



EFFECTIVENESS OF MEDICAL-CARE EQUIPMENT MANAGEMENT: CASE STUDY IN A PUBLIC HOSPITAL IN BELO HORIZONTE / MINAS GERAIS

¹Estevão Maria Campolina de Oliveira

²Eloísa Helena Rodrigues Guimaraes

³Ester Eliane Jeunon

ABSTRACT

This study aimed to identify and analyze the factors that contribute to the effectiveness of the management of medical-care equipment at the Hospital of Federal University of Minas Gerais (HC-UFMG) in Belo Horizonte, Minas Gerais. To achieve this goal, a case study was performed along with a field research at HC-UFMG, through interviews using a semi-structured questionnaire to professionals who handle and operate medical-care equipment; professionals who provide maintenance on equipment, and professionals who manage the operation and maintenance of equipment. As a strategy for discussion of the results, the Collective Subject Discourse (CSD) was used supported by the analysis of the Central Idea (CI) of each question or question groups. According to the CSD results, it was possible to identify factors that contribute to the effectiveness of the management of medical-care equipment, such as: professional qualification; practical knowledge; work professionalization; supervision focused on evaluation, development, results and continuous improvement; professional updating and technical support; individual accountability; adequate infrastructure; and implementation of equipment management planning. These factors indicate, to the institutions, opportunities of culture change and organizational growth.

Keywords: Management in Public Hospital; Management of medical-care equipment; Effectiveness in management.

¹ Specialization in Clinical Engineering by the Federal Center of Technological Education of Minas Gerais (CEFET) Minas Gerais (Brazil). Engineer from the Federal University of Minas Gerais (UFMG) Minas Gerais (Brazil). [campolinae@gmail.com]

² PhD in Linguistic Studies from the Federal University of Minas Gerais (UFMG) Minas Gerais (Brazil). Professor at Faculty Pedro Leopoldo (FPL) Minas Gerais (Brazil) [eloisarodrigues@gmail.com]

³ PhD in Social Psychology of Work and Organizations at the University of Brasília (UnB) Federal District (Brazil). Professor at Pedro Leopoldo Faculty, FPL, Brazil [esterjeunon@gmail.com]

E FETIVIDADE NO GERENCIAMENTO DE EQUIPAMENTOS MÉDICO-ASSISTENCIAIS: ESTUDO DE CASO EM UM HOSPITAL PÚBLICO DE BELO HORIZONTE/MINAS GERAIS

RESUMO

Este artigo tem como objetivo apresentar uma pesquisa que buscou identificar os fatores que contribuem para a efetividade do gerenciamento dos equipamentos médico-assistenciais no Hospital das Clínicas da Universidade Federal de Minas Gerais (HC-UFMG), em Belo Horizonte/Minas Gerais. Para tanto, foi realizado estudo de caso com pesquisa de campo no HC-UFMG, por meio de entrevistas orientadas por questionários, com profissionais que manuseiam e operam equipamentos médico-assistenciais; profissionais que prestam manutenção nos equipamentos e profissionais que gerenciam equipes de manuseio, operação e manutenção de equipamentos. Para a discussão dos resultados foi utilizada a técnica do Discurso do Sujeito Coletivo (DSC) subsidiado pela análise da Ideia Central (IC) das perguntas ou de grupos de perguntas. A partir dos DSC's foi possível identificar os fatores que contribuem para a efetividade no gerenciamento dos equipamentos médico-assistenciais, como: qualificação profissional; conhecimento prático; profissionalização do trabalho; supervisão para avaliação, desenvolvimento, resultados e melhoria contínua; atualização profissional e suporte técnico; responsabilização individual; infraestrutura adequada; implementação de plano de gerenciamento de equipamentos. Esses fatores sinalizam, para as instituições, oportunidades de mudança de cultura e crescimento organizacional.

Palavras-chave: Gestão em Hospital Público; Gerenciamento de equipamentos médico-assistenciais; Efetividade na gestão.

INTRODUCTION

The endless search for better results in services has led organizations to deep discussion about its major potential, which is people. However, the human resources department is not the only responsible and the one to suffer from it: all units of the organization should be involved with people at work, because their actions, behaviors and attitudes are crucial to the effectiveness of results and institutional performance.

In health, it is important to note that the patient is at the center of the processes and the contribution of individuals in the workplace is a key factor for assistance with quality and safety. It is essential to understand the context of the professionals so that they are committed to the objectives and the institutional business.

In this article, the issues are related to the management of public hospitals and the management of medical-care equipment in hospitals, involving work processes, management, maintenance, handling and operation of such equipment.

Hospital medical equipment is defined by the National Health Surveillance Agency as medical care equipment, which is directly or indirectly used for diagnosis, therapy and monitoring in health care of patients in Intensive Care Units, Emergency Department and Surgical Center (RDC, Anvisa n. 02/2010). These devices have great relevance in care procedures, high cost, diversity of models, great sensitivity in the handling and operation, being among the equipment with high potential to cause harm to patients (Brasil, 2004).

Because of that, the management of medical-care equipment requires an organizational structure that ensures the effective acquisition, maintenance and use.

The handling and operation of equipment in hospitals require detailed standards, from the acquisition to the qualification and skill assessment of the involved professionals, whether in transportation,

cleaning, sterilization, handling, operation and during procedures performance (Calil, 2008).

When deploying a medical equipment management system, it is relevant to consider the importance of the service to be executed and its specific characteristics required for the handling and operation. Professionals need to know the importance of equipment in medical procedures or in support activities and especially be trained periodically for proper use and maintenance (Calil, 2008).

Therefore, it is essential to maintain a clear and objective description, following the rules and techniques, of the duties of health professionals and, above all, ensure that these professionals are qualified and possess the skills required for its activities. After all, the lack of professional qualification and periodic training is one of the factors that contribute to frequent and large number of equipment damage.

Reflecting on this approach, it is considered that the frequency of medical equipment are damaged interferes directly in care results, administrative and financial hospitals.

Through medical care equipment management, it is possible to maintain forms of traceability to provide processes that ensure quality, safety and reliability in the use of equipment in patient care.

Considering the challenges of the management of medical equipment in hospitals, this study seeks answers to the following guiding question: **What factors contribute to the effectiveness in the management of medical-care equipment in a public hospital?**

From that questioning the purpose of the study is to present the factors that contribute to the effectiveness of the management of the medical-care equipment in a public hospital in Belo Horizonte / Minas Gerais through investigation of process management, handling, operation and maintenance of equipment.

LITERATURE REVIEW

Public health institutions that seek to improve the quality and security of services through specific methodologies build policies, programs and management plans from models applied in industries, technology and private health. The adoption of quality methodologies involves the entire organization, managers and professionals, which are pieces of utmost importance to the effectiveness of the results (Mintzberg, 2008).

Expenditures on health have been the basis for discussions of national policies, because all health segments are facing problems with rising costs of personnel, medicinal drugs, infrastructure, technology and computerization (Freire, 2011).

In Brazil, health policies have invested efforts for two centuries in the construction of legislation to guide and organize the management of services, ensuring the safety and quality assurance in health care. These efforts follow the world scenery, marked by demographic and epidemiological transition, with social inequality growth and great challenges in health care (Neto & Malik, 2011).

One of the strategic actions of the Ministry of Health (MH) is the definition of excellence criteria for health care with monitoring programs in hospitals network, both public and private, through certifications supported by Laws, Decrees and Ordinances (Yazbek, 2014).

The complexity in hospital management, according to La Forgia and Couttolenc (2009), is due to the fact that it involves organizations with multiple areas with great interface and interdependence of work processes, for example, the infrastructure of facilities, medical equipment, human resources, financial and essentially the mission to prevent or recover health.

The Unified Health System (UHS) is considered one of the largest health plans in the world due to both the coverage and the complexity of its management. This system is under the responsibility of the federal

government and was developed through joint leaders in sanitary movements after the military regime and is guided by three basic principles: its Universality; its Completeness; and its Equity.

Popular participation in the system settings is an advanced form of democracy. However, even after nearly three decades of many advances, The UHS still appears insufficient and lacking in management with quality to fulfill its mission.

Hospitals are considered the center of the health system in Brazil and account for 75% of the sector expenditures. They represent the workspace for the biggest part of physicians and health professionals, being reference to the training of human resources, development environment and adoption of new technologies (La Forgia & Couttolenc, 2009).

Hospitals are structured through policies oriented from top to down in a vertical hierarchy. However, the relationship between primary care and hospitals have been the subject of discussions in strategic areas, it has influenced health care and financial results. In this sense, one of the organizational objectives of primary care is decentralization, capillarity and proximity of people's lives.

Technology in health

In the growing market of technological innovation, adoption of quality standards and the use of new technologies allow more accurate diagnoses, fewer errors in treatments with faster recovery and consequently cost savings in the health system.

Participation in the Sentineling-Hospitals Program, coordinated by ANVISA, aims to create a network for discussion and implementation of quality and safety standards in patient care, including management of medical equipment.

The technical surveillance is responsible for the management of medical equipment and seeks to prevent medical events that may pose risks to the patient as result of improper use of equipment. With that purpose, it uses quality tools that record the incidents, allowing the analysis of the information

collected to propose corrective actions (Antunes, Vale, Mordelet, & Grabois, 2002).

The Office of Technology Assessment (OTA) states as medical or health technologies: drugs, medical equipment and other devices, medical and surgical procedures and the organizational systems of health care and support. In this context, referring to the hospital management process, health technology is understood as elements which range from knowledge embedded in artifacts - new drugs, vaccines and equipment - as underlying knowledge to new procedures / techniques and new organizational forms of health services (OTA, 1978).

Thus, the responsibility must be shared from the managers to the professionals who handle and operate each device in procedures. These devices can be classified into categories such as: diagnostic equipment, therapeutic, life support, monitoring and laboratories. However, regardless of the types of medical devices and equipment, it is essential that they are properly maintained and specialized companies are engaged in machine maintenance to maintain the reliability of each device.

The equipment used in the hospital where this research took place is part of a significant group of health technologies in the global context. The members of this group have great relevance in care procedures, high cost, diversity of models and are of extreme sensitivity in handling, operation and high risk of causing harm to patients.

The effectiveness in the management of hospitals and in the management of medical equipment

The lack of autonomy and flexibility to plan, coordinate and manage human resources efficiently has been a challenge to public health institutions in order to meet the needs of the population and monitor the rapid technological advancement. Some changes of management and individual practices, consequently, lead to improve effectiveness and results of the services.

Concern for costs in healthcare is increasingly urgent. Statistical studies of La Forgia and Couttolenc (2009) report that spending on health accounted for more than 8% of Gross Domestic Product (GDP) of Brazil and 60% of spending in this area are funded by public resources.

The flexibility of the professional body and work processes emerge as motivation for the search for new alternatives for management, in order to escape the difficulty of adapting to changes in the contemporary world.

The Ministry of Health (MH) has advanced in improvement proposals, such as hospital reform, including assessment of the deficiencies. There was an expansion of the hospital network in order to improve users' access and this has resulted in the proliferation of small hospitals, which had important implications for the efficiency and quality of care.

The authors La Forgia and Couttolenc (2009) highlights six main weaknesses, namely: a) disorganization in bed offer with oversupply in some areas and shortage in others; b) deficient administrative practices; c) lack of information on efficiency and quality; d) hospital payment mechanisms that induce distortions; e) lack of network arrangements that link hospitals to outpatient care; f) and high variation in the volume and quality of services among hospitals.

The studies of Freire (2011) present the reasons for so many differences between the performance of public and private hospitals; such differences may be in the different clinical practices, in health professionals, in patient profiles and in characteristics of the teaching, care and research, which affect the planning and execution of practices.

In that sense, La Forgia and Couttolenc (2009) specify that the proposals may be translated into the institutions by presenting analytical dimensions that determine the performance of the health system: the

external environment, organizational environment and internal environment.

Among these dimensions, the internal environment is highlighted because, according to La Forgia and Couttolenc (2009), the influence of external and organizational environments is observed in the internal environment and resources are converted into services exactly in this context. Significant behavioral elements include resource management practices (human, material, medical, financial etc.); structural characteristics of services such as facilities, equipment and manpower; and treatment processes (La Forgia e Couttolenc, 2009, p. 4).

It is also in the internal environment that organizations create strategies to achieve positive results in the interrelationship of work processes. Reaching practices for recycling, innovation, keeping good results in different conditions and sustaining care to the increasing demands at the lowest cost are the organizational effectiveness factors (Mintzberg, 2008).

It is noteworthy in this study the use of the term effectiveness as a form of analysis to be performed in a given fact or event with the intention of evaluating the results of actions, according to Seixas (2002) cited by Morici and Barbosa (2013). The effectiveness is focused on results with actions aligned with the objectives set by the plan of action.

According to Morici and Barbosa (2013), one of the main initiatives for health quality and safety is to encourage professionals, who work in different areas, from patient care to administration, to create new healthcare culture.

Rescuing concepts of Donabedian (1994) cited by Freire (2011), health quality can be considered as a training process for the evaluation of services, in search for better results for the patient, reducing risks and costs.

Neto and Malik (2011), in one of their reflections, conclude that the effectiveness of the results can be identified by monitoring the activities and

improvement actions. These authors highlight that health services cannot be understood as organizations whose economic or political concerns are obstacles to the development of their core functions of caring for people, making them well (principle of beneficence). In this sense, besides the individual obligations of the various health professionals, there is the moral responsibility of the manager to implement policies and actions led by ethical, professional, technical and economic principles, in search of the improvement of institutional quality standards.

The management of such equipment requires an organizational structure that ensures the effective acquisition, evaluation of actions of the qualification of the professionals involved in the handling, whether in transportation, cleaning, sterilization, maintenance, as well as during the procedures and operation of equipment (Calil, 2008).

Biomedical and clinic engineering studies have advanced to programs for creating a safe environment for patients and health professionals. The Ministries of Health and Education encourage studies in this area, increasing the number of educational institutions providing specialized courses in clinical engineering. The main objective was to recover and manage the lifespan of medical equipment, seeking to meet the shortage of skilled professionals in this area, to train professionals who handle and operate the equipment and promote safe patient care (Calil, 2008).

As maintained by the studied theories, applying resources more efficiently and increasing the quality of patient care are essential actions for governments make systematic changes in scenery possible.

Besides the principles of effectiveness and efficiency, the effectiveness of management in health care must be based on ethical principles such as respect for human dignity, autonomy of the people in the activities of the organization, charitable, social utility, equity and justice.

Whereas the principles of management should be part of the daily life of organizations, investments in

practices for the qualification of people are up to managers. The training, performance and people management interfere directly in the quality of services and satisfaction of patients as well as in the stimulation of professionals to create a new healthcare culture.

In developed countries, the structure of professions is well defined and follows the context of health technology. Its management is the responsibility of biomedical engineers or clinical engineers, due to the rapid development of medical equipment from the research centers.

The complexity in the management of medical equipment in Brazil has causes external to the institutions, such as poor condition and distribution of equipment for the country's hospitals.

Because of the lack of preparation for the proliferation of technologies in hospitals in the 70s, besides the numerous deaths caused by electrocution of patients, studies in the areas of biomedical and clinical engineering have advanced for creating a safe environment for patients and for health professionals.

The prevention of accidents requires evaluation and standardization of equipment within the hospital sectors, including the replacement of the obsolete devices.

As claimed by Calil (2008), the management of hospital equipment must be unfolded in actions to systematize the technical, theoretical, administrative and scientific dimensions from acquisition to disposal of equipment.

The professionals' responses to responsibilities and institutional performance

Since the Classical Theory of Management by Henri Fayol, in labor environment, in order to ensure efficiency to all parties involved, whether people or departments and sectors, one should go from the holistic organization and its structure. At that time, administrative functions for organizations were already drawn with the purpose of predicting, managing,

guiding people, coordinating and checking if everything was according to the defined rules.

Following the lines of approaches of the Management Theory, specialized schools in professional behavior and its relationship with the organizations and the work arose. The motivation, according to Maslow, develops in levels or stages corresponding to the physiological, psychological and self-realization, being essential to provide conditions for personal development.

It is worth noting that, whatever the type of management and the organization driving line, the people are the ones who enter, remain and participate in the organization, regardless their hierarchical level, through their skills, knowledge, attitudes, behaviors, perceptions, etc.

Reciprocal relationship or interaction between people and organizations, as well as exchange of incentives and contributions, generating organizational idea of balance become necessary.

METHOD

As for the approach, this research is characterized as qualitative and quantitative, that, according to Oliveira (2012) refers to an attempt to explain in depth the meaning and the result of the information characteristics. It is a subjective character approach focusing on interpretative resources for analysis of the collected materials.

The survey data were collected through interviews with questionnaires, literature and observations which allowed researchers immerse in the context of the subjects to observe their reality and gather information. Therefore, it was possible the description and understanding of the logic that governs the relations within the investigated working group.

This is a type of research that is commonly adopted when the chosen theme is underexplored, constituting a first step for further research to be done in order to

contribute to our knowledge of individual, organizational, social, political and group phenomena.

The research unit of analysis and observation was a federal public university hospital in Belo Horizonte, Minas Gerais, which has a staff composed by more than four thousand professionals and is settled in campus with students of all courses in the health area of the Federal University of Minas Gerais.

The sectors surveyed are part of the process of management, handling, operation and maintenance of medical equipment critical to health. The professionals in technical and assistance positions of these sectors were interviewed responding to the proposed questionnaire.

The data were collected through an interview done with semi-structured questionnaire with open and closed questions.

The questionnaires that guided the interviews were prepared considering the handling and operation processes, besides the maintenance and management of medical-care equipment.

The questions in the questionnaire have been prepared in order to preserve the uniformity of understanding by the respondents, which contributed to more reliable results, as well as to the standardization and exploitation of the researcher analysis field.

As a strategy for the analysis of data collected through the responses to closed/open questions and feedback, the technique of the Collective Subject Discourse (CSD) was used. The technique was developed in the late 90s, by Lefèvre and Lefèvre (2006), as an explicit proposal for reconstituting an empirical collective being or entity that expresses an opinion in the form of a speech subject issued in the first person singular.

According to the authors, the technique seeks to answer the self-expression of the collective thought or

opinion, respecting the dual qualitative and quantitative condition such as an object (Lefèvre & Lefèvre, 2006). It is the qualitative way of representing the thought of the community, which is made by the addition, in one speech synthesis, discursive content of similar meaning, issued by different people, as answers to open or semi-open questions questionnaire. It is a process that allows the crossing of the speeches of the interviews with the addressed theories and concepts used in the theoretical framework.

From the proposal of this technique, the responses to each question were organized by job positions and working sectors through the methodological framework of the Central Idea (CI), which consists of the description of the senses present in the comments of each response and in the joint responses of different individuals with similar meaning, besides the CSD for the construction of global analysis through the responses and individual comments with greater equivalence (Lefèvre & Lefèvre, 2004). This methodological procedure explores the quantitative dimension and the collected data through tabs via Microsoft Excel, allowing the correlations that are part of the construction of the CSD analyzes.

RESULT ANALYSIS

The presentation of the general data, in Table 1, provides information relating to the quantitative aspects of research participants: the amount of professionals in each sector and the amount of the ones who participated in the data collection.

The data concerning the number of professionals in the sectors were given by the Personnel Management Division of the Hospital, extracted from the Human Resources System in 04/20/2014.

Table 1

Quantitative of professionals regarding their work sector and position, amount of respondents, including the percentage of participation.

| Sector | Position | Amount in position | Amount of participants | Respondents percentage |
|--|-------------------|--------------------|------------------------|------------------------|
| Hospital and Electronic Engineering | Electronics Tech. | 02 | 01 | 50% |
| | Engineer | 01 | 01 | 100% |
| | Headship | 01 | 01 | 100% |
| Respondents | | | 03 | 83,33% |
| Surgery Center | Nursing Tech. | 45 | 22 | 49% |
| | Nurse | 20 | 09 | 45% |
| | Physician | 80 | 36 | 45% |
| | Headship | 10 | 08 | 80% |
| Respondents | | | 75 | 54,75% |
| Adult Intensive Care Unit | Nursing Tech. | 25 | 11 | 44% |
| | Nurse | 15 | 09 | 60% |
| | Physician | 08 | 02 | 25% |
| | Headship | 03 | 02 | 67% |
| Respondents | | | 24 | 49% |
| Pediatric Intensive Care Unit | Nursing Tech. | 18 | 11 | 61% |
| | Nurse | 10 | 08 | 80% |
| | Physician | 15 | 13 | 87% |
| | Headship | 03 | 03 | 100% |
| Respondents | | | 35 | 82% |
| Neonatology Intensive Care Unit | Nursing Tech. | 15 | 07 | 47% |
| | Nurse | 07 | 02 | 29% |
| | Physician | 10 | 06 | 60% |
| | Headship | 03 | 03 | 100% |
| Respondents | | | 18 | 59% |
| Emergency Room | Nursing Tech. | 25 | 08 | 32% |
| | Nurse | 10 | 04 | 40% |
| | Physician | 08 | 02 | 25% |
| | Headship | 03 | 02 | 67% |
| Respondents | | | 16 | 41% |
| Total of Respondents | | | 171 | 61,51% |

Source: Survey data (2015).

From this table it was possible to evaluate the results by the type of each investigated process: handling and operation; maintenance; management of medical-care equipment. In the following sections, for each of these processes the corresponding CSDs are presented and discussed.

Handling and operation teams

The questionnaires presented to professionals who handle and operate the equipment - nurses, nursing technicians and physicians - have focused on the qualifications and skills required for carrying out

assistance activities to hospital patients. The answers of these professionals were condensed in the CSDs that follow.

CSD 1: *In academic education, handling / operation of medical-care equipment is not taught; there is only an introduction to the subject and what you learn is in practice.*

The CSD 1 shows that there are inconsistencies in the training of professionals who handle / operate medical-care equipment, because during education (technical or graduated), the professional has only an introduction to the subject which leads him/her to learn the procedures through teamwork and care practice.

Also noteworthy is the fact that professionals of the three investigated positions are responsible for comprehensive care to patients at hospital and part of this assistance is performed by medical equipment.

The sectors surveyed (Surgery Center, Adult Intensive Care Unit, Pediatric Intensive Care Unit, Neonatology Intensive Care Unit and Emergency Room) are considered as high complexity care because they sustain equipment and professionals monitoring patients full-time in life-threatening situations.

CSD 2: *The experience is inherent in medical training, but there is concern with current technologies. The nursing staff have little contact with equipment handling and the experience each one has is very different.*

The CSD 2 shows that respondents have considerable work experience in the institution, but concerning the handling / operation of medical-care equipment there are differences between the nursing professionals experience, even involving the equipment in their work processes. Physicians claim to have experience in the operation of equipment including the concerning to keep up with current technologies and the different brands and models.

CSD 3: *When hired, the professional is only informed about some equipment; additional information is implied. Before starting the activities there is no formal training, learning happens through colleagues.*

The CSD 3 identifies hospital weaknesses from the moment of hiring of professionals, which has a direct impact on patient care and the lifespan of the equipment.

According to information from the Division of Personnel Management at the Hospital of Federal University of Minas Gerais (HC-UFMG), the professional admission process does not have a formal standard of presentation of the professional routines and activities to be performed.

Professionals are admitted at different times and before starting their activities are presented to the immediate supervisors that conduct their inclusion in the job. Therefore, each manager has his/her way to conduct the professional in the work process.

It is necessary that hospitals have strategies to manage and monitor their processes in order to adapt to the changes of contemporary and to ensure standards in the process of hiring their staff and monitoring professional qualifications (Morici & Barbosa, 2013).

As believed by Chiavenato (2000), well-defined processes make people who enter the organization remain part of it, regardless of their hierarchical level or a task, with satisfactory performance.

CSD 4: *Periodic trainings, when realized, are made by the supplier on their own and without regular basis. Manuals, reports, and instructions on the equipment are difficult to locate and understand. When necessary, they count on the assistance of the responsible for the equipment. Supervision for guidance on operational and technical issues is decentralized: leadership, colleagues and engineering.*

The CSD 4 shows decentralization of references on which sector or which professional is responsible for the periodic training / retraining of professionals, the

location of manuals, instructions and the handling and operation equipment checklist for professional consultation; moreover, supervisory role for guidance is not well defined to the professionals.

Each year, the Professional Training Program at the hospital prepare a training plan with strategic actions of in-service education, which guides managers to build their specific plans according to the needs of each team.

Thus, it became clear that there is not a standard determination in the institution to keep the teams who handle and operate medical-care equipment qualified and updated about the work process. Moreover, it was also not identified a systematic performance evaluation process of the professionals focused on results.

The lack of professional qualification and periodic training to update the professionals who handle and operate medical equipment is one of the factors that contribute to frequent and large number of equipment damage. It is worth noting that, according to the Hospital Engineering, which is the focus of this research, 60% of the equipment that comes to the workshops or have been checked in sectors through service order does not have the description of the reason recorded by the professional.

According to Neto & Malik (2011), the reason for the biggest part of the damage in medical equipment in hospitals is the misuse during handling / operation. The authors also point out that the institutions fail in the planning of training and how to monitor the performance of activities and procedures.

Regarding the closed answers, comments and observations during the interviews, it was possible to identify that the logistics of these sectors is not conducive to proper organization and updating of professionals. The manuals of the equipment are not all available and easily accessible in the sectors.

It was shown that they are filed in the Clinical and Electronics Engineering Department or in filings with

the coordination, without being use regularly by the professionals who handle and operate the equipment.

It was possible to observe that the sectors have no checklist for preparing the usage of equipment and accessories. Noteworthy is the Surgical Center, a sector that has the largest arsenal of medical-care equipment for procedures on patients.

Another important point of observation concerns the different brands of equipment and accessories, found in the HC-UFGM, that follow different standards for handling and operation.

According to the Sentineling-Hospitals Program, coordinated by ANVISA, hospitals need to enter in discussion networks for the implementation of quality and safety standards in the management of medical-care equipment, aligning its processes from the standardization and need for acquisition to assistance directly to patients. Thus, the determination made by ANVISA must become a standard process in practice and daily life of the institution.

The HC-UFGM has, in its organizational structure, shared management through functional units, which represent business units. The sectors surveyed have supervision / coordination of administrative, nursing and medical staff, however is not set as rule to the leadership conduct proper supervision and provide guidance to professionals when dealing with operational and technical issues relating to equipment. The engineering service is responsible for preventive and corrective maintenance of the hospital equipment, through calls / service orders made by sectors.

However, concerning the guidelines that should be followed by the institution, a fragmentation is observed in the accountability process regarding the individuals, managers and teams. Nevertheless, the institution provides openings for the participation of professionals and staff in management processes, in particular in equipment management.

CSD 5: *The frequency of problems in equipment is considered high by the nursing staff, as part of the routine. Physicians regard them as eventual. The*

problems identified relate to accessories, functions and lack of knowledge of the equipment.

It is noteworthy that the HC-UFMG has a technology park relatively adequate to their local needs and, according to information obtained from the hospital engineering sector, everyday problems are recorded for different reasons, but mostly on the misuse by lack of knowledge in handling and operation. There is no process flow related to records and monitoring of problems in the sector.

By identifying the damage, the sector opens a Service Order and from there the records are sent to Hospital Engineering for evaluation and maintenance. Neither the professional who identifies the problem, nor the staff and headship participate in the treatment or are informed about the damage of the equipment.

The Engineering sector showed no training program and monitoring to reduce the damage to the equipment by misuse.

CSD 6: *Concerning the teamwork, professionals feel responsible for the conservation and use of equipment.*

ANVISA, as a regulator agency of health care in the SUS and in the supplementary health (network agreements), regularly publishes good practice determinations for zeal, conservation and accountability of health professionals for the medical-care equipment and equity public.

The reciprocity between people and organizations is explained by the exchange of incentives and contributions. Therefore, the institutions are structured with mechanisms to align the interests of reciprocity relying on organizations that represent professional categories.

CSD 7: *The available equipment are modern and new, need preventive maintenance and better performance of the hospital engineering.*

The authors Calil (2008) and Neto and Malik (2011), when referring to the hospital management and

medical equipment topic, point out that in a teaching hospital with high complexity assistance is essential, for the fulfillment of its mission, maintaining an updated technology park to provide education and assistance with quality.

Despite the fact that an equipment management plan was not identified in the hospital where the research took place, there are initiatives in some sectors and references for monitoring and process conducting.

In the next section, the search results for those responsible for maintenance of the equipment used in the HC-UFMG will be presented.

Maintenance

The questionnaires presented to professionals who provide maintenance on equipment used in the HC-UFMG focused, beyond the technical condition and qualification, planning and potential supervisory teams and work processes.

The Hospital Engineering Unit is at a time of restructuring of its management model and operation. In this research, it is represented in the interview by a technician and an engineer hired by public process. In the CSD 8, the technical respondent reports on the characteristics of professionals who make repairs in the equipment and, in the CSD 9, the Engineer interviewed talks about the professionals of the Hospital Engineering Department.

CSD 8: *The professionals who provide equipment maintenance had specific training in the area of operation. They have more than 10 years in experience. They are informed of the activities and trained before starting work at the hospital.*

CSD 9: *The professionals of Hospital Engineering periodically receive internal or external training to update their knowledge. They have manuals, instructions, reports and checklists of equipment available on file. They also search the web or from the manufacturers.*

The Hospital Engineering sector of HC-UFMG is responsible for receiving all the demand for solution of problems with medical equipment. The sector is in transition with the restructuring of its equipment management model. It lacks staff to meet the hospital sectors in terms of supervision and in a preventively way.

Currently, Hospital Engineering assumes the shared responsibility with heads of sectors on existing equipment at the hospital, besides fulfilling advisory and corrective maintenance activities.

It is important to point out that the relevant legislation to the management of the medical-care equipment provide for training for recycling and update on the technologies installed in the institution.

It is important to point out that the relevant legislation to the management of the medical-care equipment predict training for recycling and updating the technologies used in the institutions.

CSD 10: *Maintenance activities are recorded in a specific system to monitor the historic data of the hospital technological park.*

The CSD 10 revealed the fragility of the institution because it fails to present, in a systematic way, a management plan for medical equipment that includes guidelines from the acquisition of equipment to the daily monitoring of maintenance and training of users who handle and operate the equipment.

The plans must be built with the participation of those involved in the process and managed to require individual responsibility and full service delivery.

In the context in which the Hospital Engineering and the HC-UFMG are inserted, it was possible to identify it's necessary to define the responsibilities concerning managers and/or technicians related to their respective roles in work processes in the equipment management plan.

The next section presents the results of interviews with medical headship, nursing and administrative sectors: Surgery Center, Adult Intensive Care Unit, Pediatric Intensive Care Unit, Neonatology Intensive Care Unit and Emergency Room.

Headship of nursing and administration

The professionals of these sections occupy different positions; they are physicians, nurses and administrators with leadership functions in the surveyed sectors, which are also responsible for medical-care equipment next to each professional and the staff of Hospital Engineering.

More than 300 global health institutions are certified by the methodology of the JCI (Joint Commission International / Brazilian Consortium Systems Accreditation and Health Services), including in Brazil, constituting a network of institutions recognized for excellence in patient care. The HC-UFMG is in accreditation process for 5 years and is intended to be assessed for certification at the end of year 2016.

The heads of the different sectors have the responsibility of organizing work processes; in this case, management of the medical-care equipment through quality tools defined by the institution, as shown in the CSD 11:

CSD 11: *Supervisors do not have training on management of medical equipment, as this training is not required for the function. They declare experience in management in general and management of people and do not receive information on all the function of activities, including equipment management.*

Currently, the heads of the units and sectors are evaluated professionals appointed by the Hospital Director to occupy positions of trust. Therefore, they are not necessarily trained professionals in the area that they will perform, even concerning training on hospital management.

In the CSD 11, it is possible to identify the interviewed managers are responsible for sectors that require great knowledge about managing medical-care equipment, however, they have no training or experience or are informed about the responsibility assigned to the management function. In addition to this, it's required greater involvement of staff of Hospital Engineering to maintain the equipment in good working order. However, they feel responsible for promoting training when new equipment is purchased.

CSD 12: *Leadership promotes training for new equipment with the supplier and Engineering Hospital Sector, according to demand. There is no process for updating and provision of manuals and other documents about the equipment. Either, there is no Leaders feel responsible for managing the equipment together with other references and technical support engineering.*

From the CDS 12, it's possible to meet the initiatives of the interviewed leaders in order to maintain the management of the medical-care equipment, such as team training with the engineering suppliers and the responsibility of this process with other sectors.

However, there is evidence of its weakness due to the absence of a registered plan for equipment management, including flows of work processes, necessary skills of both professionals and the heads of the different areas of the hospital.

CSD 13: *Supervisors consider the equipment management a strategic process for the institution that deserves to be better defined and organized.*

In this CDS, there is evidence that, according to Freire (2011), meets the quality in health care trajectory. The results effectiveness of services is directly related to the establishment of process improvement through change management and individual practices.

From these analyzes it was possible to identify factors that contribute to the implementation of actions aimed at effectiveness in the management of medical-care equipment, in the next section.

FINAL CONSIDERATIONS

Considering all the steps taken to complete the research described in this article, there is a vast theoretical and practical approach in which the effectiveness in managing medical-care equipment is inserted.

The subject is presented with great relevance in the health management area with great challenges in the daily life of institutions, especially in public hospitals. It was possible to identify weaknesses in the equipment management process and to trace the effectiveness factors with proposed actions to better performance and development of professionals and the institution.

These factors were identified through of the analysis of CSDs, constructed from the responses of CIs or group of responses of the three types of drawn questionnaire.

In Table 2, there are the main benefits for the completion of this study.

Table 2

CSD's description and effectiveness factors in the management of equipment.

| <i>CSD's descriptions</i> | <i>Factors in the management of equipment</i> |
|---|--|
| <i>CSD 1: In academic education, handling / operation of medical-care equipment is not taught; there is only an introduction to the subject and what you learn is in practice.</i> | Professional qualification |
| <i>CSD 8: The professionals who provide equipment maintenance had specific training in the area of operation. They have more than 10 years in experience. They are informed of the activities and trained before starting work at the hospital.</i> | |
| <i>CSD 11: Supervisors do not have training on management of medical equipment, as this training is not required for the function. They declare experience in management in general and management of people and do not receive information on all the function of activities, including equipment management.</i> | |
| <i>CSD 2: The experience is inherent in medical training, but there is concern with current technologies. The nursing staff have little contact with equipment handling and the experience each one has is very different.</i> | Practical knowledge |
| <i>CSD 3: When hired, the professional is only informed about some equipment; additional information is implied. Before starting the activities there is no formal training, learning happens through colleagues.</i> | Professional insertion at work |
| <i>CSD 4: Periodic trainings, when realized, are made by the supplier on their own and without regular basis. Manuals, reports, and instructions on the equipment are difficult to locate and understand. When necessary, they count on the assistance of the responsible for the equipment. Supervision for guidance on operational and technical issues is decentralized: leadership, colleagues and engineering.</i> | Supervision: evaluation, development, results, continuous improvement |
| <i>CSD 9: The professionals of Hospital Engineering periodically receive internal or external training to update their knowledge. They have manuals, instructions, reports and checklists of equipment available on file. They also search the web or from the manufacturers.</i> | |
| <i>CSD 12: Leadership promotes training for new equipment with the supplier and Engineering Hospital Sector, according to demand. There is no process for updating and provision of manuals and other documents about the equipment. Either, there is no Leaders feel responsible for managing the equipment together with other references and technical support engineering.</i> | |
| <i>CSD 5: The frequency of problems in equipment is considered high by the nursing staff, as part of the routine. Physicians regard them as eventual. The problems identified relate to accessories, functions and lack of knowledge of the equipment.</i> | Professional development and technical support |
| <i>CSD 6: Concerning the teamwork, professionals feel responsible for the conservation and use of equipment.</i> | |
| <i>CSD 13: Supervisors consider the equipment management a strategic process for the institution that deserves to be better defined and organized.</i> | Individual accountability. |
| <i>CSD 7: The available equipment are modern and new, need preventive maintenance and better performance of the hospital engineering.</i> | Adequate infrastructure |
| <i>CSD 10: Maintenance activities are recorded in a specific system to monitor the historic data of the hospital technological park.</i> | Management plan |

Source: Survey data (2015).

The research also enabled the development of proposed actions for the improvement of work processes in the HC-UFGM in pursuit of effectiveness in managing medical-care equipment and continuously improve the quality and delivery of services to health.

Proposal 1: Engage the existing forums - Standing Committee Specification and Equipment and Materials Standardization; Core Technology in Health; Quality Program and Professional Training – which already discusses and promotes actions on medical equipment

and on the construction of an Equipment Management Plan.

Proposal 2: Implement the Equipment Management Plan, following the relevant legislation to the acquisition, custody, handling, operation and maintenance of equipment that support the comprehensive health care of patients.

Proposal 3: Consider the time of transition and restructuring as an opportunity for change the culture

of the organization and alignment of service delivery to contemporary standards of quality and safety.

As a conclusion to this study, it is considered that it was possible to contribute to the expansion of knowledge in the area of management of medical-care equipment, because it was conducted in a public hospital with broad reaching that, up to this moment, hasn't got study records to approach the subject. It's believed that keeping this process in full operation is a

major challenge of health institutions, which meets the calls that ANVISA in RDC / ANVISA (2010), which recommends that each stage of the management should be documented in the form of standards, technical or operating procedures. All relevant information and traceability technologies should be readily available, because it is necessary to conduct systematic records that show objective evidence of the execution of each activity and stages of management.

REFERENCES

- Antunes, E., Vale, M., Mordelet, P., & Grabois, V. (2002). *Gestão da tecnologia biomédica: Tecnovigilância e engenharia clínica*. Brasil/França: ACODESS.
- Brasil. Agência Nacional de Vigilância Sanitária. (2004). *Boletim Informativo de Tecnovigilância – BIT* (4a ed.). Brasília.
- Calil, S. J., & Teixeira, M. S. (2008). *Gerenciamento de Manutenção de equipamentos Hospitalares* (Série Saúde & Cidadania). **Faculdade de Saúde Pública da Universidade de São Paulo**, SP, Brasil.
- Chiavenato, I. (2000). *Introdução à teoria geral da administração* (6a ed.). **São Paulo: Campus**.
- Freire, R. P. (2011). *Gestão de Equipamento Médicos como fonte de vantagem competitiva: o papel da prática de qualidade num hospital de excelência*. (Dissertação de Mestrado em Administração e Desenvolvimento Empresarial. **Universidade Estácio de Sá**. Rio de Janeiro, RJ. Brasil).
- JCI - Joint Commission International/ Consórcio Brasileiro de Acreditação de Sistemas e Serviços de Saúde – CBA. (2010). *Padrões de Acreditação da Joint Commission International para Hospitais* (4a ed.). Rio de Janeiro.
- La Forgia, G. M., & Couttolenc, B. (2009). *Desempenho hospitalar no Brasil: em busca da excelência*. **São Paulo: Singular**.
- Lefèvre, F., & Lefèvre, A. M. C.. (2015). Instituto de Pesquisa do Discurso Coletivo. *Perguntas & respostas*. Recuperado de <http://www.ipdsc.com.br/scp/perguntas.php>
- Mintzberg, H. (2008). *Criando organizações eficazes: estruturas em cinco configurações* (2a ed.) (A. B. Brandão, Trad.). São Paulo: **Atlas**.
- Morici, M.C., & Barbosa, A. C. Q. (2013). A Gestão de Recursos Humanos em hospitais do Sistema Único de Saúde (SUS) e sua relação ao modelo de assistência: um estudo em hospitais de Belo Horizonte, Minas Gerais. *Rev. Adm. Pública*, 47(1), 205- 225.
- Neto, V, G., & Malik, A.M. (2011). *Gestão em Saúde*. Rio de Janeiro: **Koogan**.
- Oliveira, M. M. (2012). *Como fazer pesquisa qualitativa*. Rio de Janeiro: **Vozes**.
- OTA. (1978). *Assessing the Efficacy and Safety of Medical Technologies*. Recuperado de <https://www.princeton.edu/~ota/disk3/1978/7805/780501.pdf>
- Yazbek, P. (2014, fevereiro 2). Os hospitais brasileiros de excelência em 2014. *Revista Exame*. Recuperado de <http://exame.abril.com.br/seu-dinheiro/noticias/os-hospitais-brasileiros-de-excelencia-em-2014>.