF data were analyzed. The studies show material resources as the first source of waste, with 32.1% of the total. The analyzed articles suggest awareness strategies targeted at health professionals about waste and reduction ways through labor process optimization and organization. This way, it is expected that institutions invest in waste management strategies as a way to control avoidable costs for these services.*

**Keywords:** *Costs and cost control, hospital costs, health material resources*

### INTRODUCTION

Health costs, from the perspective of both health companies and users, has been increasing due to factors like utilization of new technologies, demand and life expectancy increase, managerial inefficiency from health professionals, lack of qualified professionals, among others. This growing elevation and the efficiency and effectiveness search have been leading professionals to look for better allocation of resources and balance between costs and financial resources (Francisco and Castilho, 2002; Pereira and Schutz, 2012).

From this landscape, there is a need for professionals to acquire greater knowledge about costs and measures to balance them with financial resources, aiming to optimize results. For both health managers and paying sources, worries have been turning towards calculation and control of hospital costs and its containment measures focusing on waste, one of the main sources of expenditures within the sector (Francisco and Castilho, 2002; Aranha and Vieira, 2004).

In the literature, studies involving costs and waste show that according to health professionals, physicians and nurses, the biggest source of waste is related to material resources, which generates an annual estimated cost of approximately 479 million reais. Waste related to these resources can occur in many ways, from the stock purchase of questionable quantity and quality to usage in inadequate way or quantity. Considering material resources represent the second biggest cost in health institutions, consuming from 15 to 45% of the hospital budget, researchers have been indicating the use of management tools to change the reality of hospital waste and maintain economic viability for them (Vagheti et al, 2011; Castro e Castilho, 2013).

Sacramento (2001) defines waste as the use of available resources in an uncontrolled, abusive, irrational and inconsequent way. It is the use without need, finality or defined goal. Waste comprehends actions that do not aggregate value to the product or service, but generate unnecessary costs and expenses (Castilho et al, 2011).

To Castilho et al (2011), waste in the health sector is represented by the unnecessary expenditure of resources in the production of processes, products, procedures or services destined to client assistance. Its sources are plenty

and range from material purchase in questionable quality and quantity to those related to human resources. These, on the other hand, can generate waste related to low productivity, absence, rework, high turnover, lack of training on resource usage, inadequate usage of hospital material and work accidents (Sacramento, 2001; Aranha and Vieira, 2004).

On health services, identifying and measuring waste are made more difficult due to the complex logistics and the complex network of actions necessary to patient care. Sources of waste in a hospital institution are many, such as, badly designed processes, untrained professionals and consequent rework, excessive use of materials and medicine as well as misappropriation, uncalibrated equipment, unnecessary procedures and exams, stressed workers, absence, and even patients waiting for care. Therefore, in order for the patient not to pay for organizational inefficiency, an efficient hospital management and cost control is important (Toussant, 2010).

Due to the increase in business competitiveness and harder to reach profits, health companies look for waste reduction, superfluous reduction and financial activities control (Rodrigues et al, 2004; Schutz and Siqueira, 2011).

Some hospital institutions are currently adopting the lean manufacturing model. Lean thinking had its origin in the Toyota production system and aims to obtain better results through minimizing waste in the whole production and service process, paired with quality as well as worker and client satisfaction. According to Buzzi and Plytiuk, 2011, "Lean Thinking can be defined as a systematic approach that allows the identification and elimination of waste in productive processes, while its main focus is to aggregate quality and deliver to client only what he considers value".

Although waste has been an object of study in industrial production for some time, in the health area, this concern is still recent; therefore, it is not properly equated. Waste comes to aggravate the problems related to resource scarcity in this sector (Sacramento, 2001; Silva et al, 2006).

Material resources consume 15 to 45% of hospital budgets and represent the second biggest cost of health organizations. Waste of these resources can occur from the purchase of big stocks, making it difficult to control, acquisition of low quality material, as its inappropriate and abusive use. Studies show that in public hospitals, there are approximately 3000 items of consumption material, from which around 80% are used by the nursing staff and its waste increases expenses in approximately 30% (Vagheti et al, 2011).

Health professionals and hospital managers still need knowledge and awareness on material management and its capacity to lower assistance costs. Therefore, in order to reduce waste and optimize material resources consumption, prior planning, control and proper use are indispensable (Castro and Castilho, 2013).

From this data and looking to add efforts to increase the knowledge on waste in the health sector, the present investigation was conducted, aiming to identify the knowledge that has been produced over the last ten years about health waste and its cost.

## **METHODOLOGY**

It was conducted an integrative review, technique that synthesizes and gathers the existing knowledge related to theme in question and allows for incorporation of these studies' results into the practical world (Bezerra et al, 2014)

In order to operationalize this review, the following steps were performed: establishment of hypothesis and objectives; definition of inclusion and exclusion criteria; selection of information to be extracted from selected articles; representation of selected information into tables; analysis of results; discussion and conclusion.

The present review has the following guiding question: What are the sources of waste in assistance materials and what is its impact on hospital cost management?

As an identification strategy and study selection, a search for indexed publications on the theme of study was conducted, in order to identify the knowledge produced so far in the following computer databases: *Literatura da América Latina e do Caribe em Ciências da Saúde* (LILACS – Latin America and Caribbean Literature in Health Sciences), Medical Literature Analysis and Retrieval System Online (MEDLINE) and *Base de Dados de Enfermagem* (BDENF - Nursing Data Base).

The following inclusion criteria for article selection were adopted: articles with full abstracts and bodies of text for analysis; which fit the study question; published in Portuguese, English or Spanish languages; published between the years of 2004-2014, and that contained in its titles and abstracts the following health sciences descriptors (DeCs): costs and cost analysis, hospital costs, material resources in health and nursing. It is important to highlight that the term health waste, although it is the objective of this study, is not considered a health descriptor.

Relevant data from the selected articles were collected by filling a form created by the author with identification of authors, sources of location, objectives, methodology design, data analysis, results and discussion and the obtained information was organized into a table (table 1), shown ahead.

## RESULTS AND DISCUSSION

Researching the Lilacs database, 512 articles were found with the descriptor costs and cost analysis, 213 articles for the descriptor hospital costs, 227 works on the research for the descriptor material resources. On the BDNF base, 35, 26 and 38 were found, respectively. On Medline, research was made with words and subject descriptors, crossing the descriptors costs and analysis and nursing, costs and cost analysis and health material resources, health material resources and nursing, hospital costs and nursing. The amounts of articles obtained were 2258, 11, 115 and 703, respectively.

Among the articles found in the research, only five articles obeyed the criteria previously mentioned and approach the subject of waste in health institutions. For the present integrative review, the selected articles were read thoroughly.

In terms of professional category, 3 articles were published by nurses, 1 by engineers and 1 by a multi-professional team comprised by physician, pharmacist and biologist. The articles written by nurses were published in national nursing magazines, the engineering one was published in a health administration magazine and the article published by the multi-professional team was published in a health magazine.

From the 5 articles analyzed, 3 had a quantitative approach and 2 had a qualitative approach, wherein the articles that quantified the cost of waste (2) realized a quantitative approach.

The articles were published between the years of 2004 and 2013. One article was published in 2004, one in 2006, two in 2011 and one in 2013. From the five articles, four were developed in university hospitals, two of them being extracted from masters and doctorate works.

### *The causes of health assistance material waste*

The articles analysed show plenty of causes for health material resources waste, some of them also approach different types of waste in this area. To Ohno, engineer and creator of the Toyota Production System, we can find seven types of waste in the productive process. They are overproduction, wait, excessive transportation and handling, inappropriate processes, inventory excess, unnecessary movement and defects. These wastes can be responsible for up to 95% of the total cost in companies that do not adopt the Lean methodology (Buzzi and Plytiuk; 2011).

Another analyzed study shows a survey taken from a hospital institution's staff, who point out material resources as the first source of waste, with 32.1% of the total. (Aranha, 2004; Palma, 2012).

One of the initial causes of health waste is at the beginning of the process, that is, the acquisition of material by the managers and personnel responsible for purchasing. In many institutions, public and private, material purchasing is made by professionals that are not at the tip, without enough assistant technical knowledge to know if the acquired products, although covering the requested standard specifications, have enough quality for adequate and efficient use, without damages to the work process or the client who receives care. Therefore, the participation of a professional with managerial assistance knowledge is important in this process to optimize it through purchasing products with accessible price and good quality, preventing, then, the waste generated by the use of more than one product for the same purpose, because the first one was inefficient and/or insufficient for the assistance practice. One of the articles cites as an example needles that do not perforate, adhesive tape that does not adhere, catheters that do not drop or that lead to the use of bigger quantities in order to achieve the expected result, as well as rework from the health care professionals, which also represents a cause for waste. (Aranha, 2004; Vaggetti, et al, 2011).

Another cause for waste occurs mainly in public institutions, in which purchasing processes are accomplished through bidding and, thus, suppliers that provide the smaller cost for their materials end up winning. Many times, these materials have questionable quality, inferior to others that presented bigger costs. This way, many hospital institutions are hostages to suppliers that offer smaller costs and delivery times, but inferior quality. The articles still highlight that poor quality can lead, besides causing waste, to damages to the patient's physical integrity, as well as putting him or her at risk in emergency situations that do not allow time for rework due to bad quality materials (Vagheti, et al, 2011).

Dependence on acquiring products from bidding processes can also generate another form of waste, through use of unnecessary and more costly materials. These processes usually take a long time and in many situations, there is a lack of basic material, like procedure gloves, for example, without which professionals cannot work. For them, the only alternative is to use sterile gloves, that have a much higher cost.

Human resources can also generate an increase in service costs. Many professionals are unexperienced and some do not receive proper training from the institutions. Besides, many hospitals also have interns, especially education institutions. These professional may lead to waste for the institution through lack of technical knowledge in performing activities, maybe using more materials than would be necessary for an experienced professional, besides inappropriate provision for the realization of procedures, like, for example, an unexperienced professional opening many gauzes to make a bandage, leaving the unused amount to waste, since it loses its sterile properties (Vagheti, et al, 2011; Aranha, 2004; Castilho et al, 2011).

Another source of waste is the inappropriate presentation of many materials for a specific function. Medicines and materials do not usually have many presentation forms and according to the activity they are destined to, come in a quantity far superior than necessary and many times cannot be reused due to determinations of the institutions' Commissions of Hospital Infection, thus, discharging what is leftover, leading to waste.

#### *Other sources of waste in health institutions*

The analyzed articles point to other forms of health waste besides assistance materials, amongst which are the ones related to hospital equipment. This context represents permanent materials, health care equipment such as monitors and its cables, infusion pumps, pressure equipment, pulse oximeters, glycaemia equipment, amongst others. As causes to waste of these materials, which generates cost, are lack of personnel training for proper handling, lack of periodic maintenance, work overload and lack of knowledge about costs (Castilho et al, 2011).

On the study performed by Aranha, through a survey, the types of waste that may occur in a hospital institution were presented in order of magnitude. In first place, comes the waste of material resources, as mentioned above, followed by electric power, water, medicine, food, hygiene and cleaning material, printing and office supplies. Injectable drugs have a stability time after diluted, therefore, being discharged many times without the use of the whole volume. The same goes for enteral and parenteral solutions. Therefore, it is important for the health staff, especially the nursing staff, to know the drugs', solutions' and diets' stability in order to avoid waste after preparation (Aranha, 2004).

Another cause for waste is the occupation of hospital beds for more time than necessary to health assistance, leading to prolonged hospitalizations that generate unnecessary costs, besides exposing clients to hospital environment for longer than the time destined to treatment, which increases the predisposition to hospital infections. This bed occupation can be caused by delays in diagnostics performance, postponed surgical procedures, lack of clinical knowledge and professional inexperience that lead to unnecessary hospitalizations due to hasty conducts, besides inefficient communication among the health staff (Castilho et al, 2011).

Previously, we mentioned the unexperienced staff as cause for waste of material resources. Human resources can also contribute to other forms of waste. Among the causing factors pointed in the performed study, are the organization and distribution of personnel in shifts, the lack of reposition for medical licenses, professionals with no profile to perform at the unit, work overload generating professional inefficiency when executing the activities and even absence (Vagheti et al, 2011).

In relation to the sector in which the most waste occurs in health institutions, two works point to the surgical center as the place that consumes the biggest amount of materials in a short time interval, besides receiving several professionals that are not part of the hospital health staff. One of the articles obtained, through mensuration of

waste through survey with the nursing staff, a 20% index. Another case study performed in a surgical center, adopting an computerized management system, obtained a 9.34% index (Castro e Castilho, 2013; Aranha, 2014).

*Waste management and impact on health costs*

Health costs are constant concern for health managers and, in this constant search for cost control, they have been looking for ways to monitor waste and prevent it. Before tracing preventive measures, managers must know their institution, the sources of waste and measurement ways, in order to obtain indicators.

The analyzed articles point out suggestions and strategies for professional awareness on waste and ways to reduce them through work process organization and optimization.

Permanent education of the professionals must be performed through service training and qualification of unexperienced professionals. One of the articles highlights the importance of creating a flow diagram in specific processes in order to avoid rework and waste of time, human resources and materials. (Aranha, 2004).

Only one of the analyzed articles measured the cost of waste in the sectors of medical practice, surgical practice, pediatrics, nursery and joint accommodation, however the percentage found in the literature for waste of assistance materials, which is 20%, was used.

None of the articles found approaches the Lean methodology, still not widely adopted in health institutions. The Lean principle, is already knowledgeable to many health leaders as a strategy to help reducing waste and improving patient safety and quality of care.

**CONCLUSION**

This study allowed for the knowledge of scarcity of current literature production about waste and verification of the need to improve knowledge in this area, due to the great impact it represents in health institutions' costs. Such impact can be prevented through managers adopting the correct measures.

Health managers and professionals still need information and awareness about the capacity of material management to reduce costs in health institutions. Only identifying is not enough to control waste. Therefore, it is important that managers measure waste in their institutions, provide indicators and invest in training for the professionals, besides adopting managerial strategies for restructuring administrative processes.

Thus, it is expected that institutions invest in waste management strategies as a way to control avoidable costs for these services.

Table 1 – Synthesis of articles included in the integrative review

Article Name	Authors	Magazine	Objectives	Methodology Design	Results and discussion
The cost of waste in consumption materials in a surgical center	Castilho, L.C. Castilho, V.	Rev. Latino-AM. enfermagem	Identifying the types, quantities and cost of consumption materials wasted on surgeries; classifying waste as avoidable and unavoidable, and computing the waste index of consumption materials in the intraoperative in a university hospital's Surgical Center.	Case study, descriptive and exploratory, with quantitative approach.	The most wasted items were surgical threads, cotton surgical thread and gauze compresses. The average percentage of waste in the sample was 9.34%, being 1.23% avoidable and 8.14% unavoidable. Conclusion: the study proved that efficient management of material resources reduces processes costs and decreases waste.

A survey on the main sources of waste in an university hospital assistance unit	Castilho, V. et al.	Rev Esc Enferm USP	Survey the different types of waste, its causes and suggestions to eliminate them, according to the opinion of nursing professionals and physicians performing in health units and estimating the cost of the main source of waste in these units.	Descriptive, exploratory study with quantitative approach, performed at the University of São Paulo's University Hospital.	Waste related to materials (36%) was pointed out by all professional categories followed by physic structure (27%). The annual material waste cost in the studied units can be around R\$476,262.86.
Waste of assistance materials from the perception of nursing workers in an university hospital	Vaghetti, H. H. et al.	Rev. Enferm UERJ	Identifying the perception of nursing workers in a university hospital on the south of Brazil around the causes of daily assistance materials waste.	Descriptive and exploratory study in which 45 subjects from four units of the hospital were interviewed between August 2009 and December 2010.	Structural, organizational and managerial factors, which include lack of knowledge on assistance materials by the purchasing responsible, the bad quality of acquired material and the lack of materials were identified as waste causes. They suggest the inclusion of nursing workers in the purchasing staff.
Quantification of medicine waste in clinical practice	Nakazon e, M. A. et al.	Arq Ciênc Saúde	Analyzing drugs, including presentation and price, aiming to fit the commercialized product to the medical prescription practice and, consequently, reducing governmental and personal costs.	A survey on clinically prescribed drugs was performed.	Presentation of most drugs indicated in the treatment of frequent diseases in the population is not adjusted to medical prescription, reflecting in drug and financial waste.
Study on one of the indicators of quality cost: waste	Aranha, G. T. C.; Viera, R W. V.	RAS	Knowing the causes of waste in the areas, evaluating them in order to avoid them and creating indicators and/or evaluation indexes of waste, in order to provide support elements for better management.	Survey performed at the Clinics Hospital/Unicamp in the year of 1999, with the staff.	Waste was analyzed in several hospital services and the surgical center became, according to staff perception, the main consumer of hospital material and consequently a priority place for potential waste analysis.

## REFERENCES

- Aranha G. T. C and Vieira R. W. (2004). Estudo de um dos indicadores do custo da qualidade: o desperdício. *Rev Adm Saúde*, 23(6), 43-55.
- Buzzi D. and Plytiuk C.F. (2011). Pensamento enxuto e sistemas de saúde: um estudo da aplicabilidade de conceitos e ferramentas lean em conceito hospitalar. *Revista Qualidade Emergente*, 2(2), 18-38.
- Castilho, V. et al. 2011. Levantamento das principais fontes de desperdício de unidades assistenciais de um hospital universitário. *Rev Esc Enferm USP*, 45 (Esp), 1613-1620.
- Castro, L. C. and Castilho, V. (2013). O custo do desperdício de materiais de consumo em um centro cirúrgico. *Revista Latino-Americana de Enfermagem*, 21(6), 1228-1234.
- Franciso, I. M. F and CASTILHO, V. (2012). A enfermagem e o gerenciamento de custos. *Rev Esc Enferm USP*, 36(3), 240-244.
- Palma, CJSL. Lean healthcare – Os Princípios Lean aplicados nos serviços de uma unidade Hospitalar. 2012. Projeto de mestrado em gestão de serviços de saúde
- Pereira, F. V. and Schutz, V. (2012). Análise parcial de custos de matérias hospitalares: o custo de matérias hospitalares utilizados em clientes com insuficiência cardíaca dentro de uma enfermagem cardiovascular. *Cuidado é fundamental online*, 4(2), 2970-2980.
- Rodrigues, V. A., Perroca, M. G. and Jerico, M. C. 2004. Glosas hospitalares: importância das anotações de enfermagem. *Arquivo Ciência Saúde*, 11(4), 210-214.
- Sacramento, F. 2002. Desperdícios em instituições hospitalares. *Revista Ibero-Americana de Estratégia*, 1(1).
- Silva, O. R. S., Sacramento, F. J. S. and Palmisano, A. (2006). Desperdícios em instituições hospitalares: um estudo exploratório. XIII SIMPEP, São Paulo.
- Siqueira, B. Schutz, V. (2011). A enfermagem e o custo com os materiais hospitalares: uma revisão bibliográfica. *Rev. Cogitare. Enferm.*, Rio de Janeiro, 16(1).
- Souza M. T., Silva M.D. and Carvalho R.(2010). Revisão integrativa: o que é e como fazer. *Einstein*, 8(1), 102-106.
- Toussaint J, Gerard R. A. 2010. *On the Mend: Revolutionizing Healthcare to Save Lives and Transform the Industry*. Cambridge: Lean Interprise Institute. 181 p.
- Vagheti, H. H. et al. (2011). Desperdício de materiais assistenciais na percepção de trabalhadores de enfermagem em um hospital universitário. *Rev. Enferm. UERJ*, 19(3) ,369-374.