Proposal of an environmental management model for Nephrology services*

Proposta de um modelo de gestão ambiental para os serviços de Nefrologia

Propuesta de un modelo de gestión ambiental para los servicios de Nefrología

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ABSTRACT

Objective: This study aimed at proposing a new model of Environmental Management for Nephrology Services through a situational diagnosis made in three services. **Methods:** This work is an exploratory descriptive research that used quantitative methodology and multicase techniques. Three different instruments were used for data collection, and answered by nurses, managers, nursing technicians and cleaning servants, as well as patients with chronic renal insufficiency submitted to hemodialysis. **Results:** The detailed analysis of the processes and the application of the evaluation instruments showed that they are efficient tools in the identification of non-conformity factors, which enabled the elaboration of an environmental management proposal applicable to nephrology services. **Conclusion:** The implementation of the proposed system in the services brought several benefits such as reduction of residue and liquid effluents; preservation of natural resources, use of more environmentally correct materials and inputs; cost reduction as well as the preservation of human health and the environment.

Keywords: Environmental administration; Nephrology; Health services; Waste management; Medical waste

RESUMO

Objetivos: Este estudo objetivou propor um modelo de Gestão Ambiental para os serviços de nefrologia, a partir do diagnóstico situacional realizado em três serviços. **Métodos:** A metodologia foi exploratório-descritiva quantitativa, com técnica de multicaso. Para coleta de dados, foram utilizados três instrumentos diferentes, respondidos por enfermeiros, administradores, técnicos em enfermagem e serventes, além de pacientes com insuficiência renal crônica em tratamento de hemodiálise. **Resulatdos:** A análise detalhada dos processos e a aplicação dos instrumentos de avaliação demonstraram ser ferramentas eficazes na identificação de fatores de não-conformidades, o que possibilitou a elaboração de uma proposta de gestão ambiental aplicável aos serviços de nefrologia. **Conclusão:** A implantação do sistema proposto nos serviços trouxe inúmeros benefícios que vão desde a redução de resíduos e efluentes líquidos; preservação dos recursos naturais; uso de materiais e insumos mais ambientalmente corretos; redução de custos; preservação da saúde humana e do meio ambiente.

Descritores: Administração ambiental; Nefrologia; Serviços de saúde; Gerenciamento de resíduos; Resíduos de serviços de saúde

RESUMEN

Objetivo: Este estudio tuvo por objetivo proponer un modelo de Gestión Ambiental para los servicios de nefrología, a partir del diagnóstico situacional realizado en tres servicios. **Métodos:** La metodología fue exploratorio-descriptiva cuantitativa, con técnica de multicaso. Para la recolección de los datos, se utilizaron tres instrumentos diferentes, respondidos por enfermeros, administradores, técnicos de enfermería y personal de servicio, además de pacientes con insuficiencia renal crónica en tratamiento de hemodiálisis. **Resultados:** El análisis detallado de los procesos y la aplicación de los instrumentos de evaluación demostraron ser herramientas eficaces en la identificación de factores de no-conformidades, lo que hizo posible la elaboración de una propuesta de gestión ambiental aplicable a los servicios de nefrología. **Conclusión:** La implantación del sistema propuesto en los servicios trajo innumerables beneficios que van desde la reducción de residuos y fluidos líquidos; preservación de recursos naturales; uso de materiales e insumos ambientalmente correctos hasta la reducción de costos; preservación de la salud humana y del medio ambiente.

Descriptores: Administración ambiental; Diagnóstico ambiental; Nefrología; Servicios de salud; Administración de residuos; Residuos de hospitales

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INTRODUCTION

The environmental issue has been of great concern in society. It is a relevant topic in national and international government policies. The current moment requests new management models, and consequently, new ways of environmental management, including more social responsibility [1].

The environment intervention benchmark happened worldwide in the eighteenth century after the Industrial Revolution, when the natural resources were used by industries. Population started to grow fast and agriculture was mechanized, resulting environment changes, leading to biogeochemical cycle unbalance [2].

In Brazil, industrial activity was not noticed until mid 1960, causing important environmental impacts, both physical as economical and social. A cultural transformation came up related to new environment awareness, and it gained dimension and put the environment as one of the most fundamental mankind principle [3].

The advances in environmental legislation development took place in the world, starting in the seventies, when several countries constituted their rules to regulate the impact generating activities, or made the existing laws more restrictive. However, it can be said there have not been environment concerns and its resources in the past decades. Nevertheless, there was not a comprehensive concept of environment that could inform an environment policy [4].

Throughout the nineties, environment preservation is converted into a higher influence factor, with great market penetration. Thus, companies began to search solutions to reach sustainable development and, at the same time, began to profit from their businesses [3].

As men health preservation is part of environment preservation, managerial measures used in the health services, become effective actions of hospital environment management, decreasing residues and effluents, saving water and energy, recycling materials, using the waste in the own production and mitigating costs [5]. This Environmental Management system may be defined as "part of a global management system that includes organizational structure, planning activities, responsibilities, practices, procedures and resources to develop, implement, reach, revise, and maintain environment policy" [6].

Therefore, the proposal to carry out this study aimed at proposing an Environmental Management (EM) model) for the nephrology services.

METHODS

This research has been the exploratory-descriptive quantitative with multicase technique type. The study has been carried out in three nephrology services, encompassing two private (A and B) and a public one (C). Three different instruments have been used during data gathering: the first for nursing technicians and servants, the second for the patients and the third for nurses and administrators.

The sample has been made up of professionals: nurses, administrators, nursing technicians and servants, besides chronic renal insufficiency patients, being treated through hemodialysis. All the above-mentioned professionals, who were working on December 2005, were invited to take part in this study and signed the Free Informed Consent Term.

The patient sample has been calculated from 240 subject population, taking into account the sample proportion $p = 0.80$, the sample error $e_o = 0.10$ and $a= 5\%$, totaling a 61 patients sample. The choice has been made systematically, obeying the arrival order in the different services.

The professional sample has been composed of seven nurses, making up 70.0% of the total, two administrators both from service A as well as service B, answered the survey, what represents 100% of the total. Service C does not own an administrator, for this service is an intra-hospital service carried out in a public hospital. Thirty-eight nursing technicians of the three nephrology services answered the instrument, accounting for 74.5% of the total and four servants of service A and B, accounting for 80%. In service C, the servants are employees hired by an outsourced company, not belonging to the sector fixed body of workers. That is why they have not participated in the study.

The field analysis was made up of visits paid to the studied services, with records in spreadsheets of the performed operation sequence, existing documentation analysis (material purchasing data, supply records and residues destination) and photographic documentation. This analysis generated process flowcharts, to identify improvement opportunities, as well as helping elaborate an Environmental Management model proposed for nephrology services.

During model development and evaluation, several management improvement actions were performed, some already show results and others are in monitoring phase, in a progressive implantation.

RESULTS

The instruments that refer to the service evaluation answered by the professionals encompass seven topics concerning environment management, namely: water supply and quality, liquid effluent, solid effluent, handling steps of solid residues, management systems, biosafety

and worker health. The instrument applied to the patients encompassed five topic: service-generated residues, handling steps of solid residues, biosafety, besides service quality and security.

Most of the environment aspects surveyed in the three nephrology services complied with legislation. However, some management failures have been identified. They are highlighted:

- in terms of **water quality**, in all the services studied, there have already been episodes of contamination of the treated water used in the hemodialysis treatment. All of them solved right away;

- in terms of **liquid effluents**, service C is not connected to the public sewage system. It does not own internal treatment of its effluents, pouring them into water;

- in terms of **solid residues**, only service B was not in compliance with legal determinations[7], for it does not own a suitable external shelter for the different types of residues;

- in terms of **system management**, there was a lack of environment license and a lack of environment hazards presentation program. In services A and B there is not a team in charge of environment issues;

- in the area of **biosafety and worker health**, in both services there was a lack of an emergency plan in case of fire and the occurrence of working accidents related to residues handling. In service A, 67.0% of employees reported the occurrence of accidents, in service B, 50.0% and in service C 71.4%. Furthermore, in service C, individual protection equipment was not used when handling residues, as reported by 42.8% in service C.

Among service A and B patients, 91.7% and 90.5% of them demonstrated respectively unawareness of questions related to the service-generated solid residues final destination.

Another difficulty perceived by patients, to a lower extent, was the ignorance regarding machine and service equipment preventive maintenance, being quantified as 12.5% in service A and 16.2% in service B. The remaining items evaluated by the patients comply with legislation.

To analyze the processes, the observational method was used. It helped in the diagnostic of Environmental Management in the nephrology services. The procedure, handling techniques and behaviors in these institutions, related to prevention and/or environment preservation has been observed.

The document evaluation of the organization adopted procedures was based on the analyses of norms and services routines, as well as the activity flowchart in the hemodialysis process shown in Figure 1, which identified chances of improvement.

The data rising was used to analyze the process, since

the patient arrival to the service through the procedure performing, until the patient departure. In addition, the required supplies to perform the procedures have been analyzed, and the residues generated from the activities.
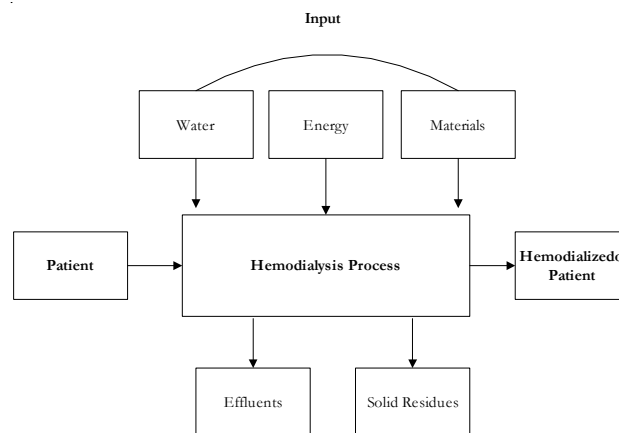

Figure 1 – Global Analysis of the hemodialysis process

DISCUSSION

In the analysis obtained from the three instruments data, it was given emphasis to the results that did not comply with legislation[7-10].

Regarding water quality, all the services own good quality water, meeting all the legislation requirements [9] that controls the nephrology services. It has been seen episodes of contamination of treated water used for hemodialysis, in a point in time, throughout the years. These contaminations were caused by trouble in the water treatment by reverse osmosis, as membrane breaking, hydraulic system contamination. All of them were solved right away because the services had a routine and an action plan for this type of accident.

Studies show that there may be contamination hazards related to osmosis membrane rupture, progressive deterioration and membrane bacterial colonization. When it occurs, there is passage of a great amount of chemical and microbiological contaminants[11].

Hemodialysis is one of the hospital services that mostly generate significant liquid effluents, due to great water consumption in this treatment. The implantation of waste combat programs and water rational use, rebound favorably in the minimization of liquid effluent generation.

Regarding solid residues, the studied services perform the suitable handling in all the steps of the management, from its generation through its final disposal according to legislation[7-8].

Regarding biosafety and worker health, in both services, there was the occurrence of residue handling

related working accidents, although they had training programs and continued education for their team and an Accident Prevention Intern Commission.

The nurses and administrators interviewed in the services A, B e C, demonstrated great level of knowledge and environment issues awareness. However, the nursing technicians and the servants, even receiving periodic training, did not show concern about water and energy saving in the service, and did not care about using Individual Protection Equipment when handling residues, as described in a service.

Based on these findings, it is necessary to raise people awareness in relation to environment issues, as well as providing permanent education in search of their behavior change.

In the patients' results, there was difficulty with questions related to service-generated solid residues final destination, showing the need of further information. To overcome such problem, a leaflet was created, tackling Environmental Management issues, also made available to the patients. In the other evaluated items, the patients showed great knowledge and a good interaction with the services, showing security and trust in them.

In the process analysis, hemodialysis process flowcharts were elaborated, since the patient arrival in the service, through procedures performing, until patient departure, so as to evaluate all the requested supplies, as well as the residue generated from the activities.

This analysis identified improvement opportunities, and helped to elaborate an Environmental Management (EM) model proposed for nephrology services. It has also been used a diagnostic obtained with the questionnaires applied to professionals and patients. One of the identified opportunities was the elaboration of specific formulation for disinfection of the arteriovenous fistula puncture site, with supply reduction and improvement in the patient comfort.

Proposal of an Environmental Management model for nephrology services

The proposed methodology aims at contribute to the nephrology services in the implantation of a Environmental Management system, which meets the market patterns, the service needs and, at the same time, preserves the environment with sustainable practices, using as reference the ISO 14001[10] requirements and Cipolat[4].

The implantation of an Environmental Management system should be led by the board of directors in a participative and integrated way, with everybody´s involvement.

In Figure 2, the proposed SGA model is represented and it is being implanted in services A and B. The model

is divided into four steps, which will be described:
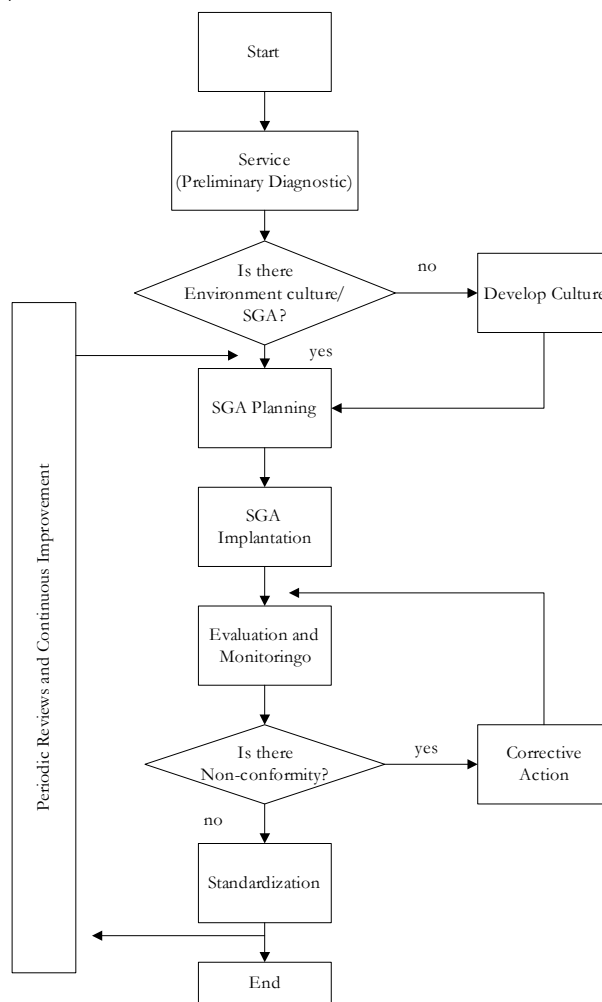
Figure 2 – Flowchart proposed for the implantation of an SGA in Nephrology Services

- first step – service evaluation: preliminary diagnostic - in order to obtain success in implanting a SGA, it is necessary to perform a preliminary diagnostic, identifying the level of environment awareness the service has, as well as possible difficulties to be overcome. There are several tools that can be used to identify the probable difficulties that will be faced: a report of the actions that have been done, highlighting the possible reasons of success or failure; the study of the organizational atmosphere and the company´s environment background.

- second step – planning of the Environmental Management system - based on the identification of all the environment aspects, resulting from the activities performed in the service, the ones that cause the most relevant and significant impact deserve attention. The company is liable for choosing the right tool among many existing ones in literature.

For the company to control, analyze and modify, it is recommended to have an internal control and evaluation systematics, complying with legislation. It is vital to have the knowledge of environment aspects related to the activities, products and organization services to perform an effective analysis of its applicability. The goals should be established from the aspect priorities and company significant environment impacts, identified in the pre-diagnostic.

- third step – implantation of the Environmental Management system - The successful implantation of a SGA requires all the organization employees´ engagement. It begins in the company´s highest managerial levels, where high administration establishes the environment policy and assures that the Environmental Management system is implanted. As part of this engagement, management designs its specific representative, with responsibilities and authority defined to implement SGA. It also establishes and maintains resources to identify the training needs.

The service formalizes procedures for communicating, receiving and documenting relevant information, in order to meet the demands of the interested parts, including environment impacts associated with organization operations. For the communication to be effective in the different hierarchic levels of the services, it is recommended the use of a control spreadsheet, avoiding possible communication flaws.

Aiming at assure the control and success in SGA implantation, it is essential to elaborate documentation for all the team. According to the norms, the documentation should contain a description of the system central elements and introduce clearly the diverse interactions among them. It is advisable to elaborate an Environmental Management manual with Standard Operational Procedure, which, besides technical procedure, contains corrective actions, operational routines, work instructions, spreadsheets and forms.

- fourth step – SGA evaluation and monitoring - It is necessary to perform measurements and systematic system monitoring implemented in the organization, to assure a continuous improvement in the environment performance. It is important to point out that the results of these activities should be used, not only to analyze whether the goals have been reached, but also to help identify where the corrections and improvements are priority.

The critic analysis is performed by high administration and it is fundamental for the continuous improvement process to be assured in a strategic and operational level. The results obtained by auditing will provide this critic analysis, indispensable for a permanent evaluation of the established policy, allowing orientation correction and/or standardization, as well as establishing new goals, seeking to improve and enhance the system.

With the implantation of the SGA model proposed in this study, it was possible to realize countless benefits such as: residue and liquid effluent reduction; natural resources preservation; environment-friendly material

Chart 1 - Results of improvement actions implanted in the Services of nephrology A e B from January, 2004 through May 2006

Implanted action	Residues reduction	Effluent reduction	Cost reduction/ month	Cost reduction/ year
Disinfection with Biogel of arteriovenous fistula	80%	100%	R$ 96.00	R$ 1.152.00
Implantation of a Residue Management Plan	28.8% of total	_	_	_
Change in the disposable glass use routine.	3000 disposable glasses/month	_	R$ 61.00	R$ 732.00
Change in the sterilization material packaging routine.	Yes	_	R$ 177.18	R$ 2.126.16
Change in the anticoagulation routine of patient during hemodialysis session.	3000 10ml syringes/month	_	R$ 1.158.00	R$ 13.896.00
Change in the disinfection routine of hemodialysis machines with sodium hypochlorite.	_	936 liters/year Sodium hypochlorite 5 %	R$ 97.05	R$ 1.170.00
Printing routine change of the laboratory exams.	280 sheets /month	_	R$ 17.90	R$ 214.80
Substitution of tissue for a better quality one.	30%	_	Measuring stage	Measuring stage
TOTAL			**R$ 1,607.13**	**R$ 19,285.00**

and supply use; human health and environment preservation. With SGA implantation in services A and B, some improvement actions are still in monitoring phase. In Chart 1, the results of improvement actions already implanted in the nephrology services are presented.

This research results showed that, changes and innovations, that reduce the environment impact and costs, improve quality and service competitiveness. In this way, the innovations allow the companies to use more productively a wide range of supplies, raw material and energy sources, as an attempt to compensate the expenses to preserve more the environment, making them more competitive[12].

CONCLUSION

The environment diagnostic carried out in this study showed to be an effective tool to identify factors that do not conform with environment management, what enabled the elaboration of an Environmental Management model propos applicable to nephrology services.

The implantation of an Environmental Management system in the services brought countless benefits such as residue and liquid effluent reduction, natural resources preservation, environment-friendly material and supply use; cost reduction, human health and environment preservation.

It should be pointed out that the success in the SGA development and maintenance depends on the importance attributed by the high administration, as well as some known factors, such as the environmental and cultural characteristics of each service and, mainly, of the workers, who should be motivated and involved in the process.

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