



Revista Prevenção de Infecção e Saúde

The Official Journal of the Human Exposome and Infectious Diseases Network


ORIGINAL ARTICLE

DOI: <https://doi.org/10.26694/repis.v8i1.2296>

Microbiological evaluation of the effectiveness of concurrent disinfection of the patient unit in intensive care

Avaliação microbiológica da efetividade da desinfecção concorrente da unidade do paciente em terapia intensiva

Evaluación microbiológica de la efectividad de la desinfección concurrente de la unidad del paciente en cuidados intensivos

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How to cite this article:

Soares JHR, Danelli T, Tomita GY, Lima ACS, Faggion RPA, Cardin SL, Oliveira TA, Perugini MRE, Tacla MTGM, Belei RA, Kerbauy G. Microbiological evaluation of the effectiveness of concurrent disinfection of the patient unit in intensive care. *Rev Pre Infec e Saúde* [Internet]. 2022;8:2296. Available from: <http://periodicos.ufpi.br/index.php/repis/article/view/2296>. DOI: <https://doi.org/10.26694/repis.v8i1.2296>

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ABSTRACT

Introduction: The health environment can act as a reservoir for microorganisms. For microbiological control, it is necessary to effectively disinfect and to monitor the quality of this process. **Aim:** To evaluate, through microbial analysis, the effectiveness of concurrent disinfection of the patient care unit of patients receiving intensive care. **Outlining:** Cross-sectional, descriptive, and observational. Microbiological cultures were performed in the patient's unit, before and after concurrent disinfection using 70% ethyl alcohol. The analysis of the cultures was performed by standard methodology. **Results:** 42 surfaces were investigated. At the time of pre-disinfection, contamination was identified on 26 (62.0%) surfaces, with the touch screen panels of the mechanical ventilators (6040 CFU/mL - 85.7%) being the ones with the highest microbial quantity (6040 CFU/mL - 85.7%), followed by bedside lockers (2380 CFU/mL - 57.1%) and the bed side rails (650 CFU/mL - 42.9%). After disinfection, 65.3% (17) of the surfaces achieved a total reduction in colony count. **Implications:** The importance of carrying out concurrent disinfection, with 70% ethyl alcohol, on inanimate surfaces with a high degree of contact with hands in the intensive care unit, for the reduction of the microbial load and promotion of a biologically safe environment for the patient was evidenced.

DESCRIPTORS

Cross Infection; Colony Count, Microbial; Disinfection; Intensive Care Units; Housekeeping, Hospital.

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Submitted: 2022-03-14
Accepted: 2022-09-23
Published: 2023-04-20

INTRODUCTION

The environment of health services can act as an important reservoir of microorganisms, exposing patients to the risk of cross contamination and development of infections caused by the agents.¹⁻³

Faced with the risk of infections that the contaminated environment provides to patients, the Centers for Disease Control and Prevention (CDC) recommends the cleaning and both concurrent and terminal disinfection in the environment of health services, in particular, on surfaces, high-touch equipment, and close to the patient.⁴⁻⁵

The disinfection in the hospital environment favors the control and prevention of infections, as it provides the cleaning of the surfaces and consequent reduction of the microbial load.⁶ To control this contamination, effective disinfection is important and so is the monitoring of the quality of this process.⁵⁻⁷

In critical unities, such as Intensive Care Unities (ICU), Brazilian Health Regulatory Agency (ANVISA) recommends daily concurrent disinfection on the surfaces of patient unit, by rubbing 70% ethyl alcohol or other sanitizing agent standardized by institution's HICC (Hospital Infection Control Committee), to be performed either three times a day or at each work shift. According to ANVISA, a patient care unit is composed of a bed (mattress, legs, and headboard), desk, serum holder, waste bin, ladder, ward screen and arm stand. These are considered surfaces with a high degree of contact with the hands of professionals and patients.⁷

Along with these surfaces, some pieces of equipment are considered as a source of high risk, due to their proximity to patients and frequency of use by the health professionals, also in the concurrent disinfection process. The mechanical ventilator, the infusion pumps for intravenous therapy and the multiparameter monitor are amongst the ones to watch out for.⁷

High-touch surfaces, so named due to the frequent contact with the hands of the health

professionals and with the patient, represent an important factor for environmental contamination because of their ability to become a probable source of dispersion of microorganisms.⁸

Although there are many studies that deal with environmental contamination, there are still gaps in knowledge on this subject matter. It is considered that many studies which approaches the effectiveness of the disinfection, measuring only the level of environmental contamination after the disinfection process, ignoring the previous contamination of the surface, which hinders the performance of analysis of quantitative reduction of the contamination.^{2, 6, 9-11}

The investigations also do not consider the complete set of the patient unit, being limited to some surfaces.^{1,5-6, 8-10, 12-17}

Considering these gaps, this study aimed to evaluate, by microbiological analysis, the effectiveness of concurrent disinfection of the patient unit in two intensive care units.

METHOD

Research's Outlining and Study's sample

This is a cross-sectional and descriptive study which set out to evaluate the environmental contamination and the effectiveness of the disinfection by counting the colony forming unities (CFU) of the microbiological cultures of furniture's surfaces and equipment that make up the patient unit, before and after the concurrent disinfection with ethyl alcohol solution at a concentration of 70% (Prolink® - Guapiaçu, SP, Brazil).

The investigation was carried out in a single day. The samples of the surfaces and equipment were collected for convenience, in accordance with bed occupancy, for a period longer than 48 hours on the date of the collection of cultures. Unoccupied beds were excluded.

Ethical considerations

This research integrates the aims of the research “Investigation of environmental contamination in critical hospital areas and evaluation of the effectiveness of disinfection”, approved by the Ethics Committee in Research Involving Human Beings of the institution, under Certificate of Presentation for Ethical Appreciation: 28169520.0.0000.5231.

Place of the Study

The research was carried out in two intensive care units (ICU) at a tertiary University Hospital, in the south of Brazil, which is referenced in high complexity for the Unified Health System (SUS). It consists of 454 beds, distributed among inpatient units, emergency room and ICU.

The sectors investigated in this research were a non-surgical Adult ICU and the Burn Center Unit (BCU). This adult ICU has 10 beds for clinical and surgical hospitalization, mainly for infected patients. The BCU has 06 beds for hospitalization with a major burn profile (a burned area greater than 20% of body surface).

Concurrent Disinfection Procedure

The institutional protocol recommended by HICC was used for accomplishing the concurrent disinfection. A 70% ethyl alcohol solution was applied as sanitizing (Prolink® - Guapiaçu, SP, Brazil) in three unidirectional rubbing movements, for at least 15 seconds on the area to be disinfected. The complete drying of the product was respected, and the following order of disinfection was obeyed: 1st step: disinfection of the bedside locker, table, gas panel and serum holder; 2nd step: disinfection of the infusion pumps, multiparameter monitor and mechanical ventilator; 3rd step: bed.

Concurrent disinfection was performed by the nursing staff of each ICU. The procedure was performed by the licensed practical nurse scheduled to work in the patient unit on the day of collection

for this research. It is noteworthy that each licensed practical nurse was responsible for two patient units.

For the application of the disinfectant, a single-use polypropylene and viscose compress (Non-Woven Fabric (NWF) - 40g/m²) was used. The change of this compress was done systematically, as recommended by the institution's protocol, after the complete concurrent disinfection of each group of surfaces (equipment, surfaces, and beds). It was performed in three rubbing movements, with the same compress, under the same group of surfaces; it could be replaced if it was visibly soiled. The 70% ethyl alcohol, sealed by the manufacturer until the moment of use, was transferred to a previously disinfected hand sprayer, and was applied on the surfaces or on the NWF. The volume used was at the discretion of the employee who was applying the product, following the recommendation that it should have been applied over the entire surface.

Microbiological collection procedures

To evaluate the environmental contamination, the selected surfaces and equipment were investigated, based on the handbook for cleaning and disinfection of surfaces issued by ANVISA⁷ for the composition of patient units. The frequency of contact with the hands of the professionals and the proximity to the patients were considered.⁵

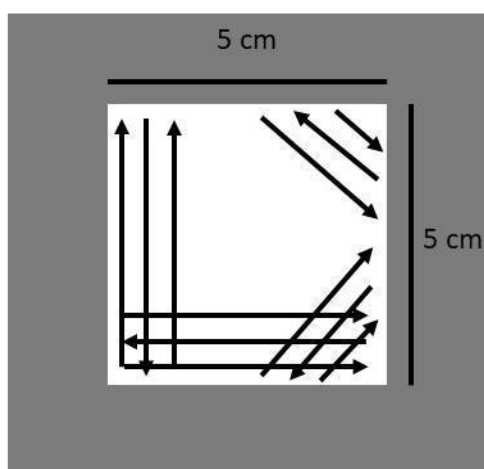
The surfaces with collected samples were:

- Surface 1: center of the support bedside locker, located on the side of the bed;
- Surface 2: area for controlling the ventilatory parameters in the touch screen panel of the mechanical ventilator;
- Surface 3: outer face of the bed side rail.

Considering that the investigated units were occupied by patients, and that the mattress is cleaned (when organic matter is present) and posteriorly disinfected with 70% ethyl alcohol during the shower, according to the routine of the health institution, this object was excluded from the research.

The microbiological samples were collected by the team of researchers, who were trained to carry out such a procedure, following the institutional protocol of the referred service. Such collections were performed in a single moment, allocating one day to each studied ICU. The collections were carried out in two moments: Moment 1: before proceeding with the concurrent disinfection of the unit; Moment 2: after carrying out concurrent disinfection, in order to respect the action and drying times of 70% ethyl alcohol. Sterile swabs (Olen Kasvi™ - São José dos Pinhais, PR, Brazil) were used for collection. Templates¹⁰ made of 90 gsm brown paper were used to standardize the sampling, they had a standard 5cm x 5cm (25cm²) opening and were autoclaved for 15 minutes at a temperature of 121 °C. The templates were positioned in different areas of the aforementioned surfaces, before and after concurrent disinfection. In the inner area of the template, the swab moistened with sterile 0.9% saline solution (Eurofarma™ - Itapevi, SP, Brazil) was rubbed in standardized movements (Figure 1). After collection, the swabs were transported in 10 ml of sterile 0.9% saline solution to the microbiology laboratory.

Figure 1 - Model of the Template and direction of movement of the Swab.



Source: Direct search.

Microbiological Cultures

For the quantitative analysis of the microbial load recovered from the surfaces, manual agitation of the tubes containing 10 mL of sterile 0.9% saline solution was performed. With the aid of a micropipette (KASVI™ - São José dos Pinhais, PR, Brazil), a 100 microliters (μL) aliquot of the suspension was plated on Tryptic Soy Agar (TSA - KASVI™ - São José dos Pinhais, PR, Brazil), using a flamed *Drigalski* strap, forming a uniform mat in a solid medium. Next, the 90 mm Petri dishes were incubated in a microbiological oven (Sterilifer™ - Diadema, SP, Brazil) at 37°C for 48 hours. After incubation, the dishes were subjected to colony count and the results obtained were multiplied by 10 to be expressed in colony forming units (CFU) per milliliters (mL) in 25 cm².

Data Analysis

To assess the effectiveness of the disinfection, a comparative analysis of the CFU counting was performed between the pre- and post-disinfection moments. The reduction was expressed in units and percentages for all sampled surfaces.

RESULTS

14 patient units of patients under intensive care were analyzed, 8 from the adult ICU and 6 from the BCU, considering that 2 units were unoccupied on the day of the study. The ICU has 10 patient units, however, one was free at the time of analysis, and the other was excluded from the sample, as disinfection was performed before collection with the swab. The BCU had all the beds occupied at the time of the analysis.

In each patient unit, three surfaces were investigated, totaling 42. The presence of organic matter was not detected on any surface, therefore, disinfection was performed without previous cleaning (Table 1).

Table 1 - Distribution of the quantity of Colony Forming Units (CFU)/mL on the surfaces of patient units of adult ICU and Burn Care Unit, before and after concurrent disinfection. Londrina, PR, 2020.

PRE-DISINFECTION															
Surfaces	CFU/mL - ICU							CFU/mL - BCU						Total per Surface	
	U1	U2	U3	U4	U5	U6	U7	U8	U1	U2	U3	U4	U5		U6
Bedside Locker	0	30	800	0	600	100	100	0	440	0	30	0	0	10	2380
Mechanical ventilator	100	20	0	30	500	230	190	40	80	18	10	50	0	20	6040
Bed rail	400	0	0	0	100	0	100	0	0	0	0	10	30	10	650
	Total							Total						TOTAL	
	8200							870						9070	
POST-DISINFECTION															
Bedside Locker	500	0	0	10	0	0	0	13	20	0	0	0	0	0	1920
Mechanical ventilator	0	0	0	0	0	0	0	20	20	40	40	10	10	10	330
Bed rail	0	0	0	0	0	0	0	10	0	0	10	*	10	0	120
	Total							Total						TOTAL	
	2200							170						2370	

Legend: CFU/mL: Colony Forming Unit per milliliter / U: Patient unit / ICU: Intensive Care Unit / BCU: Burn Care Unit / * Contaminated sample.

Source: Direct search.

The most frequently contaminated surface (85.7%) and which presented the highest concentration of microbial colonies (6040 CFU/mL) in the areas studied, in both ICUs, was the touch screen panels of the mechanical ventilators, followed by the surfaces of the bedside locker (57.1% - 2380 CFU/mL).

At the post-disinfection moment, there was a total reduction of 73.9% in the count of microorganisms for the two units, whose contamination of the surfaces studied went from 9070 to 2370 CFU/mL. The greatest reduction was

observed in the BC, which decreased from 870 to 170 CFU/mL (80.5%).

Regarding the surfaces, at the pre-disinfection moment, in the general analysis of the ICUs, of the 42 surfaces analyzed, there was CFU growth in 26 of them, representing 62.0% of the surfaces. Of these, 17 (65.3%) achieved total CFU reduction after disinfection with 70% ethyl alcohol.

In the ICU, 12.5% (5) of the surfaces displayed some contamination after disinfection, totaling 2200 CFU/mL. The three bedside lockers that showed contamination at the post-disinfection time did not

show contamination at the pre-disinfection time. In the BCU, 50.0% of the surfaces had some contamination, totaling 170 CFU/mL.

DISCUSSION

Inanimate surfaces and hospital equipment are considered potential reservoirs of microorganisms, which can be transmitted to patients and trigger colonization and/or infection. It is essential to emphasize the need for greater rigor and control regarding the disinfection of surfaces in the ICU, due to the inherent risk of the environment, the physical specificities of the unit and the clinical susceptibility of patients, which favor the spread of pathogens.^{1,5,9}

The applicability of this research consisted of identifying the level of environmental contamination, through the load (CFU) recovered from equipment and inanimate surfaces with a high degree of contact with hands in the patient unit in intensive care. Furthermore, it sought to evaluate the effectiveness of concurrent disinfection, through the quantitative reduction of CFU on these surfaces, after the procedure.

ICUs are considered high risk areas for cross-contamination. This risk is due to several factors, which contribute to the increasing fragility of patients' immune system. The following may be cited: the severity of the patients being treated; the high number of invasive procedures; the use of several materials and equipment that come into contact with the patient; prolonged hospital stays, extensive use of antimicrobials, among others.^{2,9,18}

The fixed surfaces and equipment analyzed in this study are considered to have a high degree of contact with the hands, due to their high frequency of use in direct patient care. Researchers also carried out their analyzes based on the principle that inanimate surfaces, where there is a high frequency of handling by professionals and patients, may be the main sources of pathogenic microorganisms in the hospital environment.^{10-11,19}

A research carried out in a large public hospital in the North of Brazil, with the aim of analyzing the environmental contamination on surfaces with high handling in both neonatal and adult ICUs, found, using the quantitative method of real-time Polymerase Chain Reaction (qPCR), samples with higher microbial load on the surface of the incubator (1.8×10^5 CFU per cm^2) and mattress (1.0×10^5 CFU per cm^2), showing the risk of contamination that such surfaces represent. The authors infer that the quality of the in-hospital cleaning/disinfection process varies according to the health service facilities, the cleaning service team and health professionals. They highlight the need to ensure that all professionals are aware of the importance and responsibility of such a process.²

A study correlating the level of microbial load with the frequency of handling surfaces close to the patient in the ICU, found a significant association between the frequency of touching the hand and a high microbial load (greater than 12 CFU/ cm^2) with a Spearman's correlation coefficient 1 / $p = 0.08$, for three analyzed surfaces: the cardiac monitor, infusion pump and bed protection rails.²⁰

The use of a solution of ethyl alcohol at a concentration of 70% for concurrent disinfection was defined following the criteria set by ANVISA and by Hospital's HICC.⁷ A laboratory-controlled study carried out in the Southeast region of Brazil, aiming to analyze the effectiveness of sanitizing agents on surfaces previously contaminated with suspension of *S. aureus* ATCC 25923 (in 0.9% saline solution, concentration of 1.5×10^8 CFU/ml), proved the effectiveness of using 70% ethyl alcohol when compared to other concentrations, in addition to showing that 70% ethyl alcohol and 1st and 5th generation of quaternary ammonium were 100.0% efficient in reducing CFU in such surfaces.⁶

It should be noted that, even with the same efficiency, 70% ethyl alcohol has some advantages when compared to quaternary ammonium, such as: low cost, easy application, immediate action against

bacteria (except spores), viruses and fungi. In contrast, quaternary ammonium is expensive, requires rinsing after application due to its corrosive content, has low action against non-enveloped viruses, in addition to having the risk of inactivation in the presence of organic matter or if associated with the use of soaps and anionic surfactants.⁷

In this research, at the time of pre-disinfection, bacterial colonies were observed on more than half of the surfaces analyzed (62.0%), corroborating the results of researchers who identified the presence of microorganisms on more than 50.0% of the analyzed surfaces in the phase that preceded disinfection. The relevance of environmental contamination of surfaces and equipment in the patient unit in the context of cross-contamination is highlighted.^{5,13}

The present investigation showed that, both in the ICU and in the BCU, in the pre-disinfection stage, the surface of the touch screen panel of the mechanical ventilator had a higher rate of contamination, followed by the bedside lockers and the bed rails. The study was carried out in a pediatric ICU in the Southern region of Brazil, where six surfaces in nine beds were analyzed. The mechanical ventilator was the second most frequently contaminated surface; of the nine ventilators analyzed, seven were contaminated.⁹

Corroborating the results of the current study, a research carried out in the ICU of a Public Hospital, with the objective of evaluating the efficiency of the disinfection procedure with 70% ethyl alcohol on selected surfaces based on the frequency of contact with the hands, demonstrated that the surface of the bedside table, which has the same function as the bedside locker analyzed in this research, had the highest number of contaminating colonies (37.5%) among the five surfaces with a high frequency of contact with hands.⁵

The same study showed that 87.5% of the analyzed surfaces were considered clean (free of microbial growth) after concurrent disinfection with

70% ethyl alcohol. This result is close to data from the current research, which, after disinfection, achieved a significant decline in the microbial load on the analyzed surfaces.

A research carried out in a large public outpatient clinic in the Midwest region of Brazil was divided into three stages: Pre-intervention stage (observation of disinfection practices), intervention stage (training of nursing staff and cleaning staff) and post-intervention stage (observation of adherence to the practice after 2 months of intervention). It showed an 82.3% reduction in colony counts on high-touch surfaces by users and professionals, after disinfection with the product 5% Incidin™ Extra N (intermediate level disinfectant composed of Glucoprotamine). It should be noted that the author found approval (comparison between the CFU before and after disinfection) in the post-intervention stage of 85.8%, showing that the training of the nursing and cleaning staff resulted in a positive effect on cleaning efficiency and outpatient disinfection.¹³

Another investigation, carried out in a secondary public hospital in Ecuador, analyzed the surfaces of the 17 rooms of different sectors, before and after the disinfection using UV light (PX-UV). The researchers obtained a 75.0% reduction in the environmental contamination ($p < 0.001$), whose the initial CFU load was 3,569 on 124 surfaces, reaching 889 CFU after the utilization of PX-UV.²¹

In the current study, most surfaces that were previously contaminated achieved total CFU reduction. It is worth mentioning that the absence of microorganisms in the collected region does not necessarily mean that they are not present in the area, since the collection technique had some limitations, such as: sample of a small portion of the surface, as well as the possibility of swab not being able to recover the microorganism that may be present on the post-disinfection surface.

It was observed that 26.1% of the surfaces remained contaminated, even after disinfection. The maintenance of the state of contamination on

surfaces subjected to disinfection was more frequent in a study conducted in the ICU of a public hospital in the southeastern region of Pará, where 87 samples were collected from inanimate surfaces with greater contact with patients and professionals, before and after concurrent disinfection of the unit with 70% ethyl alcohol. The authors found bacterial growth on 39 (45.0%) surfaces, 25 (64.1%) after the material/equipment disinfection process, indicating failures in the execution of the procedure.²²

One of the factors that may contribute to the ineffectiveness of disinfection is the inadequate application of the recommended technique. A study was carried out in an ICU, in which the efficiencies of three surface friction techniques during concurrent disinfection were compared; demonstrated that there was no statistically significant difference between them in relation to the direction in which they were performed, that is, unidirectionally, bidirectionally, or centrifugally.¹⁶

However, the authors concluded that the efficiency of the cleaning and/or disinfection may be related to other variables of the employed technique, such as: the quality of friction performed, aiming the remotion of a greater load of dirtiness regardless of a pre-established direction, the type of cloth utilized; the folding of the woven during the frictions; the contact time of the sanitizer with the surface; the presence or absence of organic matter; the type and level of microbial contamination and the presence of biofilm on the surfaces and equipment.¹⁶

It is known that the application of adequate cleaning and disinfection methods, associated with hand hygiene of the health professionals, can

significantly reduce the environmental spread of microbes and control the transmission of healthcare associated infections. In order to achieve this goal, it is essential that health services implement protocols, supervise the application and schedule continuing education activities within this theme.²³⁻²⁴

Amongst the limitations of this study, the following stand out: the reduced number of the sample; the fact the investigation had been held in a single day; and the failure to observe the concurrent disinfection technique. However, it is worth mentioning that the research was carried out in two intensive care units, and that all beds that were occupied at the time of data collection were included.

CONCLUSION

The results of this research showed that, in both ICUs, the most frequently contaminated surfaces were those on the touch screen panels of the mechanical ventilators, followed by the surfaces of the bedside lockers.

A significant reduction in the count of microorganisms was obtained for both units after concurrent disinfection with 70% ethyl alcohol, proving its effectiveness without being related to the application technique.

Such findings may contribute to further research on this topic, in order to elucidate best practices for effective concurrent disinfection and maintenance of a biologically safe environment for patients, their families and health professionals.

RESUMO

Introdução: O ambiente de saúde pode atuar como um reservatório de microrganismos. Para o controle microbiológico é necessário efetiva desinfecção e monitoramento da qualidade deste processo. **Objetivo:** Avaliar por análise microbiológica a efetividade da desinfecção concorrente da unidade do paciente em terapia intensiva. **Delineamento:** Estudo transversal, descritivo e observacional. Foram realizadas culturas microbiológicas na unidade do paciente, antes e após a desinfecção concorrente, utilizando álcool etílico a 70%. A análise das culturas foi realizada por metodologia padrão. **Resultados:** Foram investigadas 42 superfícies. No momento da pré-desinfecção, foi identificada a contaminação em 26 (62,0%) superfícies, sendo as com maior quantitativo microbiano o painel *touch screen* do ventilador mecânico (6040 UFC/mL - 85,7%), seguido da bancada lateral (2380 UFC/mL - 57,1%) e grade lateral da cama (650 UFC/mL - 42,9%). Após a desinfecção, 65,3% (17) das superfícies alcançaram redução total de colônias. **Implicações:** Evidenciou-se a importância da realização da desinfecção concorrente, com álcool etílico a 70%, nas superfícies inanimadas de alto grau de contato com as mãos na unidade do paciente em terapia intensiva, para a redução da carga microbiana e promoção de um ambiente biologicamente seguro para o paciente.

DESCRITORES

Infecção Hospitalar; Contagem de Colônia Microbiana; Desinfecção; Unidades de Terapia Intensiva; Serviço Hospitalar de Limpeza.

RESUMEN

Introducción: El entorno sanitario puede actuar como reservorio de microorganismos. Para el control microbiológico es necesaria una desinfección eficaz y un seguimiento de la calidad de este proceso. **Objetivo:** Evaluar por análisis microbiológico la efectividad de la desinfección concurrente de la unidad de cuidados intensivos. **Delineación:** Estudio transversal, descriptivo y observacional. Se realizaron cultivos microbiológicos en la unidad de pacientes, antes y después de la desinfección concurrente, utilizando alcohol etílico al 70%. El análisis de cultivo se realizó mediante metodología estándar. **Resultados:** se investigaron 42 superficies. En el momento de la predesinfección, se identificó contaminación en 26 (62,0 %) superficies, siendo la mayor cantidad microbiana el panel de la pantalla táctil del ventilador mecánico (6040 UFC/mL - 85,7 %), seguido del banco lateral (2380 CFU/mL - 57,1%) y barandilla de cama (650 CFU/mL - 42,9%). Después de la desinfección, el 65,3% (17) de las superficies lograron una reducción total de colonias. **Implicaciones:** La importancia de realizar desinfección concurrente, con alcohol etílico al 70%, en superficies inanimadas con alto grado de contacto con las manos en la unidad de cuidados intensivos, para disminuir la carga microbiana y promover un ambiente biológicamente seguro para el paciente.

DESCRIPTORES

Infecção Hospitalar; Recuento de Colonias Microbianas; Desinfección; Unidades de Cuidados Intensivos; Servicio de Limpieza Hospitalaria.

REFERENCES

1. Cordeiro ALAO, Oliveira MMC, Fernandes JD, Barros CSMA, Castro LMC. Contaminação de equipamentos em unidade de terapia intensiva. *Acta Paul Enferm.* [Internet]. 2015 Mar-Apr [cited 2019 Jan 17]; 28(2):160-165. Available from: <http://dx.doi.org/10.1590/1982-0194201500027>
2. Costa DM, Johani K, Melo DS, Lopes LKO, Lopes Lima LKO, Tipple AFV, et al. Biofilm contamination of high-touched surfaces in intensive care units: epidemiology and potential impacts. *Lett Appl Microbiol.* [Internet]. 2019 Feb [cited 2019 Mar 14]; 68(4):269–276. Available from: <http://dx.doi.org/10.1111/lam.13127>
3. Ferreira LL, Azevedo LMN, Salvador PTCO, Morais SHM, Paiva RM, Santos VEP. Cuidado de enfermagem nas Infecções Relacionadas à Assistência à Saúde: Scoping review. *Rev Bras Enferm* [Internet]. 2019 Mar-Apr [cited 2020 Jan 01]; 72(2):498-505. Available from: <https://doi.org/10.1590/0034-7167-2018-0418>
4. Centers for Disease Control and Prevention (CDC). Antibiotic resistance threats in the United States, 2013. [Internet]. 2019 [cited 2019 Jan 17]; Available from: <http://www.cdc.gov/drugresistance/threat-report-2013/index.html>
5. Ferreira AM, Andrade D, Rigotti MA, Almeida MTG, Guerra OG, Junior AGS. Avaliação da desinfeção de superfícies hospitalares por diferentes métodos de monitoramento. *Rev. Latino-Am. Enfermagem* [Internet]. 2015 May-Jun [cited 2019 Feb 20]; 23(3):466-74. Available from: <https://doi.org/10.1590/0104-1169.0094.2577>
6. Barbosa ASAA, Carneiro GS, Repullio LF, Silveira M, Silva SMUR, Moreno FRV. Eficácia do álcool etílico e quaternário de amônio na desinfeção de equipamentos médicos hospitalares. *Rev Epidemiol Control Infec* [Internet]. 2018 Out-Dez [cited 2019 Jan 18]; 8(4):409-414. Available from: <https://online.unisc.br/seer/index.php/epidemiologia/article/view/11394>
7. Agência Nacional de Vigilância Sanitária (ANVISA) (BR). Segurança do paciente em serviços de saúde: limpeza e desinfeção de superfícies/Agência Nacional de Vigilância Sanitária. Brasília: Anvisa [Internet]. 2012 [cited 2019 Jan 15]; Available from: <https://www.gov.br/anvisa/pt-br/centraisdeconteudo/publicacoes/servicosdesaude/publicacoes/manual-de-limpeza-e-desinfecao-de-superficies.pdf>
8. Casini B, Tuvo B, Totaro M, Aquino F, Baggiani A, Privitera G. Evaluation of the Cleaning Procedure Efficacy in Prevention of Nosocomial Infections in Healthcare Facilities Using Cultural Method Associated with High Sensitivity Luminometer for ATP Detection. *Pathogens* [Internet]. 2018 Aug [cited 2019 Mar 28]; 7(3):1-9. Available from: <https://doi.org/10.3390/pathogens7030071>
9. Brixner B, Renner JDP, Krummenauer EC. Contaminação ambiental da UTI pediátrica: fator de risco para aquisição de infecções oportunistas? *Rev Epidemiol Control Infec* [Internet]. 2016 Abr [cited 2019 Apr 20]; 6(1):24-28. Available from: <https://online.unisc.br/seer/index.php/epidemiologia/article/view/6819>
10. Gil AC, Bordignon APP, Castro EAR, Castro ST, Rafael RMR, Pereira JAA. Avaliação microbiológica de superfícies em terapia intensiva: reflexões sobre as estratégias preventivas de infecções nosocomiais. *Rev enferm UERJ* [Internet]. 2018 Abr [cited 2019 Mar 18]; 26:e26388. Available from: <https://doi.org/10.12957/reuerj.2018.26388>

11. Raro OHF, Gallo SW, Ferreira CAS, Oliveira SD. Carbapenem-resistant *Acinetobacter baumannii* contamination in an intensive care unit. *Rev. Soc. Bras. Med. Trop* [Internet]. 2017 Mar-Apr [cited 2020 Oct 01]; 50(2):167-172. Available from: <https://doi.org/10.1590/0037-8682-0329-2016>
12. Deasy EC, Moloney EM, Boyle MA, Fleming TE, O'Donnell MJ, Coleman DC. Minimizing microbial contamination risk simultaneously from multiple hospital washbasins by automated cleaning and disinfection of U-bends with electrochemically activated solutions. *J Hosp Infec* [Internet]. 2018 Feb [cited 2019 Abr 12]; 100(3):e98-e104. Available from: <https://doi.org/10.1016/j.jhin.2018.01.012>
13. Furlan MCR, Ferreira AM, Barcelos LS, Rigotti MA, Sousa AFL, Junior AGS, et al. Evaluation of disinfection of surfaces at an outpatient unit before and after an intervention program. *BMC Infec Dis* [Internet]. 2019 Apr [cited 2020 Mai 01]; 19(355). Available from: <https://doi.org/10.1186/s12879-019-3977-4>
14. Gonçalves LR, Luz PCT, Azevedo ALO. Avaliação microbiológica de incubadoras: antes e depois a limpeza em uma maternidade de Teresina - PI. *R. Interd* [Internet]. 2016 Abr-Jun [cited 2019 Out 10]; 9(2):57-64. Available from: <https://dialnet.unirioja.es/servlet/articulo?codigo=6771895>
15. Mendes JR, Brasileiro MSE. Proposta de protocolo para descontaminação de equipamentos em unidade de terapia Intensiva. *Rev Enfer Centro-Oeste Mineiro* [Internet]. 2017 [cited 2019 Jan 09]; 7:e.2346. Available from: <https://doi.org/10.19175/recom.v7i0.2346>
16. Rigotti MA, Ferreira AM, Nogueira MCL, Almeida MTG, Guerra OG, Andrade D. Avaliação de três técnicas de fricção de superfície para remoção de matéria orgânica. *Texto & Contexto Enfermagem* [Internet]. 2015 Dec [cited 2019 Out 28]; 24(4):1061-1070. Available from: <https://doi.org/10.1590/0104-0707201500003690014>
17. Weldegebreal F, Admassu D, Meaza D, Mulatu A. Non-critical healthcare tools as a potential source of healthcare-acquired bacterial infections in eastern Ethiopia: A hospital-based cross-sectional study. *SAGE Open Med* [Internet]. 2019 Jul-Dec [cited 2019 Jan 17]; 7:1-10. Available from: <https://doi.org/10.1177/2050312118822627>
18. Dresch F, Birkheuer CF, Rempel C, Maciel MJ. Contaminação de superfícies localizadas em unidades de terapia intensiva e salas de cirurgia: uma revisão sistemática da literatura. *Rev Epidemiol Control Infec* [Internet]. 2018 Ago [cited 2019 Apr 01]; 8(1): 85-91. Available from: <https://online.unisc.br/seer/index.php/epidemiologia/article/view/9897>
19. Johani K, Abualsaud D, Costa DM, Hu H, Whiteley G, Deva A, et al. Characterization of microbial community composition, antimicrobial resistance and biofilm on intensive care surfaces. *J Infec Public Health* [Internet]. 2018 May-Jun [cited 2019 Jan 17]; 11:418-424. Available from: <https://doi.org/10.1016/j.jiph.2017.10.005>
20. Adams CE, Smith J, Watson V, Robertson C, Dancer SJ. Examining the relationship between surface bioburden and frequently touched sites in Intensive Care. *J Hosp Infec* [Internet]. 2017 Nov [cited 2019 Dez 01]; 95(1):76-80. Available from: <https://doi.org/10.1016/j.jhin.2016.11.002>
21. Villacís JE, Lopez M, Passey D, Santillán MH, Verdezoto G, Trujillo F, et al. Efficacy of pulsed-xenon ultraviolet light for disinfection of high-touch surfaces in an Ecuadorian hospital. *BMC Infectious Diseases* [Internet]. 2019 Jun-Jul [cited 2019 Jan 15]; 19(575). Available from: <https://doi.org/10.1186/s12879-019-4200-3>
22. Lima LKOL, Pinto JCG, Misael LS, Castro RB, Coelho DD, Benevides DVL, Sousa ERM. Avaliação da contaminação cruzada por *Acinetobacter* spp. em uma unidade de terapia intensiva. *Rev Epidemiol Control Infec* [Internet]. 2019 Jul-Set [cited 2020 Jan 15]; 9(3):241-247. Available from: <https://online.unisc.br/seer/index.php/epidemiologia/article/view/12510>
23. Ambrogi V, Cavalieri L, Mantion B, Gliglia MJ, Cointault O, Dubois D, Prère MF, Levitzki N, Kamar N, Malavaud S. Transmission of metallo β -lactamase-producing *Pseudomonas aeruginosa* in a nephrology-transplant intensive care unit with potential link to the environment. *J Hosp Infect* [Internet]. 2016 Out [cited 2019 Fev 13]; 92(1):27-9. Available from: <https://doi.org/10.1016/j.jhin.2015.09.007>
24. Rutala WA, Weber DJ. Disinfectants used for environmental disinfection and new room decontamination technology. *Am J Infec Control* [Internet]. 2013 May [cited 2020 Oct 12]; 41(5):S36-S41. Available from: <https://doi.org/10.1016/j.ajic.2012.11.006>

COLLABORATIONS

JHRS: substantial contributions to project's conception, data collection, collection of laboratory samples, analysis of the results and article's writing. TD: contributions to the standardization and to the supervision of the laboratory processes. GYT, ACSL e RPAF: contributions to the collection of laboratory samples, analysis of the results and article's writing. SLC e TAO: contributions to the processing of laboratory samples. MREP: contributions to project's conception, analysis of laboratory results and review of the manuscript. MTGMT: contributions to the analysis of results and review of the manuscript. RAB: contributions to project's conception, analysis of results and review of the manuscript. GK: contributions to project's conception, collection of laboratory samples, analysis of results, article's writing, final approval of the version to be published. All authors agree and are responsible for the content of this version of the manuscript to be published.

ACKNOWLEDGMENTS

To the UEL University Hospital and to the Microbiology Laboratory of the Health Sciences Center - UEL.

AVAILABILITY OF DATA

The data from this research was presented in a table, resulting from the comparative analysis of the CFU count between the pre- and post-disinfection moments, and the reduction expressed in units and percentages for all sampled surfaces.

FUNDING SOURCE

The research was financed by its authors.

CONFLICTS OF INTEREST

There are no conflicts of interest to declare.