

# IMPLEMENTATION OF A STEAM TERMINAL CLEANING SERVICE IN OPERATING ROOMS

*Implantação de um serviço de limpeza terminal a vapor em salas operatórias*

*Implementación de un servicio de limpieza terminal a vapor en quirófanos*

Sandra Terumi Yoshino<sup>1</sup>, Ana Cristina Cardoso Hering<sup>1</sup>, Rachel de Carvalho<sup>2</sup>

**ABSTRACT: Objective:** To report the experience of the first implementation of a steam terminal cleaning service in operating rooms at a private hospital in São Paulo, Brazil. **Method:** A descriptive and narrative study of a case report, through a review of the different types of hospital cleaning, with emphasis on steam cleaning of operating rooms. **Results:** The implementation of steam cleaning and disinfecting in operating rooms showed positive results, such as optimization and quality in the work process, occupational safety, reduced time of terminal cleaning and room working, procedure automation, environmental benefits (saving water and chemicals), and security by providing an environment free of important pathogens for the development of infections. **Conclusion:** Steam cleaning is an effective alternative to hospital hygiene combined with technology. The steam system is able to effectively reduce the microbial load on surfaces with higher quality and safety.

**Keywords:** Housekeeping, Hospital, Operating rooms, Disinfection, Contamination.

**RESUMO: Objetivo:** Relatar a experiência da implantação pioneira de um serviço de limpeza terminal a vapor nas salas operatórias de um hospital privado de São Paulo. **Método:** Pesquisa descritiva, narrativa, do tipo relato de experiência, mediante a realização de revisão acerca dos diversos tipos de limpeza hospitalar, com ênfase na limpeza de salas operatórias a vapor. **Resultados:** A implantação da limpeza e a desinfecção de salas operatórias a vapor mostrou resultados positivos, tais como otimização e qualidade no processo de trabalho, segurança ocupacional, redução no tempo de limpeza terminal e de giro de sala, automatização do procedimento, benefícios ambientais (economia de água e produtos químicos) e segurança, por oferecer um ambiente livre de patógenos importantes ao desenvolvimento de infecções. **Conclusão:** A limpeza a vapor é uma alternativa eficaz de higienização hospitalar aliada à tecnologia. O sistema a vapor é efetivamente capaz de reduzir a carga microbiana em superfícies, com mais qualidade e segurança.

**Palavras-chave:** Serviço hospitalar de limpeza. Salas cirúrgicas. Desinfecção. Contaminação.

**RESUMEN: Objetivo:** Reportar la experiencia de la primera implementación de un servicio de limpieza a vapor terminal en los quirófanos de un hospital privado de São Paulo, Brasil. **Método:** Estudio descriptivo, narrativo, un relato de experiencia mediante la celebración de la revisión de los diferentes tipos de limpieza del hospital, con énfasis en el sistema de limpieza de quirófanos a vapor. **Resultados:** La aplicación de limpieza y desinfección de quirófanos a vapor mostraron resultados positivos, como la optimización y calidad en el proceso de trabajo, seguridad en el trabajo, reducción en el tiempo de limpieza terminal y de habitación, automatización del procedimiento, beneficios ambientales (ahorro de agua y productos químicos) y seguridad al proporcionar un ambiente libre de patógenos importantes para el desarrollo de infecciones. **Conclusión:** El limpiador a vapor es una alternativa eficaz para la higiene hospitalaria combinado con la tecnología. El sistema de vapor es capaz de reducir eficazmente la carga microbiana en las superficies, con mayor calidad y seguridad.

**Palabras clave:** Servicio de limpieza en hospital. Quirófanos. Desinfección. Contaminación.

<sup>1</sup>Nurses; Specialists in Surgical Center Nursing, Anesthetic Recovery and Material Center and Sterilization, Faculdade Israelita de Ciências da Saúde Albert Einstein (FICSAE). E-mails: sandra.sandra.terumi@hotmail.com; anacristinahering@gmail.com

<sup>2</sup>Nurse; PhD in Nursing, School of Nursing, Universidade de São Paulo; Professor in Undergraduate and Graduate programs, FICSAE; Professor and Member of the Collegiate Board of Directors of the Professional Science Master's Degree in Nursing, FICSAE. E-mail: rachel.carvalho@einstein.br

Avenida Professor Francisco Morato, 4.293, Butantã, CEP: 05521-200, São Paulo, SP, Brasil, Telephone: (11) 2151-1001.

Received: 17 Mar. 2015 – Accepted: 07 May 2015

DOI: 10.5327/Z1414-4425201500020008

## INTRODUCTION

The environment is identified as an important reservoir of microorganisms in health services. Contaminated environmental surfaces can play an important role in the transmission of some pathogens. Many of these can remain in the hospital for weeks or months and may pose a risk to patient safety<sup>1,2</sup>. Therefore, providing effective measures to control infection aiming at the safety of an environment that involves the patients is considered as an important factor in preventing healthcare-associated infections (HAIs)<sup>3</sup>. The measures such as the implementation of good hygiene practices and proper cleaning frequency form a crucial component in the overall strategy for preventing infections<sup>4</sup>. On the other hand, failure in cleaning and disinfecting surfaces may result in the dissemination and transfer of microorganisms in healthcare environments, risking the safety of patients and professionals working in these places<sup>3,4</sup>.

For some time, it was believed that an environment had little involvement in the epidemiological chain of HAIs, and ignoring the importance of hospital hygiene just ended up favoring the survival of these microorganisms in the environment. This scenario did not comply with the practices for strict control of antibiotics, combined with contact precautions in place for colonized patients<sup>5</sup>. Thus, the quality of care cannot be restricted to an approach limited to the care provided directly to the patient. Therefore, the nursing staff is responsible for seeking a biologically safer and more comfortable hospital setting<sup>2</sup>.

Over the past decade, there has been a dramatic evolution in the recommendations and norms for improving the hospital environment. In 2003, recommendations made by the Centers for Disease Control and Prevention (CDC), in 2010, the Best Practices in Surface Cleaning and Disinfection by the Brazilian Health Surveillance Agency (ANVISA), and scientific studies that discuss the importance of the environment are some examples<sup>1,6</sup>.

In this context, the surfaces of operating rooms (ORs) also have great importance regarding the risk factors to the onset of HAIs in surgical patients. The completion of the cleaning and disinfection of surfaces is essential to reduce the incidence of infections, as it reduces the inoculum of the agent on the environment<sup>2,7</sup>.

Cleaning is defined as the removal of dirt lying on the surfaces of the OR using mechanical means, such as

friction; physical means, such as temperature; or chemicals means, such as sanitizing and disinfectant products. As a result, physical and nutritional media that support the microorganisms are eliminated, as the epidemiological chain is interrupted<sup>1,7</sup>.

The Surgical Center (SC), as a critical area of the hospital, requires specific types of cleaning related to the instant of operation of the OR. Thus, the preparatory cleaning is performed before the first operation of the day, to remove the dust particles from the surfaces of surgical lights, furniture, and equipment. The operative cleaning is done during surgery, in the event of contamination of the ground with organic matter, in the presence of residue or drop of material, and to keep the organization and within the OR hygiene. The concurrent cleaning is performed after each surgical procedure so that it can remove dirt and contaminants before the next operation. Finally, terminal cleaning, which takes place daily or weekly, depending on the hospital routine, aims to reduce the amount of dirt and microorganisms from all the surfaces in the OR, both the horizontal and the vertical, to reduce the likelihood of environmental contamination<sup>1,7-9</sup>.

In the literature, several methods of terminal cleaning used in hospitals were found. However, in this study, the terminal steam cleaning will be addressed specifically. It is a recent practice and little known in Brazil, although it is already being studied and used in health services in Europe for about six years<sup>4,10</sup>. This terminal cleaning method has attracted some relevance in the hospital environment, as it only uses the water steam for cleaning and disinfection, reducing the use of sanitizing chemicals. Furthermore, the steam cleaning method avoids the use of polluting substances, without disregarding the required hygiene standard and, at the same time, reduces operating costs. Another factor is the decreased risk of developing resistance among pathogens, triggered by an excessive use of disinfectants on surfaces<sup>10-12</sup>.

Faced with the related evidence, this study describes the practical experience of steam terminal cleaning implementation in the ORs of a private hospital in São Paulo. Another issue that prompted us to conduct this study was the lack of available articles about steam cleaning. This shows that the issue is still a challenge that needs to be studied for the dissemination of this knowledge and for encouragement for the development of new studies.

## OBJECTIVE

To report our experience in implementing a steam terminal cleaning service in the ORs of a private hospital in São Paulo.

## METHOD

This is a descriptive and narrative study of a case report, which described the work conducted by the first author in a private hospital in São Paulo. The case report consists of acquiring practice for us to gain a deeper knowledge of the study object, seeking a new path for its understanding<sup>13,14</sup>.

The study aimed to describe the experience of implementing a hospital cleaning service in the ORs of a large private hospital located in São Paulo. The institution under study has two SCs, being composed of two distinct areas, in which one has six digital rooms for the performance of minimally invasive surgery and the other six conventional rooms, besides the ophthalmology center. The other SC consists of 14 ORs for the performance of highly complex procedures and robotic surgery encompassing all specialties<sup>15</sup>.

Through this case report, we describe how the activity was developed and the studies conducted before the implementation, comparing the conventional terminal cleaning with steam cleaning, in addition to the positive and negative results, and the difficulties encountered in this pioneering OR terminal cleaning method.

## RESULTS

### **Case report: study, description, and implementation of steam cleaning actions in operating rooms**

The steam cleaning method emerged in Brazil in 2011, with the purpose of offering a cost-effective, practical, and an effective alternative to hospital cleaning combined with technology.

To minimize the risk of surgical site infection (SSI), a private hospital in São Paulo outlined several improvement actions in the OR, including OR terminal cleaning process. Previously, the procedure was performed with manual techniques and relied heavy on labor; so, the proposal was to optimize resources through the implementation of a steam cleaning equipment. Thus, a hygiene service

provider, in partnership with the hospital itself, began a comparative study between the conventional method and steam cleaning using a high-temperature equipment (150°C), without the use of chemicals and saving natural resources, such as water.

The project was conducted by a nurse, and the activity was carried out by one professional from the cleaning staff, who was trained to operate the equipment. In addition, all the areas of the interface were involved: Hospital Infection Control Service, work safety, healthcare staff, clinical engineering, and maintenance.

The electrical structure of the building was evaluated by the maintenance staff to ensure the functioning of the equipment and ensure patient and employee safety. For the control and monitoring of environmental safety, adenosine triphosphate (ATP) tests were performed before and after cleaning.

Some guidelines were taken into consideration for the collection of data and for quantitative and qualitative analyses:

- Standard operating procedure (SOP) and cleaning techniques adopted by the institution: these items were evaluated to compare the method used by the hospital and later describe the items that could be sanitized with steam. The cleaning sequence, the procedures performed (waste collection or disinfection of organic matter), and the items to be cleaned were previously agreed with the nursing and governance staff.
- Measurement of the area under study: measurements were performed (total and individual) of the OR to calculate productivity in square meters.
- Process indicators: hospital indicators were analyzed to verify the productivity, the average cleaning time, and the consumption of raw materials by the conventional method.

The SC routine was not changed because of the study. Therefore, the terminal cleanings were made according to the clearance of each OR and the availability of nursing staff.

The method was applied from December 2011 to January 2012, during the night shift, when the terminal cleaning had already been carried out. Sixty terminal cleanings were monitored, whose data were recorded in its own checklist, and the following items were evaluated: total activity time, number of rooms cleaned per shift, sanitized items, and quantity of water and chemicals used. However, only a portion of this sample was applied to complete the study, that is, 11 terminal cleanings were recorded during four shifts, which are as

follows: one terminal cleaning on the first day, two on the second day, four on the third day, and four in the fourth day. This occurred because of the unavailability of the nursing staff, and that the technical capacity studied could reach an average of six cleanings per day.

Chart 1 specifies all activities performed in the ORs, including the sanitized items. Some items and surfaces not compatible with steam, such as electrical parts, surgical lights, negatoscope, and telephone, were cleaned manually.

At first, we conducted the cleaning of items covered by the cleaning staff (designated in Chart 1). However, throughout the study, we began to add more items that were cleaned by the nursing team (Chart 2). This is because of the greater technical cleaning capacity with steam equipment when compared with the conventional method.

Thus, the results on the mean cleaning time were found to be as follows: first day, 56 minutes; second day, 45 minutes; third day, 50.5 minutes, and the fourth day, 44.5 minutes, which results in an average of 47.81 minutes. These results varied greatly according to the size of the OR (from 30.27 to 51.87 m<sup>2</sup>) and procedures performed (waste collection, process of disinfection of organic matter, etc.). However, the result was positive, when compared with the conventional method adopted by the hospital, whose average cleaning time was 115 minutes, i.e., a 58.43% reduction in time to accomplish terminal cleaning in the ORs.

Another important result was the reduction of water consumption and sanitizing chemicals. The hospital consumed, on average, 6,472 mL water and 152 mL concentrated sanitizing product during a terminal cleaning. In contrast, the steam equipment consumed only 1.730 mL of water and 144 mL concentrated product. The reduction in consumption of cleaning products was not as significant as the water, corresponding to 5%, as the use of these products was necessary for disinfecting items that were incompatible with steam and during the disinfection procedure of the organic material. However, the water consumption was extremely low, with a reduction of 73% compared with the conventional method.

One year after the study, the hospital hired the steam terminal cleaning service. The team hired was properly trained on site and the activity was monitored, in the first weeks, by a nurse from continuing education and a technical coordinator of the service provider company. The team was responsible only for terminal cleanings, and an initial target of 17 in the SC and two in the obstetric

center, daily, was agreed. Therefore, each OR was sanitized, altogether, three times a week, since the previous frequency was just once a week.

A checklist of terminal cleaning was implemented for checking and recording the activities, and an SOP was also prepared. Subsequently, the process indicators were created and monitored monthly.

**Chart 1.** Activities performed and items sanitized with steam and manually in operating rooms.

Item	Status
Waste	Collected (manually)
Disinfection	Performed (manually)
Waste baskets	Performed (manually)
Hamper rims	Performed (steam)
Roof	Performed (steam)
Lamps, externally	Performed (steam)
Exhaust screens	Performed (steam)
Walls	Performed (steam)
Air vents	Performed (steam)
Roof	Performed (steam)
Negatoscope	Performed (manually, only rims)
Telephone	Performed (manually)
Fixed benches	Performed (steam)
Monitor	Performed (manually)
Medical gas panel	Performed (manually)
Power outlet plates	Performed (manually)
Surgical lights support	Performed (manually)
Doors	Performed (steam)
Alcohol gel support	Performed (steam)
Packing replacement for hamper	Performed (manually)

**Chart 2.** Items sanitized by the nursing staff, which were incorporated during steam cleaning.

Item	Status
Auxiliary table	Performed (steam)
Mayo table	Performed (steam)
Surgical table	Performed (steam)
IV pole (without pump)	Performed (steam)
Chairs	Performed (steam)

After a certain time, when the team was more skilled and familiar with the steam equipment, the average cleaning time decreased from 47.8 (results found in the study) for 30 minutes, further optimizing the workforce and increasing the productivity.

## DISCUSSION

During the study period, the SC staff showed to be very interested and curious by the novelty of the steam equipment for terminal cleaning, and many were even unaware about this technology, which facilitated the implementation period, for the whole routine standardization process was monitored by them. Thus, there was no resistance from the SC team.

At first, the cleaning staff came across some operational difficulties, which were resolved as they acquired experience in the use of the equipment, for example, handling of the machine and cleaning sequence without the risk of cross contamination.

Another difficulty found was the increase in complaints about the aspect of the OR floor after the use of the steam, which was left with scratch-like marks. This was because the floor was impregnated with dirt. Therefore, scratches happened because of the output of steam that penetrated the impregnated floor. With this, the elaboration of a separate schedule for floor treatment, with the use of industrial washers for cleaning and maintenance, was necessary, as the steam could not completely remove the dirt.

Among the main results, we obtained

- 58.43% reduction in the average length of OR terminal cleaning;
- 12% reduction in room turnover time;
- 73% reduction in water consumption;
- 5% reduction in the consumption of sanitizing chemicals;
- optimization of the workforce of the healthcare team (absorption of some cleaning equipment by the hygiene professional);
- improvements in the environmental hygiene process with reduced ATP count;
- mechanization of the process and reduction of labor;
- reduction in the ergonomic risk of the professional, because of the reduction of physical effort through process automation, minimizing the possibility of removal from the job.

Another challenge found in the study and implementation of this service was the search for a scientific evidence for a theoretical basis, as there is a large shortage of articles that address this matter. No Brazilian studies were found on this subject, and only American and European studies were published<sup>16,17</sup>.

In Brazil, in a survey conducted in Goiânia (GO), the authors had the care to characterize the cleaning of the OR and the use of personal protective equipment by professionals, who performed it manually. It was found, through the observation of 40 surgeries, that there was organic matter on the floor in 37.5% of them and that disinfection with 70% alcohol was not performed. In addition, the use of personal protective equipment was ignored by many professionals, which reflects directly on the security of the employee. The authors highlight the need for training of professionals regarding the cleaning process, the use of PPE, hand hygiene, and their responsibility in controlling SSI<sup>18</sup>.

This study can be used to reflect about the advantages of steam terminal cleaning of ORs compared with the conventional method.

In other countries, since 2008, studies have been conducted on the use of steam cleaning/disinfecting systems, including considerations that this cleaning system is able to reduce significantly and consistently the presence of pathogens on surfaces<sup>3,4</sup>.

A study in the United States<sup>16</sup> showed over 90% of reduction in the microbial load after cleaning with steam, proving that bacterial spores can also be effectively treated with this type of device. However, on surfaces with rounded edges, reduction rates were lower, and the effectiveness was proven in smooth and flat surfaces, as they guarantee the better heat transfer of the equipment. These decreases can also be improved if the steam contact time is extended. Even with the extension of the contact time, the steam treatment also requires less time when compared with the use of chlorine-based disinfectants, for example, with the advantage of not producing harmful byproducts. Furthermore, the steam system does not represent a risk of cross contamination of surfaces, as may occur in other conventional cleaning methods<sup>16</sup>.

Another American study shows the speed of steam in reducing concentrations of pathogens in just five seconds. On the other hand, most of the liquid chemicals require five to ten minutes to achieve microbial reductions on surfaces.

Another positive aspect observed is the elimination of the risk of antimicrobial resistance present in the indiscriminate use of disinfectants. This is explained by the absence of residues on the surface when only steam is used<sup>17</sup>.

## FINAL CONSIDERATIONS

This case report has highlighted the successful implementation of the steam terminal cleaning service in ORs from a private hospital in São Paulo. Faced with the concern for the safety of the surgical patient and the risk of SSI related to the environment, this study showed an effective alternative to hospital hygiene combined with technology.

Despite the lack of scientific evidence, the few studies found show that the steam system is able to effectively reduce the microbial load on surfaces, with higher quality, when compared with the use of disinfectants. According to the results obtained, along with environmental benefits and

occupational safety, this suggests that steam cleaning is a viable alternative to the conventional cleaning method, which uses chemicals for cleaning/ disinfecting environmental surfaces.

However, given the shortage of studies on this subject, there is still the need for further studies related to the use of steam in hospital hygiene to be developed.

Thus, this cleaning method was implemented in a pioneering way in the hospital studied, and was shown to be more productive and efficient than conventional terminal cleaning regarding the positive results such as optimization and quality in the work process, reduction of ergonomic risk for the professional, reduction in terminal cleaning time and room turnover, automation of the cleaning procedure, and reduction in the consumption of natural resources. In this way, the environmental sustainability guidelines practiced by the institution were adopted. Above all, the patient safety should be ensured by means of an environment free of important pathogens for the development of HAIs.

## REFERENCES

1. Assad C, Reinehr E, Siliprandi EM, Costa G. Limpeza e desinfecção de superfícies. In: Brasil. Ministério da Saúde. Agência Nacional de Vigilância Sanitária (ANVISA). Segurança do paciente em serviços de saúde: limpeza e desinfecção de superfícies [Internet]. Brasília; 2010. [citado 15 nov 2014]. Disponível em: <http://portal.anvisa.gov.br/wps/wcm/connect/4ec6a200474592fa9b32df3fbc4c6735/Manual+Limpeza+e+Desinfeccao+WEB.pdf?MOD=AJPERES>
2. Andrade D, Angerami EL, Padovani CR. Condição microbiológica dos leitos hospitalares antes e depois de sua limpeza. Rev Saúde Pública [Internet]. 2000 [citado 18 dez 2014]; 34(2):163-9. Disponível em: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S00348910200000200010&lng=en&nrm=iso](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S00348910200000200010&lng=en&nrm=iso)
3. Carling PC, Parry MF, Von Beheren SM. Identifying opportunities to enhance environmental cleaning in 23 acute care hospitals. Infect Control Hosp Epidemiol. 2008;29(1):1-7.
4. Andersen BM, Rasch M, Kvist J, Tollefsen T, Lukkassen R, Sandvik L, et al. Floor cleaning: effect on bacteria and organic materials in hospital rooms. J Hosp Infect. 2009;71(1):57-65.
5. Torres S, Lisboa TC. Gestão dos serviços: limpeza e desinfecção de superfícies e processamento de roupas em serviços de saúde. 4 ed. Rio de Janeiro (RJ): Sarvier; 2014.
6. Centers for Disease Control and Prevention (CDC). Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR [Internet]. 2003 [cited 2014 Nov 15];52(10):1-48. Available from: [http://www.cdc.gov/hicpac/pdf/guidelines/eic\\_in\\_HCF\\_03.pdf](http://www.cdc.gov/hicpac/pdf/guidelines/eic_in_HCF_03.pdf)
7. Associação Brasileira de Enfermeiros de Centro Cirúrgico, Recuperação Anestésica e Centro de Material e Esterilização (SOBECC). Práticas recomendadas SOBECC: centro de material e esterilização, centro cirúrgico, recuperação pós-anestésica. 6 ed. Barueri (SP): Manole/SOBECC; 2013.
8. Carvalho R. Conceitos básicos no bloco cirúrgico/classificação de áreas e artigos/classificação de cirurgias. In: Carvalho R, coordenadora. Enfermagem em centro de material, biossegurança e bioética. Barueri (SP): Manole; 2015. p. 35-57.
9. Kawagoe JY. Métodos de limpeza e desinfecção/tipos de limpeza de sala operatória. In: Carvalho R, coordenadora. Enfermagem em centro de material, biossegurança e bioética. Barueri (SP): Manole; 2015. p. 59-69.
10. Osprey Deep Clean Steam Cleaning Technology. Validation of the osprey deep clean steam cleaning technology in a healthcare environment. Osprey Deep Clean 2008. Osprey Deep Clean Nederland BV, Rotterdam [cited 22 Nov 2014]. Available from: <http://www.ospreydc.com/sectors/#MainBenefits>
11. Exner M. Divergent opinions on surface disinfection: myths or prevention? A review of the literature. GMS Krankenhaushyg Interdiszip [Internet]. 2007 [cited 2014 Nov 25];2(1):19. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2831491/pdf/KHI-02-19.pdf>

12. Associação Paulista de Epidemiologia e Controle de Infecção Relacionada à Assistência à Saúde (APECIH). Higiene, desinfecção ambiental e resíduos sólidos em serviços de saúde. 3 ed. São Paulo (SP): APECIH; 2013.
13. Cervo AL, Bervian PA, Silva R. Metodologia científica. 6 ed. São Paulo: Pearson Prentice Hall; 2007.
14. Gil AC. Métodos e técnicas de pesquisa social. 6 ed. São Paulo: Atlas; 2008.
15. Hospital Israelita Albert Einstein (HIAE). Sociedade Beneficente Israelita Brasileira. Instalações cirúrgicas [Internet]. [citado 27 nov 2014]. Disponível em: <http://www.einstein.br/Hospital/cirurgia/Paginas/instalacoes.aspx>
16. Sexton JD, Tanner BD, Maxwell SL, Gerba CP. Reduction in the microbial load on high-touch surfaces in hospital rooms by treatment with a portable saturated steam vapor disinfection system. *Am J Infect Control*. 2011;39:655-62.
17. Tanner BD. Reduction in infection risk through treatment of microbially contaminated surfaces with a novel, portable, saturated steam vapor disinfection system. *Am J Infect Control*. 2009;37:20-7.
18. Barreto RA, Rocha-Vilefort LO, Silva AC, Prado-Palos MA, Barbosa MA, Borges VP. Processo de limpeza da sala operatória: riscos à saúde do usuário e do trabalhador. *Rev Eletron Enferm* [Internet]. 2011 [citado 10 fev 2015];13(2):269-75. Disponível em: <http://www.fen.ufg.br/revista/v13/n2/v13n2a13.htm>