

# Implementation of computerized material management system at the University of São Paulo University Hospital\*

IMPLEMENTAÇÃO DO SISTEMA DE GESTÃO DE MATERIAIS INFORMATIZADO DO HOSPITAL UNIVERSITÁRIO DA UNIVERSIDADE DE SÃO PAULO

IMPLEMENTACIÓN DE UN SISTEMA DE GESTIÓN DE MATERIALES INFORMATIZADO DEL HOSPITAL UNIVERSITARIO DE LA UNIVERSIDAD DE SÃO PAULO

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## ABSTRACT

This is an experience report on the process of implementing a computerized materials management system at the University Hospital of the University of São Paulo. The system was called Materials Management System (SGM). The process comprised four phases: choice of the model and information tool; restructuring of the logistic materials process at the hospital; restructuring of the support areas and establishment of the SGM system itself. A study carried out at the Surgical Center after the establishment demonstrated that, when comparing materials consumption and inventories in the SGM with the Traditional System, the consumed quantity and the cost of inventory materials at the Unit decreased.

## KEY WORDS

Nursing.  
Materials management, hospital.  
Automatic data processing.

## RESUMO

Trata-se do relato do processo de implementação do sistema informatizado de gestão de materiais no Hospital Universitário da USP. O sistema foi intitulado Sistema de Gestão de Materiais (SGM). A implementação apresentou quatro fases: a escolha do modelo e da ferramenta informacional, a reestruturação do processo logístico de materiais do hospital, a reestruturação das áreas de apoio e a implantação do próprio sistema SGM. O estudo realizado no Centro Cirúrgico após a implantação do sistema demonstrou que, comparando o consumo e o estoque de materiais do SGM em relação ao Sistema Tradicional, houve uma diminuição da quantidade consumida e do custo dos materiais estocados na Unidade.

## DESCRIPTORIOS

Enfermagem.  
Administração de materiais no hospital.  
Processamento automatizado de dados.

## RESUMEN

Se trata de un informe de experiencia del proceso de implementación de un sistema informatizado de gestión de materiales en el Hospital Universitario de la Universidad de São Paulo, Brasil. El sistema llevó por nombre Sistema de Gestión de Materiales (SGM). La implementación necesitó de cuatro fases: la elección del modelo y de las herramientas informáticas, la reestructuración del proceso logístico de materiales hospitalarios, la reestructuración de las áreas de apoyo y la implantación del propio sistema SGM. Un estudio realizado en los Quirófanos luego de la implementación demostró que, comparando el consumo y el stock de materiales del SGM en relación al Sistema Tradicional, hubo una disminución de las cantidades consumidas y del costo de los materiales en stock en la Unidad.

## DESCRIPTORIOS

Enfermería.  
Administración de materiales de hospital.  
Procesamiento automatizado de datos.

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## INTRODUCTION

Health organizations in general are being obliged to respond to growing demands with increased patient care delivery, but also need to reduce costs, imposed by their sectors' production levels and by the financial resources available.

Authors appoint the need to adopt cost management systems to contain expenses and, at the same time, keep up service delivery with quality and efficiency<sup>(1)</sup>.

On the other hand, continuous technological advancements have triggered an increase in care complexity and, hence, greater material consumption.

In view of the above, health organization managers have taken more interest in cost control and better materials management systems.

The materials management system is one of the main determinants of an institution's financial planning, that is, it is the area where much revenue is spent and where capital can be consumed<sup>(2)</sup>.

Given the complexity of hospital organizations, marked by distinguished procedures, incorporation of new technologies and use of a wide range of materials, controlling these inputs and their costs is fundamental.

In this perspective, the goal of materials management is to provide adequate quantities of the material resources the health organization needs, with quality, at the right time and, mainly, at the lowest cost<sup>(3)</sup>.

Hospital institutions, mainly in the private sector, involved in a competitive context and concerned with preserving their market share, have advanced in the development of computerized materials management systems which, besides permitting greater control of materials purchases and distribution, have contributed to cost reduction. Research on the computerization of materials management in the hospital area is scarce though, raising the need for further studies on the theme.

Hospital organizations in some countries, including the United States, France and Canada, have put in practice computerized systems with bar codes and optical readers for materials management as one of the ways to improve materials and cost control.

The Summit Medical Center Oakland in California, United States changed its storeroom-focused management model, which involved materials inventories only, to a new computerized system that used bar codes. When comparing the results of storeroom inventories, they found a decrease in materials consumption, accompanied by a cost reduction of approximately 49%<sup>(4)</sup>.

Some authors report that, on the average, spending on material resources has represented between 15% and 45% of Brazilian hospital institutions' budget<sup>(5-6)</sup>.

Nowadays, the University Hospital of the University of São Paulo (HU-USP), the place of study, has received a fixed amount from the Ministry of Health, in addition to financial contributions from a University. Spending on material consumption correspond to 49% of hospital costs, surpassing literature data.

Since its establishment in 1981, the Traditional System had been adopted for materials management at this hospital. In this system, pre-established material quotas were distributed to the users, with replacement at fixed dates. After so many years, this manually controlled Traditional System showed some problems, such as: monthly preview with badly dimensioned quotas, loss of inventory control, total lack of knowledge about consumption, lack and waste of material. This causes intense exhaustion among the professionals involved, as the system lost credit, generated high inventory costs and was in no conditions to provide reliable data and controls.

In view of these factors, the administration started to pay more attention to materials management at the study hospital. The need was perceived to restructure this area in order to provide a more effective response to different services in quantitative and qualitative terms, duly and at a lower cost. To solve the entire problem involving this area, the hospital is restructuring the entire materials management process, developing a computerized Materials Management System.

Thus, this research aims to present the implementation of the computerized Materials Management System (MMS).

## METHOD

This is an experience report. The place of study was the University Hospital of the University of São Paulo (HU-USP). Approval for the study was obtained from the HU-USP Chamber of Teaching and Research, opinion No 771/07.

The HU-USP is a large general teaching hospital, with 243 beds distributed among four basic specialties: medical, surgical, obstetric and pediatric.

## RESULTS

### *Implementation of the Computerized Materials Management System (MMS)*

To restructure the materials management, first, further knowledge was needed on what was available on the market in terms of materials management information systems.

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The market offers some systems for supermarkets, private health companies and others. These areas' work processes, however, differ from processes at public hospitals, mainly teaching establishments inserted in a university. At the HU-USP, the purchasing process is marked by peculiarities and details of public tenders, besides the guidelines of the University of São Paulo. The hospital uses a materials and goods purchasing program called "Mercúrio", developed by the University. This program has its own particularities, with information and data needed to purchase any material.

In view of the above observations, the decision was made to build the institution's own computerized materials management system, with an interface with *Mercúrio*. This process started in 2004, with frequent meetings involving all care sectors. The goal of the meetings was to discuss the problems resulting from the Traditional System used at the hospital, get to know the work processes, routines and needs of each sector. Experiences from other hospitals were presented and all heads participated with meetings and reflections on the characteristics of the new system.

The Materials Management System (MMS) was developed in four phases: choice of the model and information tool; restructuring of the hospital materials logistic process; restructuring of the support areas and, finally, implantation of the MMS itself.

### **1st phase: Choice of the model and information tool**

To develop the Materials Management software and support material purchasing, warehousing, distribution and control processes, the model based on the Just in Time (JIT) system was chosen. JIT establishes minimum inventories, consumption and material replacement based on existing real demand, with more frequent material distribution and in small quantities among hospital sectors. Just in time is a philosophy aiming to eliminate waste in the materials management process, ranging from purchasing to distribution<sup>(7)</sup>.

In order to choose an information tool to create compatible software, integrated with pre-existing systems at the institution, the three-tier (presentation, processing and data storage) concept was used, as well as NET (Dot Net) development tools and an Oracle database<sup>(8)</sup>.

### **2nd phase: Restructuring of the hospital material logistic process**

The restructuring of the hospital material logistic process comprised two phases. In the first phase, the areas involving materials were separated into Central Inventory Areas and Supply Areas. The areas chosen for the Central Inventory were the Pharmacy, Nutrition Service and Storeroom.

The Central Inventory areas Pharmacy and Storeroom are responsible for warehousing, separation, verification, control and distribution of hospital materials and drugs to all Supply Areas and other hospital sectors.

Supply areas are responsible for receiving materials from the Central Inventory areas Storeroom and Pharmacy, as well as for producing and distributing kits and materials to the care sectors, functioning 24 hours. To choose the place for the Supply Areas, several criteria were taken into account: available physical area, smallest financial investment to adapt the area; the sector is considered critical and complex due to patient care, and exerts the strongest financial impact, that is, with the greatest material consumption and highest cost.

The five sectors chosen to have Supply Areas were the Surgical Center (AS-I), Adult Emergency Care (AS-II), Child Emergency Care (AS-III), Adult Intensive Care Unit (AS-IV) and Pediatric Intensive Care Unit (AS-V).

The following activities take place in the Supply area of the Surgical Center (AS-I):

- Reception of material and injectable drugs from central inventories;
- Storage and physical control of material;
- Production and distribution of procedure kits to other Supply Areas and hospital care sectors;
- Distribution of materials, surgical kits and drugs to the Surgical Center.

The remaining Supply Areas receive materials, drugs and kits for consumption at their respective sectors, i.e. the Adult and Child Emergency Care and the Adult and Pediatric ICU.

In the second phase, the work process was restructured, focusing on the organization and conditioning of materials in sectors without a Supply Area. It was determined that each sector needed one single place to store minimum materials to see to patient and area needs for 24 hours, according to JIT principles. These sectors still received materials and drugs directly from the Storeroom and Pharmacy, and the Procedure kits from AS-I.

### **3rd phase: Restructuring of support areas**

To continue developing the MMS, three support areas had to be restructured, which are considered equally important for materials management: purchase, inventory and production.

**Purchase area:** this area became responsible for processes ranging from purchase to individual fractioning and labeling of products sent to the Inventory areas. The system automatically controls the hospital's purchase needs, based on replacement points, delivery deadlines, consumption averages and ABC and XYZ classification<sup>(9-10)</sup>.

**Central Inventory Areas:** daily Inventory routine starts with the sectors and AS' report on material resupply needs. This starts when the sectors and AS write off consumed products in the system and ends when the sector receives and stores the material in its respective inventory, terminating the inventory area cycle. For this to take place, two activity groups need

to be performed: some related to the inventories and others related to the writing off of consumed items. This permits material replacement with minimum inventories.

Inventory is the frequent updating of material quantities. Writing off items means registered the consumed material in the system in real time. The material contains a bar code, which the professional at the sector reads with the help of an optical reader at the moment of use, informing the consumed item to the MMS, as well as the quantity and the patient. It should be reminded that the register of this consumption defines the material resupply needs at the sector. If this activity is not performed in the system, no new supplies will arrive, which can cause a lack of materials and problems to purchase the item.

Another way to consume material is through hospital kits. The production process of hospital kits is a distinguished process, which only Supply Area I at the Surgical Center and the Pharmacy Sector can perform. In this paper, however, we will only comment on the production area of the Surgical Center's Supply Area.

**Production Area:** the assembly of the kit starts with the manufacturing order, based on the surgical program, which determines what kit and what quantity needs to be produced. The AS-I professional separates the items related to the kit, which is assembled, verified and labeled with an expiry date and batch number. After the assembly, the kit is stored at an inventory location indicated by the system. Kits should be written off in the same way as a material item, either to a patient or a sector.

In compliance with a JIT principle, which is to avoid waste, the system permits reversing unused materials and kits to the Supply Area.

#### 4th phase: Implantation of the Materials Management System (MMS)

The implantation of the MMS started with Central Inventories (Storeroom, Nutrition and Pharmacy), Supply Area I, the Purchasing sector and two care and administration sectors (Surgical Center and Informatics), with a view to testing the entire cycle of the Materials Management System and then expanding it to the whole hospital.

The same implantation method will be followed for all sectors, respecting peculiarities. Thus, the following phases have been used to put the MMS in practice:

- Elaboration of a meeting timetable for all sector professionals in order to present the system and prepare them for training;
- Review of all professionals' records for computer access purposes. Although computerization and computer access are quite disseminated at the hospital, some employees needed individual basic informatics training and even interactive games as a strategy for motor coordination.
- Establishment of the start date of the MMS, elaboration of a timetable for existing materials inventories in store at the unit and weekly meetings to follow the implantation. During the first inventory, the team counts all material existing at the sector and registers it in the MMS. From that point onwards, no material can be consumed without recording it in the system.
- Training for all nursing professionals, who receive theoretical classes about the MMS in small groups, as well as practical classes about the system screens, accompanied by computer team technicians, as shown in Figure 1, regarding screens used at the Surgical Center.

Write-off/supply screen for separate surgery items

Go to the menu Inventory/Items/Write-off/

Write off item

Item write-off screen:

Sector ← Setor CT CIRURGICO → Inventory

Inform item number or search by name → Item 1390

Patient registration Number → Paciente 0000336200

Standard quantity 01, can be changed if necessary → Qtd 1,00

Item	Produto	Localização	Qtd	Saldo	U.M.
1390	COMPRESSA GAZE BRANCO 45CM X 45CM CAMPO OPERATORIO ESTERIL	[SL] 880515	1,00	339,00	PCT
1391	COMPRESSA GAZE BRANCO 7,5CM X 7,5CM FILAMENTO RADIOPAÇO	[SL] 197220	1,00	361,00	PCT
995	ATADURA CREPON 20CM X 1,80M	[SL] 3410935	30,00	26,00	UN

Figure 1 – Item write-off screen from MMS training manual for the Surgical Center of HU-USP - São Paulo - 2009

## FINAL CONSIDERATIONS

It should be emphasized that the computerized Materials Management System (MMS), developed and put in practice at the HU-USP as a material information integration tool has permitted rapid response to user demands, resulting in a safe and reliable system. Another extremely important factor has been the possibility to know actual material consumption and inventory costs, besides permitting the use of organizational management indicators, increasing the

efficacy of the hospital's material and financial resource management service.

A study carried out at the HU-USP on material consumption at the Surgical Center<sup>(11)</sup> after putting in practice a computerized management system demonstrated that, when comparing the MMS' consumption and material inventory with the traditional system, both the consumed quantity and cost of materials stored at the Surgical Center decreased. Nevertheless, further research on the Materials Management System (MMS) is fundamental.

## REFERENCES

1. Francisco IMF, Castilho V. A enfermagem e o gerenciamento de custos. *Rev Esc Enferm USP*. 2002;36(3):240-4.
2. Long G. Pursuing supply chain gains. *Healthc Financ Manage*. 2005;59(9):118-22.
3. Vecina Neto G, Reinhardt Filho W. Gestão de recursos materiais e de medicamentos. São Paulo: Faculdade de Saúde Pública da USP; 1998.
4. Darnell T. Materials management systems: all about controlling costs. *Health Manag Technol*. 1996;17(13):14-8.
5. Castilho V, Leite MMJ. A administração de recursos materiais na enfermagem. In: Kurcgant P, editor. *Administração em enfermagem*. São Paulo: EPU; 1991. p. 73-88.
6. Vecina Neto G, Ferreira Júnior WC. Administração de materiais para sistemas locais de saúde. In: Escola Politécnica de Saúde Joaquim Venâncio. *Administração*. Rio de Janeiro: FIOCRUZ; 2001. p. 117-58.
7. Pozo H. *Administração de recursos materiais e patrimoniais: uma abordagem logística*. São Paulo: Atlas; 2007.
8. Conallen J. *Building web applications with UML*. 2nd ed. Boston: Addison-Wesley; 2002.
9. Lourenço KG, Castilho V. Classificação ABC dos materiais: uma ferramenta gerencial de custos em enfermagem. *Rev Bras Enferm*. 2006;59(1):52-5.
10. Barbieri JC, Machline C. *Logística hospitalar: teoria e prática*. São Paulo: Saraiva; 2006.
11. Paschoal MLH. *Estudo do consumo de materiais de um centro cirúrgico após a implementação de um sistema de gestão informatizado [tese]*. São Paulo: Escola de Enfermagem, Universidade de São Paulo; 2009.