

COMPUTERIZED STRUCTURE FOR PROCEDURES AT THE CENTRAL STERILE SERVICES DEPARTMENT

Estrutura informatizada para processos no centro de material e esterilização

Estructura informatizada para procedimientos en el centro de material y esterilización

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ABSTRACT: Objective: To describe the stages of development and evaluation of the computerized structure for the processing of surgical trays processing at the preparation room of the central sterile services department (CSSD). **Method:** This is a technological production development project based on the “system life cycle” theory. **Results:** The structure was created using Google Apps forms and spreadsheets. The forms were developed based on the collection of information from references recorded in the surgical instruments, and checking of correct names in manufacturers’ catalogs and photographic records of details of the parts. The evaluation was performed by the employees, and changes suggested by them were applied. The forms allowed to identify the name each surgical instrument and the manufacturer’s reference, and to access the photos of materials, which was input to spreadsheets that allowed the keeping track of and managing surgical instruments. **Conclusion:** The computerization of the process of preparation of minimally invasive surgery trays made it easier, more intuitive and traceable. Technology can optimize the nursing care time at the CSSD in what concerns the planning of actions and the keeping track of procedures.

Keywords: Surgery department, hospital. Information systems. Surgical instruments. Sterilization.

RESUMO: Objetivo: Descrever as etapas de desenvolvimento e avaliação da estrutura informatizada para processamento de bandejas cirúrgicas na área de preparo do centro de material e esterilização. **Método:** Trata-se de um projeto de desenvolvimento de produção tecnológica embasada na teoria de “ciclo de vida do sistema”. **Resultados:** A estrutura foi criada utilizando formulários e planilhas do Google Apps. Os formulários foram desenvolvidos com base na coleta de informações das referências gravadas nos instrumentais, consulta ao nome correto nos catálogos dos fabricantes e registros fotográficos de detalhes das peças. Foi realizada a avaliação pelos colaboradores, e foram feitas as alterações sugeridas pelos mesmos. Os formulários permitiram identificar o nome do instrumental e a referência do fabricante e acessar as fotos dos materiais, o que passou a gerar planilhas que permitiram a rastreabilidade e o gerenciamento dos materiais cirúrgicos. **Conclusão:** A informatização do preparo das bandejas de cirurgia minimamente invasiva contribuiu para o preparo de maneira fácil, intuitiva e de forma rastreável. A tecnologia pode otimizar o tempo de assistência do enfermeiro do centro de material e esterilização com as questões relacionadas ao planejamento das ações gerenciais e à rastreabilidade dos processos.

Palavras-chave: Centro cirúrgico hospitalar. Sistemas de informação. Instrumentos cirúrgicos. Esterilização

RESUMEN: Objetivo: Describir las etapas de desarrollo y evaluación de la estructura informatizada para el procesamiento de bandejas quirúrgicas en el área de preparación del centro de material y esterilización. **Método:** Se trata de un proyecto de desarrollo de producción tecnológica basada en la teoría de “ciclo de vida del sistema”. **Resultados:** La estructura se creó utilizando formularios y hojas de cálculo de Google Apps. Los formularios fueron

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desarrollados en base a la recolección de informaciones de las referencias grabadas en los instrumentos, consulta al nombre correcto en los catálogos de los fabricantes y registros fotográficos de detalles de las piezas. Se realizó la evaluación por los colaboradores, y se efectuaron las alteraciones sugeridas por los colaboradores. Los formularios permitieron identificar el nombre del instrumental y la referencia del fabricante y acceder a las fotos de los materiales, lo que pasó a generar hojas que permitieron la trazabilidad y la gestión de los materiales quirúrgicos. **Conclusión:** La informatización de la preparación de las bandejas de cirugía mínimamente invasiva contribuyó a la preparación de manera fácil, intuitiva y de forma rastreable. La tecnología puede optimizar el tiempo de asistencia del enfermero del centro de material y esterilización con las cuestiones relacionadas con la planificación de las acciones gerenciales y la trazabilidad de los procesos.

Palabras clave: Servicio de cirugía en hospital. Sistemas de información. Instrumentos quirúrgicos. Esterilización.

INTRODUCTION

Year after year, hospital institutions tend to be audited, both financially and on the quality of the service provided, which is a challenge to be overcome. In search of improvements, hospital managers, in general, know the importance of information technology (IT) for the institution, but do not prioritize it in their management, demoting it to a background position, behind assistance activities, consultations, medications, reforms of the units, among other activities¹.

The use of computerized systems allows immediate access to information and processes, contributing to assistance planning, cost management and decisionmaking, in order to assist in the efficiency of the institutional system¹.

The central sterile services department (CSSD), in the context of patient care, is a functional department assigned for the processing of health products. This processing encompasses a set of actions, such as pre-cleaning, following to stages related to reception, drying, integrity and functionality evaluation, preparation, sterilization, storage and distribution to the consumer departments². The nurse in this sector has the task of managing, organizing and planning procedures; developing management activities for procedures and materials, having as one of their responsibilities to ensure the safe sterilization of the materials that will be used in the development of patient care³.

Given this, the nurse is one of the most skilled professionals for the management of hospital supplies. Nurses, by trade, are put in charge of management activities, they make use of norms of sanitary regulation and legislation to evaluate the best choice of materials that meet the needs of patients and professionals, with quality and safety in care⁴.

Technological innovation has an increasing impact on nursing activity, creating the need for these professionals to understand that computerized tools, which can strongly contribute to the improvement of care, will be more and more present in their practice. In their daily activity, it is essential,

for example, that the CSSD nurse be able to dynamically and quickly find, in real time, the location of surgical instruments, using some type of computerized system to keep track of them.

According to the Brazilian Association of Technical Standards (*Associação Brasileira de Normas Técnicas – ABNT*), in NBR ISO 9000, the traceability process is defined by the ability to keep track of the history, application, use and location of a single piece of merchandise⁵. Based on this principle, at the CSSD, the most important information is related to the origin and destination of surgical trays. However, in order for this department's traceability process to be transparent and uneventful, its application should not be seen as an obligation, but as an auxiliary tool for decision-making and quality management⁶.

When observing the CSSD workflow, one may observe that it involves concepts of logistics, which include the process of supply chain management — which deals with planning, implementation, efficient and effective control over the flow and storage of goods, services and related information, from its point of origin to its point of consumption, in order to meet the needs of customers⁷.

At the CSSD, the flow of procedures is the key point. Logistics must be clear, fast and efficient, with the objective of meeting the demands of the final consumers, namely, hospital service users.

For this purpose, a computerized structure was developed, for the CSSD, to trace the processes at the surgical tray preparation room, also meeting the needs of database generated from this process, such as support to other management and service quality indicators.

In this perspective, the premise in this article was to describe the stages of development and to evaluate the computerized structure to surgical tray processing at the CSSD preparation room, in addition to contributing with information and propositions that prompted some reflections on construction of knowledge in the field of information systems.

OBJECTIVE

To describe the stages of development and evaluation of the computerized structure for surgical trays processing at the CSSD preparation room.

METHOD

This is a technological production development project based on the “system life cycle” theory, consisting of seven phases: problem identification, feasibility study, analysis (of current system activities, material needs such as hardware, software; cost and benefit per activity and database requirements), detailed project design (developed flowcharts of programs, file layouts, data description and others), implementation, testing and maintenance⁸.

Google Apps was the technology chosen in order to make the computerized structure. The electronic form is filled out by the nursing team via mobile device or on computers. For each input of a form, a line is generated on Google Sheets. This computerized structure is at a cloud-hosted website, which was also developed with the Google tool with information access profile controls, using Google Groups and sharing rules.

The study was carried out at the CSSD of *Hospital de Clínicas de Porto Alegre* (HCPA), a public institution academically linked to *Universidade Federal do Rio Grande do Sul* (UFRGS), which is part of a network of university hospitals of the Ministry of Education (*Ministério da Educação* – MEC). Its excellence in management, infrastructure, service and professional qualification is certified since 2013 by accreditation of the Joint Commission International (JCI)⁹.

The CSSD meets all the disinfection and sterilization procedures of the institution and is linked to the surgical center nursing service (SCNS), which consists of four departments: surgical ward, ambulatory operating room, recovery room and CSSD¹⁰.

This study was carried out following the precepts of resolution No. 466/2012, which regulates ethical norms for research involving human beings¹¹. The project was approved by the Nursing School’s Research Committee (*Comissão de Pesquisa da Escola de Enfermagem* – COMPESQ/ENF) of UFRGS and by the Research Ethics Committee of the HCPA (*Comitê de Ética em Pesquisa* – CEP/HCPA), under number 64023317.8.0000.5327, via Plataforma Brasil.

The current study is socially relevant by serving as a structure and a tool for management of CSSD’s procedures in the perspective of traceability and management of health service quality.

RESULTS

The research result was the application of the stages of development, based on the “system life cycle” theory⁸.

Problem Identification

Problem identification was performed through activities of CSSD nurses of HCPA, who observed the need to computerize the system that, until then, was done manually; the need to collect information of production from a particular stage of the traceability process; and, ultimately, the need to mitigate the probability of making mistakes in assembling surgical kits.

Feasibility study

Meetings were held with the SCNS heads of the institution and CSSD nursing professionals to discuss the feasibility of the applicability of the computerized structure at the CSSD. The project prioritized, then, to start with the CSSD material preparation room, working with only one surgical specialty, videosurgery.

Analysis

In this stage, four nursing technicians specialized in assembling videosurgery surgical trays were consulted about how to facilitate visualizing and accessing the forms.

The computerized structure for surgical tray preparation used resources from Google Drive, such as: Google Forms, Google Sheets e Team Drives. Forms were used in the operational part of the CSSD preparation room, and the spreadsheets were used as a database for managing surgical equipment. It was agreed that access would be granted through use of the QR code.

Project

The idea of a computerized structure was discussed and matured with a nurse, chosen by the first researcher, with

experience in building websites using Google Sites and Google Forms. This professional devised and structured a first form, used for pre-test with CSSD employees.

The pre-test form was evaluated by future users of the system in what concerns to its structure, and was modified, facilitating the work to be executed. After the creation of all forms and their spreadsheets, several meetings were held with hospital IT specialists, CSSD managers, nurses and nursing technicians, reviewing access to content in a dynamic and less stressful way.

Implementation

At this stage, the computerized structure was implemented, following the steps below:

All the equipment of a surgical specialty was photographed and, subsequently, the photos were edited and saved in Google Drive;

The sheets, which previously were used for the assembly of trays, were withdrawn and computerized, using Google forms, which contain links so that one can examine the photos of the equipment used in the tray assembly (Figure 1);

A QR code was created for each tray (Figure 2) and shared with the nursing team. This code links to Google forms;

Each workbench at the preparation room has a computer and a webcam that reads the QR codes. The freeware Quickmark was the structure found that meets the compatibility criteria of the webcams and the operating system of the department's computers ;



Figure 2. QR Code model used.

 The image shows a Google Form overlaid on a photograph of surgical instruments. The form title is "INSTRUMENTAL DE HISTEROSCOPIA CIRÚRGICA UBC - FITA BRANCA - N°1 - 08 PÇS". Below the title, there is a link to a Google Drive folder: "https://drive.google.com/drive/folders/GB_ZRTcwCVA-1YThISp4VfPpUOUk?usp=sharing". There is a field for "Seu endereço de e-mail" and a note that it will be registered upon submission. A red asterisk indicates a required field: "*Obrigatório". The form has a section for "Horário de início" with a time selection interface. The background image shows a long surgical instrument and other tools on a blue surface.

Figure 1. Google form created from the tray assembly sheets.

When Quickmark is used, the webcam is activated to read the QR code, opening the corresponding form automatically. Then, a log in with the e-mail and password used at the institution is required.

From that moment on, the employee performs the assembly of the tray with the equipment described in the form, all of which are mandatory answers (Figure 3);

At the end of the form, it is optional to send a copy of the answers to the employee by e-mail.

Having finished the tray assembly, the answers appear on a new line generated in a corresponding Google spreadsheet (Figure 4), providing information for managers — nurses of the department, in this case —, in real time, of what is being produced in the work shift;

By Google Drive and Google Forms sharing rules, it was defined who could answer the forms and view the surgical equipment photos. In this case, any employee who has the institutional e-mail can access the forms within the CSSD premises.

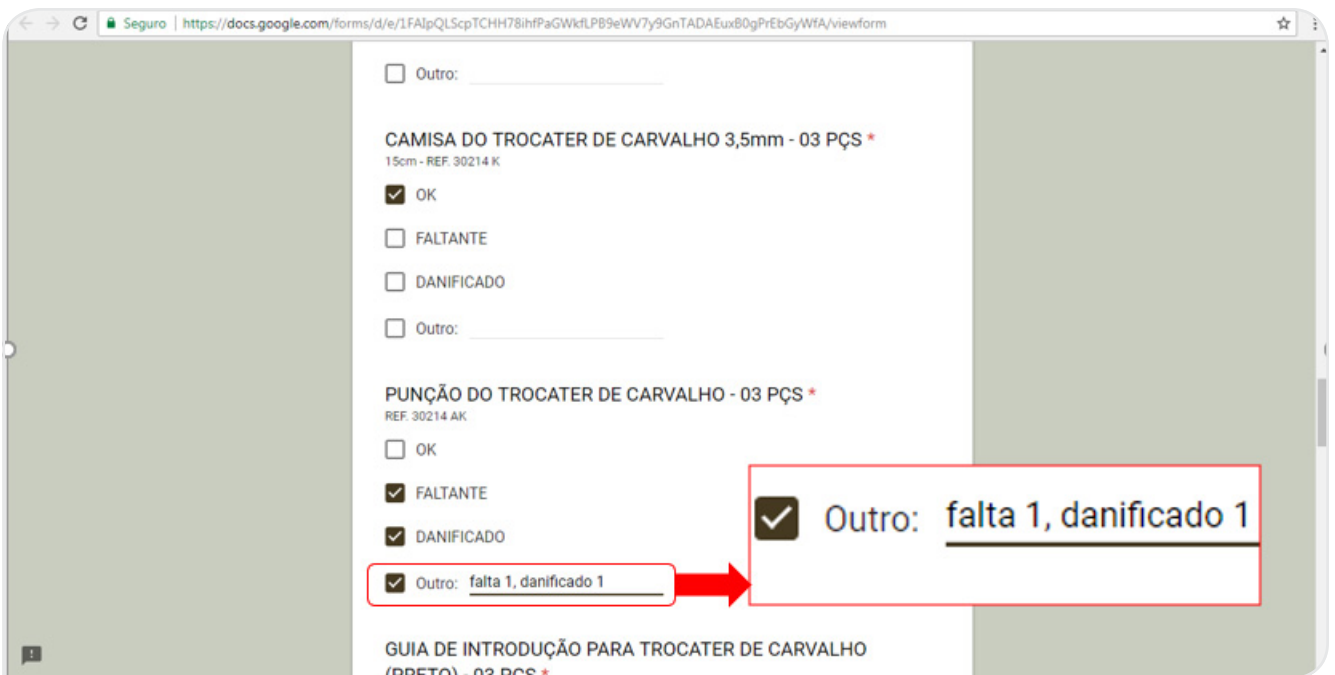


Figure 3. Example of answers that can be made on Google Form.

	A	B	C	D	E	F	G
1	Carimbo de data/hora	Endereço de e-mail	Horário de início	BRONCOSCÓPIO RÍGID	BRONCOSCÓPIO RÍGID	BRONCOSCÓPIO RÍGID	BRONCOSCÓPIO RÍGID
2	31/08/2017 17:00:30		17:00:00	OK	OK	OK	OK
3	14/09/2017 17:46:06		17:45:00	FALTANTE, 1 pç	OK	OK	OK
4	14/09/2017 17:47:04		17:45:00	OK, FALTANTE, 1pç	OK	OK	OK
5	14/09/2017 20:03:26		14:10:00	OK	OK	OK	OK
6	19/09/2017 15:54:20		15:50:00	OK	FALTANTE	DANIFICADO	OK
7							
8							

Figure 4. Report generated by Google Forms from the answers of users.

Tests

The proposal for this moment was the implementation of a pilot project at CSSD preparation room, to assess operational practice in a single surgical specialty, evaluated by specialists by an instrument in accordance with ISO/IEC 25.010.

Maintenance

When we reached this stage, the system had already passed the tests of acceptance and was considered ready for implementation. In case of any need for change on the system starting from implementation, this need was called maintenance⁸.

In the current phase, the computerized structure for surgical tray traceability did not require maintenance, but it is planned according to the steps of the life cycle of systems.

DISCUSSION

The computerized structure for feasibility of traceability of surgical equipment was built within an innovative and low-cost logic for the institution. Especially if compared to what is available in the market in terms of software for traceability, with a high cost for acquisition and support, this structure becomes even more attractive to be multiplied in other health institutions.

However, many innovative ideas are not widespread in the scientific community. They are only broadcast locally on newspapers or television, not being discussed deeply, as they should, to show their real effect on health assistance. Sometimes, these same news discredit the system that one tries to implement, when it causes minimal slowness in the process, without knowing the real importance of the system in the organization and in management¹.

The phase of analysis was one of the most exhausting ones, because of the compatibility research of the software available in the institution, the hardware in the project budget and the human resources necessary to enable its construction. According to ISO/IEC 25.000, which assesses software quality, compatibility is the ability to exchange information between software, so that there is good performance in the functions required, while sharing hardware and software resources, without any interrupting the functioning of one another or of other products¹².

As the computerized structure was created in Google Drive, it allows any hospital employee to log in and access the forms, because the corporate e-mail (Gmail) login is the same used to access the forms, being easy to connect to Google Apps.

The entire project was created using Google Drive, more specifically Google Forms and Google Sheets. Forms were used for the operational part at the CSSD preparation room, and the spreadsheets generated through these forms are used as a database to assist the best management of surgical equipment.

The North American company, that created the applications under discussion, aims at making information globally accessible and organized through internet-based products. Its tools are widely recursive and easy to apply, allowing collective work among users, so that simultaneous editing and collaboration are possible in a single document dynamically, enabling new experiences¹³.

These apps were also chosen due to their similarity to Microsoft Office software such as Word, Excel, and PowerPoint, which caused less oddity to users, by the fact that these programs are currently very popularized, except for Google Forms¹⁴.

Having all the forms and their spreadsheets been created, several meetings were held with the hospital IT specialists, managers, nurses and CSSD nursing technicians, about accessing this content dynamically, and it was agreed that this access would be through QR code.

To make access to the forms easier, QR code was identified as the best technological solution, once it is a barcode of rapid two-dimensional response that — when compared to other codes, including one-dimensional classics — can store more information and access a webpage¹⁵.

Another positive point for the adherence to QR code is that it can be generated by numerous software programs and applications available on the internet, basically changing a raw text, in this case a weblink, into a two-dimensional code matrix¹⁶.

It is a fact that we are in a time of constant renewal and technological innovation, so it is necessary to search for solutions without costs of acquisition and support, and which work in various operating systems and hardware configurations (multi-platform system)¹⁷.

The whole system was created aiming at enabling the professional nurse, a team leader who manages the sector, to perform activities in real time, optimizing time of assistance, in order to be able to absorb daily demands and to

better organize the flows and routines of the department, helping to control what is being produced daily¹⁸.

FINAL CONSIDERATIONS

The applied computerized structure was able to meet the objectives contemplated in this study, enabling the beginning of the computerization of the traceability process at the CSSD of the Institution where the study was conducted, HCPA.

The entire system scope was thought together with the nursing team, aiming at optimizing the process of assembling

surgical trays, the reliability of the data collected, the dynamics of work by the nursing team and the monitoring of daily production or shift-to-shift.

The process of implementing this technology at the department was not as simple as expected, due to the great difficulty of interaction between the software and the hardware available. Thus, the IT department of the institution was essential for everything to function stably.

The study promoted the reflection that nursing needs updating in the field of information systems. Thus, technology optimizes nurse's assistance time with bureaucratic issues and provides planning of actions based on constantly updated data.

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