

## Factors Associated With Inadequate White Coat Handling Practices by Health Care Workers

Heliny Carneiro Cunha Neves<sup>1</sup>, Silvana de Lima Vieira dos Santos<sup>1</sup>, Sandra Maria Brunini<sup>1</sup>, Anaclara Ferreira Veiga Tipple<sup>1</sup>, Sergiane Bisinoto Alves<sup>2</sup>, Jéssika Maria da Silva Rodrigues<sup>3</sup>, Adenícia Custódia Silva e Souza<sup>4</sup>

<sup>1</sup> Doctorate degree. School of Nursing, Federal University of Goiás, Goiânia, GO, Brazil.

<sup>2</sup> Doctorate degree. Hospital das Clínicas, Federal University of Goiás and Municipal Department of Health, Goiânia, GO, Brazil.

<sup>3</sup> University graduate. School of Nursing, Scientific initiation scholarship, Federal University of Goiás, Goiânia, GO, Brazil.

<sup>4</sup> Doctorate degree. School of Nursing, Pontifical Catholic University of Goiás, Goiânia, GO, Brazil.

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### Abstract

**Objectives:** Analyze the factors associated with inadequate white coat handling practices among health care workers.

**Methods:** Observational cross-sectional study conducted in a hospital located in the Central-West region of Brazil. Participants were 103 health care workers who provided direct care in the admissions ward of the Medical Clinic and wore white coats when treating patients. Univariate analysis was performed and variables with a value of  $p < 0.10$  were included in the Poisson regression model.

**Results:** Inadequate practices related to how often white coats were changed were associated with male medical doctors and those from other fields, such as nutritionists, physiotherapists, dental surgeons, psychologists, speech therapists, who have been practicing for less time and reported inappropriate transport practices ( $p < 0.01$ ). Inadequate transport practices were interrelated with unsatisfactory behavior in terms of how often coats were changed and being a medical doctor ( $p < 0.01$ ).

**Conclusions:** The practices among health care workers of using their white coats as personal protective equipment and washing them at home are inappropriate and could put their own health and that of their families at risk. This study provides evidence that these workers should not use their white coats as protective equipment in clinical practice.

**Keywords:** Clothing; Infection Control; Health care Personnel; Protective Clothing

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### I. Introduction

The inadequate handling of white coats favors contamination<sup>1-3</sup> and characterizes them as potential reservoirs and vehicles for the dissemination of microorganisms<sup>4</sup>.

Although their role in the transmission of bacteria to patients has yet to be established<sup>5,6</sup>, several studies have shown the contamination of white coats belonging to health care workers by pathogenic bacteria, such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococci* (VRE), *Staphylococcus aureus*, *Acinetobacter baumannii* and *Escherichia coli*<sup>1,3,7</sup>.

In light of this scenario and with a view to controlling and preventing health care-related infections, in 2014, the Society for Healthcare Epidemiology of America (SHEA) published guidelines to contribute to the development or modification of white coat handling standards and policies. Though still based on fragile evidence, recommendations include removing white coats before coming into contact with patients or patient environments, using them instead as a type of uniform and means of professional identification<sup>5</sup>. In Brazil, their use has become culturally mandatory for health care workers when treating patients, and is adopted as a biosecurity measure for caregivers and patients alike.

National and international regulations regarding the transport and laundering of white coats are weak, which favors inadequate behavior and handling practices<sup>5,8</sup>.

Research is needed to explore the behavioral determinants of health care workers in relation to white coats in order to reduce barriers and improve adherence to safe practices<sup>5</sup>. As such, this study aimed to analyze the factors associated with inadequate white coat handling practices among health care workers.

## **II. Methods**

### **Setting and participants**

This observational cross-sectional study was conducted in a large public teaching hospital in the Central-West region of Brazil. The establishment provides care exclusively to users of the public health system and has 239 beds covering a range of specialties. It is a dynamic teaching, research and extension studies facility for a variety of educational institutions, contributing to training professionals at secondary and tertiary levels. Data were collected in the admissions ward of the institution's medical clinic, which has 59 beds distributed among 13 wards that cater to adults in nine specialties: cardiology, hematology, nephrology, endocrinology, rheumatology, pneumology, gastroenterology, neurology and internal medicine. The unit was chosen due to the high demand for diagnostic and therapeutic procedures in the care of unstable and critically ill patients. The following professionals participated in the study: doctors, nurses, nursing technicians, nursing assistants, nutritionists, physiotherapists, dental surgeons, psychologists, speech therapists, in addition to hemotherapy and radiology technicians, who provided direct care in the admissions ward of the medical clinic and wore white coats when treating patients.

### **III. Data collection and analysis**

Data were collected through non-participant observation, totaling 384 hours. Observations were made by qualified personnel positioned at the entrance and exit of the clinic, using a checklist to record how WCs were transported and hand hygiene (HH) practices before and after using them.

The workers were unaware they were being observed. After data collection, the participants were approached individually, informed about the observation and the study objectives and invited to participate. The health care workers also took part in a structured interview containing sociodemographic, occupational and behavioral data related to white coats handling practices.

The outcome variables were: a) inadequate HH before and after white coats use; b) insufficient white coats changes; and c) inappropriate white coats transport practices.

Inadequate hand hygiene was considered workers' failure to wash their hands before and after using their white coats<sup>9,10</sup>, not changing white coats every day was deemed unsatisfactory<sup>5,11</sup> and inappropriate transport was defined as taking white coats home or bringing them to work without using a heavy duty waterproof plastic bag<sup>12</sup>.

The following predictor variables were assessed; age (years), sex, professional category (nurses vs. doctors and other categories), length of professional career (> 5 years and < 5 years) and participation in training in the last two years. Inadequate practices were also interrelated to determine possible associations.

The data were analyzed using The Statistical Package for the Social Sciences (SPSS) version 19.0 and STATA software version 11.0. Sociodemographic, occupational and WC-handling variables were analyzed using descriptive statistics. Prevalence ratios and 95% confidence intervals (CI 95%) were estimated for variables related to inadequate white coats handling practices.

Factors associated with inadequate practices by health care workers were estimated by multivariate analysis using Poisson regression<sup>13</sup>, followed by univariate analysis between outcome and predictor variables. Next, variables with  $p < 0.10$  were included in multivariate models, obtaining the prevalence ratio (PR), adjusted prevalence ratio (APR) and respective 95% confidence intervals. The chi-squared test was used to analyze the differences between ratios and  $p$ -values  $< 0.05$  were considered statistically significant.

### **Ethical approval**

The study was approved by the Research Ethics Committee of the Hospital das Clínicas of the Federal University of Goiás (protocol number 169/2011). The participants were included in the study after being informed of its objectives and signing informed consent forms that ensured their confidentiality.

## **IV. Results**

Participants were 103 health care workers from the following fields: nursing (41.7%), doctors (35.0%) and others (23.3%). The last category included residents in the psychology, physiotherapy, dentistry, nutrition, and speech therapy departments, as well as hemotherapy and radiology technicians. The characterization of the participants is shown in Table 1.

Data on white coat handling practices are displayed in Table 2.

**Table 1:** Characterization of health care workers in relation to sociodemographic and occupational data (N=103).

Characterization of health care workers	N	%	CI 95%**
<b>Age (years) (average: 33; SD*± 9.92)</b>			
<b>Sex</b>			
Male	19	18.4	12.1-27.0
Female	84	81.6	72.9-87.8
<b>Professional category</b>			
Nursing team	43	41.7	32.6-51.4
Medical team	36	35.0	26.4-44.5
Other health care workers	24	23.3	16.1-32.3
<b>Participation in training in the last two years</b>			
Yes	79	76.7	67.6-83.8
No	24	23.3	16.1-32.3
<b>Years of professional training</b>			
< 5	51	49.5	40.0-59.0
≥ 5	52	50.5	40.9-59.9
<b>Length of professional career (years)</b>			
< 5	57	55.3	45.7-64.5
≥ 5	46	44.7	35.4-54.2
<b>Time working at the clinic (years)</b>			
< 5	65	63.1	53.4-71.8
≥ 5	38	36.9	28.2-46.5
<b>Total</b>	<b>103</b>	<b>100.0</b>	

\* SD: Standard Deviation;  
 \*\* 95% Confidence Interval

**Table 2:** White coat handling in and outside the hospital by health care workers (N=103).

White Coat Handling	N	%	CI 95%*
<b>Entering the clinic**</b>			
Wearing a white coat	92	89.3	81.9- 93.9
Not wearing a white coat	11	10.7	6.0-18.1
<b>Exiting the clinic**</b>			
Wearing a white coat	77	74.8	65.5-82.5
Not wearing a white coat	26	25.2	17.8-34.4
<b>Hand hygiene before and after using the white coat**</b>			
Yes	9	8.70	4.6-15.7
No	94	91.3	84.2-95.3
<b>White coat transport practices**</b>			
Adequate	28	27.2	19.5-36.5
Inadequate	75	72.8	63.5-80.4
<b>Daily white coat changes***</b>			
Yes	47	45.6	36.3-55.2
No	56	54.4	44.7-63.6
<b>Product used for laundering***</b>			
Bleach	20	19.2	12.9-28.1
70% alcohol	17	16.3	10.5-24.8
Washing powder	2	1.9	0.5-6.8
Information not provided	64	62.6	52.4-70.9

\* 95% Confidence Interval;  
 \*\* Data obtained by direct observation;  
 \*\*\* Data obtained by interview.

With respect to laundering practices, 81.7% of health care workers reported washing white coats at home separately from their other clothes, while 29.8% washed them with their regular clothes, by hand, or had them dry cleaned. The remaining health care workers provided no information on laundering practices.

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Among the health care personnel studied, 52.9% reported they worked at another location, 18.3% of whom stated they did not have separate white coats for each job and used the same coat for both. When questioned regarding the purpose of using white coats, 83.7% felt it was for protection. Of these, 54.8% believed that white coats only protect health care workers.

Table 3 presents the univariate analysis of factors associated with inadequate white coat handling practices. No factors were associated with inadequate hand hygiene, whose prevalence was 91.3% (CI 95%: 84.2- 95.3). However, it is important to note that all the professional categories studied exhibited poor hand hygiene adherence before and after wearing white coats.

The prevalence of inadequate behavior in terms of how often white coats were changed was 54.4% (CI 95%:44.7-63.6). Age, sex, professional category, length of professional career and inadequate transport practices were associated with this outcome in univariate analysis ( $p < 0.05$ ).

Approximately 72.8% (CI 95%:63.5-80.4) of health care workers reported inappropriate practices when transporting white coats, which was correlated with professional category and insufficient white coats changes in univariate analysis.

Multivariate analysis demonstrated that the prevalence of insufficient white coats changes increased among male health care workers (APR: 1.21; CI 95%: 1.07-1.36) who were doctors (APR: 1.51; CI 95%: 1.31-1.75), other health care personnel (APR: 1.56; CI 95%: 1.37-1.78) with professional careers spanning less than five years (APR: 1.23; CI 95%: 1.09-1.38), and those who transported their white coats inappropriately (APR: 1.27; CI 95%: 1.10-1.46) (Table 4).

Inadequate white coats transport practices (APR: 1.76; CI 95%: 1.15-2.71) and insufficient white coats changes (APR: 1.51; CI 95%: 1.10-2.07) were associated with doctors (Table 4).

**Table 3:** Univariate analysis of inadequate white coat handling practices among health care workers (N=103).

Variables	Total	Inadequate HH <sup>a</sup>		PR <sup>a</sup> (CI 95%) <sup>b</sup>	p	Insufficient changes		PR <sup>a</sup> (CI 95%) <sup>b</sup>	p	Inadequate transport practices		PR <sup>a</sup> (CI 95%) <sup>b</sup>	p
		N	%			N	%			N	%		
Age (years)				1.00 (0.99-1.00)	0.98			0.95 (0.92-0.98)	<0.01			0.98 (0.97-1.00)	0.07
Sex													
Female	84	76	90.5	1.00		39	46.4	1.00		60	71.4	1.00	
Male	19	8	94.7	0.97 (0.91-1.04)	0.48	17	89.5	1.29 (1.16-1.43)	<0.01	15	78.9	1.10 (0.84-1.44)	0.46
Category													
Nursing	43	39	90.7	1.00		06	14.0	1.00		22	52.2	1.00	
Doctors	36	33	91.7	1.00 (0.94-1.07)	0.88	30	83.3	1.60 (1.43-1.80)	<0.01	35	97.2	1.90 (1.40-2.56)	<0.01
Others	24	22	91.7	1.00 (0.93-1.08)	0.89	20	83.3	1.60 (1.42-1.81)	<0.01	18	75.0	1.46 (1.00-2.13)	0.04
Length of professional career (years)													
≥5	46	43	93.5	1.00		15	32.6	1.00		31	67.4	1.00	
<5	57	51	89.5	1.02 (0.96-1.08)	0.46	41	71.9	1.29 (1.14-1.46)	<0.01	44	77.2	1.14 (0.89-1.46)	0.28
Training													
Yes	79	73	92.4	1.00		42	53.2	1.00		56	70.9	1.00	
No	24	21	87.5	0.97 (0.90-1.05)	0.51	14	58.3	1.09 (0.73-1.63)	0.64	19	79.2	1.11 (0.86-1.43)	0.38
Inadequate HH													
No	26	-	-	-	-	14	53.8	1.00		16	61.5	1.00	
Yes	77	-	-	-	-	42	54.5	1.00 (0.86-1.16)	0.95	59	76.6	1.24 (0.89-1.73)	0.19
Insufficient changes													
No	47	42	89.4	1.00		-	-	-		26	55.3	1.00	
Yes	56	52	92.9	1.01 (0.96-1.07)	0.54	-	-	-		49	87.5	1.58 (1.19-2.08)	<0.01
Inadequate transport practices													
No	28	24	85.7	1.00		07	25.0	1.00		-	-	-	-
Yes	75	70	93.3	1.04 (0.96-1.12)	0.30	49	65.3	1.32 (1.14-1.52)	<0.01	-	-	-	-

a. Prevalence Ratio;  
 b. 95% Confidence Interval;  
 \*HH: Hand hygiene

**Table 4:** Multivariate analysis (p<0.10) of inadequate white coat handling practices among health care workers (N=103).

Variables	Insufficient White Coat Changes			Inadequate Transport Practices		
	adjusted <sup>b</sup> PR <sup>a</sup>	CI 95% <sup>c</sup>	p	adjusted <sup>d</sup> PR <sup>a</sup>	CI 95% <sup>c</sup>	p
Age	0.99	0.98-1.00	0.56	0.99	0.97-1.00	0.43
Male	1.21	1.07-1.36	<0.01	-	-	-
Category (doctors)	1.51	1.31-1.75	<0.01	1.76	1.15-2.71	<0.01
Category (other professionals)	1.56	1.37-1.78	<0.01	1.33	0.85-2.08	0.20
Length of professional career (years)	1.23	1.09-1.38	<0.01	-	-	-
Inadequate transport practices	1.27	1.10-1.46	<0.01	-	-	-
Insufficient white coat changes	-	-	-	1.51	1.10-2.07	<0.01

a. Prevalence Ratio;

b. Adjusted for age, sex, professional category, length of professional career and inadequate transport practices;

c. 95% Confidence Interval;

d. Adjusted for age, professional category and insufficient white coat changes.

## V. Discussion

Inadequate white coat handling practices such as failure to change often, inappropriate laundering, transport procedures, and using the same white coat in different health care facilities were identified in this study. Similar behavior is reported in the literature<sup>1,2,7,14,15</sup>, which represents a risk for patients, health care personnel, family members and the community<sup>16</sup>, and may be associated with individual, institutional, legislative, cultural and social factors<sup>15</sup>.

Insufficient white coat changes and inappropriate transport practices among doctors may be related to social perceptions of white coat use. White coats confer a sense of professional identity and are a status symbol that differentiates doctors from other professions<sup>5</sup>.

The frequency with which doctors change their white coats varies between 12<sup>14</sup> and 20 days<sup>15</sup>. White coats that are changed and washed less frequently exhibit a higher level of contamination by resistant pathogens<sup>10</sup>. There is a close relationship between the length of time a white coat is worn and its contamination rate, whereby white coats changed every other day or more showed greater contamination than those changed every day<sup>4,11</sup>.

The main reason cited for the prolonged use of white coats among doctors is that they do not have enough white coats to allow for daily changes<sup>15</sup>. International guidelines recommend that health care workers have two or more white coats in order to change them every day<sup>5</sup>.

Insufficient white coats changes were also associated with male health care workers, who seemed to change their coats based on the presence of visible dirt or stains. There is evidence that men's white coats showed higher contamination levels when compared to women's<sup>7,11</sup>.

The data also show that the younger the health care workers and the shorter their professional career, the higher the prevalence of insufficient white coat changes. However, research indicates that the longer the professional career the lower the perception of risk, favoring inadequate safety and protection behavior in the workplace<sup>17,18</sup>.

Although most of the health care workers had participated in training on preventive measures and infection control in the previous two years, the topic of white coat handling practices had not been emphasized or problematized. The teaching-learning process has been inefficient in changing this practice<sup>19</sup>.

The insufficient white coat changes and low hand hygiene (HH) rates identified among workers in this study increased the likelihood of white coat serving as reservoirs and vehicles for bacterial dissemination. The hands are the main source of microorganism transmission to patients during health care<sup>20</sup> and there is a correlation between the contamination of health care workers' hands and white coat contamination<sup>10</sup>. As such, measures must be implemented to improve adherence to HH practices before and after using white coats and whenever they are touched<sup>9,10</sup>.

The participants in this study are susceptible to occupational risks due to inadequate practices when transporting white coats used as personal protective equipment at work. Since the white coats belong to the workers, they are transported between their home and workplace, with all the risks inherent to this practice. Brazilian legislation does not address the necessary safety measures for white coat transport and washing<sup>8</sup>.

One study found that 80.5% of nurses took their white coats home to wash them and 70.3% of white coats were contaminated with pathogenic bacteria<sup>4</sup>. This demonstrates the risk of transmitting these microorganisms from the hospital to the workers' community and family members.

The current recommendation in Brazil is that apparel contaminated with biological material should be handled as little as possible, packaged at the site it was worn and transported in heavy duty waterproof plastic bags<sup>21</sup>. This guideline on transporting white coat to be washed at home was also put forward by the University Hospital of South Manchester<sup>12</sup>.

Home laundering of white coats at 60°C for 10 minutes or 90°C for 3 minutes using detergent is sufficient to decontaminate uniforms and reduce the bacterial load to log 10<sup>7</sup>. This process is effective at decreasing the bacterial load of uniforms contaminated with MRSA and *Acinetobacter*<sup>22</sup>. However, in Brazil, high energy costs mean that household washing machines do not use hot water, but bleach can be added when laundering white coats, as recommended in SHEA guidelines<sup>5</sup>. The lack of standardized legislation on laundering white coats at home results in inadequate practices among health care workers in Brazil.

In conclusion the practices among health care workers of using their own coats as personal protective equipment and washing them at home are inappropriate and could put their own health and that of their families at risk. The difficulties in transporting and laundering white coats used as personal protective equipment and the associated consequences provide evidence that white coats should not be used as individual protection equipment in clinical practice. Health care services need to standardize and provide appropriate protective equipment for any procedures carried out by health care workers.

It is important for the relevant authorities to establish regulations that govern the use and handling of white coats in order to ensure safety and protection in the workplace. The topic should also be included in continuing education for health care workers to ensure critical reflection on the issue and influence adherence, safety and the quality of care provided.

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### References

- [1] Uneke CJ, Ijeoma PA. The potential for nosocomial infection transmission by white coat used by physicians in Nigeria: Implications for improved patient-safety initiatives. *World Health Popul.* 2010;11(3):44-54.
- [2] Oliveira AC, Silva MDM. Epidemiological characterization of the microorganisms present on health workers' white coats. *Rev. Eletr. Enf* [Internet]. 2013 [cited 2017 Jun 12];15(1):807. Available from: [https://www.fen.ufg.br/fen\\_revista/v15/n1/pdf/v15n1a09.pdf](https://www.fen.ufg.br/fen_revista/v15/n1/pdf/v15n1a09.pdf) <http://dx.doi.org/10.5216/ree.v15i1.17207>
- [3] Gupta P, Bairagi N, Priyadarshini R, Singh A, Chauhan D, Gupta D. Bacterial contamination of nurses' white coats after first and second shift. *Am J Infect Control.* 2017;45:86-8. <https://doi.org/10.1016/j.ajic.2016.07.014>
- [4] Sande SV, Basak SA. White coats: how safe are they? *Int J Adv Med.* 2015;2(1):16-20. <https://doi.org/10.5455/2349-3933.ijam20150204>
- [5] Bearman G, Bryant K, Leekha S, Mayer J, Munoz-Prince LS, Murthy R, et al. Healthcare personnel attire in non-operating-room settings. *Infect Control Hosp Epidemiol.* 2014;35(2):107-21. <https://doi.org/10.1086/675066>
- [6] Mitchell A, Spencer M, Edmiston Jr C. Role of healthcare apparel and other healthcare textiles in the transmission of pathogens: a review of the literature. *J Hosp Infect.* 2015;90(4):285-92. <https://doi.org/10.1016/j.jhin.2015.02.017>
- [7] Banu A, Anand M, Nagi N. White coats as a vehicle for bacterial dissemination. *J Clin Diagn Res.* 2012;6(8):1381-84. <https://doi.org/10.7860/JCDR/2012/4286.2364>
- [8] Ministério do Trabalho e Emprego (Brasil). Portaria nº485, de 11 de novembro de 2005. Aprova a Norma Regulamentadora nº 32. Segurança e Saúde no Trabalho em Estabelecimentos de Saúde. Brasília (Brasil): Ministério do Trabalho e Emprego; 2005.
- [9] Gaspard P, Eschbach E, Gunther D, Gayet S, Bertrand X, Talon D. Methicillin-resistant *Staphylococcus aureus* contamination of healthcare workers' uniforms in long-term care facilities. *J Hosp Infect.* 2009;71(2):170-75. <https://doi.org/10.1016/j.jhin.2008.10.028>
- [10] Munoz-Price LS, Arheart KL, Mills JP, Cleary T, DeTAScale D, Jimenez A, et al. Associations between bacterial contamination of health care workers' hands and contamination of white coats and scrubs. *Am J Infect Control.* 2012;40(9):e245-8. <https://doi.org/10.1016/j.ajic.2012.03.032>
- [11] Wiener-Well Y, Galuty M, Rudensky B, Schlesinger Y, Attias D, Yinnon. Nursing and physician attire as possible source of nosocomial infections. *Am J Infect Control.* 2011;39(7):555-9. <https://doi.org/10.1016/j.ajic.2010.12.016>
- [12] Jay Turner-Gardener, Mandly Bailey. Dress code policy version 3. University Hospital of South Manchester. Infection Prevention and Control Committee [Internet]. 2014 [cited 2017 Feb 20]. Available from: [http:// http://docplayer.net/2188676-Dress-code-policy-committee-prevention.html](http://http://docplayer.net/2188676-Dress-code-policy-committee-prevention.html)
- [13] Harris T, Yang Z, Hardin JW. Modeling underdispersed count data with generalized Poisson regression. *The Stata Journal.* 2012;12(4):736-47.
- [14] Munoz-Price LS, Arheart KL, Lubarsky DA, Birmbach DJ. Differential laundering practices of white coats and scrubs among health care professional. *Am J Infect Control.* 2013;41(6):565-7. <https://doi.org/10.1016/j.ajic.2012.06.012>
- [15] Gouraud D, Dumont R, Asehnoune K, Lejus C. White coats: How long should doctors wear them? *Ann Fr Anesth Reanim.* 2014;33(1):e23-25. doi: 10.1016/j.annfar.2013.11.012.
- [16] Higginson R. Taking uniforms home: why it just doesn't wash. *Br J Nurs.* 2011;20(13):781. <https://doi.org/10.12968/bjon.2011.20.13.781>
- [17] Neves HCC, Souza ACS, Medeiros M, Munari DB, Ribeiro LC, Tipple AFV. Safety of Nursing Staff and Determinants of Adherence to Personal Protective Equipment. *Rev. Latino-Am. Enfermagem* [Internet]. 2011 [cited 2017 Jun 12];19(2):354-61. Available from: <http://www.scielo.br/pdf/rlae/v19n2/18.pdf>
- [18] Brand CI, Fontana RT. Biosafety in the perspective of nursing staff of Intensive Care Units. *Rev Bras Enferm.* 2014;67(1):78-84. <http://dx.doi.org/10.5935/0034-7167.20140010>.
- [19] Giarola LB, Baratieri T, Costa AM, Bedendo J, Marcon SS, Waidman MAP. Hospital-acquired infections from the perspective of nursing professionals: a bibliographical study. *Cogitare Enferm.* 2012;17(1):151-7. <http://dx.doi.org/10.5380/ce.v17i1.26390>

- [20] WHO (World Health Organization). The WHO Guidelines on Hand Hygiene in Health Care (Advanced Draft). Global Patient Safety Challenge 2005-2006: Clean care is safer care. Geneva: WHO Press [Internet]. 2006. [cited 2017 Feb 12]; 205p. Available from: [http://www.who.int/patientsafety/information\\_centre/Last\\_April\\_versionHH\\_Guidelines%5b3%5d.pdf](http://www.who.int/patientsafety/information_centre/Last_April_versionHH_Guidelines%5b3%5d.pdf).
- [21] Ministério da Saúde (Brasil). Agência Nacional de Vigilância Sanitária. Serviços Odontológicos: Prevenção e Controle de Riscos. Série A. Normas e Manuais Técnicos. Brasília (Brasil): Ministério da Saúde; 2006.
- [22] Lakdawala N, Pham J, Shah M, Holton J. Effectiveness of low-temperature domestic laundry on the decontamination of healthcare worker's uniforms. *Infect Control Hosp Epidemiol*. 2011;32(11):1103-08. <https://doi.org/10.1086/662183>

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