

Hand hygiene in neonatal, pediatric, and adult intensive care units

Higienização das mãos em unidades de terapia intensiva neonatal, pediátrica e adulto

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Grejo CS, Gambero ML, Marini LA, Bueno ACR, Silva DA, Roncon CM, Capellini VK, Chadi P. Hand hygiene in neonatal, pediatric and adult intensive care units / Higienização das mãos em unidades de terapia intensiva neonatal, pediátrica e adulto. Rev Med (São Paulo). 2022 Sept-Oct;101(5):e-190653.

ABSTRACT: *Objective:* To evaluate the effectiveness of a multimodal hand hygiene educational program for health care workers in Neonatal, Pediatric and Adult ICUs. *Method:* This is a quasi-experimental time-series study with a group; therefore, the same group was evaluated before and after an intervention. Data collection was carried out in three periods: (1) pre-intervention period, carried out in 2017, observing hand hygiene compliance of health professionals and alcohol gel usage; (2) intervention, carried out during 2018, with the implementation of a multimodal educational program; (3) post-intervention period, where a new investigation was carried out using the same methodology of the first period. *Results:* 640 opportunities were observed and 327 actions were carried out, showing overall adherence of 51.09%. Mean alcohol gel usage in 2018 was 27.01 mL/patient-day in the units and in 2017 it was 43.13 mL/patient-day during the same period. *Conclusion:* Although the intervention helped professionals to clarify doubts, it was still not sufficient to maintain the rates found in the pre-intervention period. It can be suggested that educational measures that promote increased hand hygiene compliance should be routinely carried out.

Keywords: Hand hygiene; Intensive Care Units; Hospital infection.

RESUMO: *Objetivo:* Avaliar a efetividade de um programa educativo multimodal de higienização das mãos para profissionais da saúde de UTIs Neonatal, Pediátrica e Adulto. *Método:* Trata-se de uma pesquisa *quasi*-experimental, do tipo série temporal interrompida com um grupo e, portanto, esse foi avaliado antes e após a intervenção. A coleta de dados foi realizada em três períodos: (1) período pré-intervenção, realizada em 2017, observada a adesão à higienização das mãos pelos profissionais de saúde e identificado o consumo de álcool gel; (2) período de intervenção, realizada durante o ano de 2018, no qual foi executado o programa educativo multimodal; (3) período pós-intervenção, no qual foi realizada nova investigação utilizando a mesma metodologia empregada no primeiro período desta pesquisa. *Resultados:* Foram observadas 640 oportunidades e 327 ações, resultando assim em uma adesão global de 51,09%. O consumo de álcool em gel em 2018 obteve uma média de 27,01 mL/paciente-dia dentro das unidades e no ano de 2017 foi de 43,13 mL/paciente-dia no mesmo período. *Conclusão:* Apesar do período de intervenção ter ajudado os profissionais a esclarecerem dúvidas, esse ainda se mostrou não ser suficiente para manter os índices encontrados no período pré-intervenção. Pode-se sugerir que medidas educativas que promovam o aumento da adesão à higienização das mãos sejam rotineiramente realizadas.

Palavras-chave: Higiene das mãos; Unidades de terapia intensiva; Infecção hospitalar.

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INTRODUCTION

Hands are the most used body part of health professionals in direct contact with the patient and the main mode of transmission of microorganisms¹.

The World Health Organization (WHO) recognizes that Health Care-Associated Infections (HAIs) are a public health issue and recommends actions to reduce the risk of these infections².

HAIs are infections acquired after hospital admission, manifested during hospitalization or after discharge, and associated with hospitalization or hospital procedures. They can be surgical site infections, bloodstream infections, and respiratory and urinary tract infections³.

It is known that HAIs are one of the main causes of morbidity and mortality among hospitalized patients. They also increase the length of hospital stays and health care costs and favor the selection and dissemination of multidrug-resistant microorganisms⁴.

The objective of this article was to evaluate the effectiveness of a multimodal educational program on hand hygiene for health professionals in Neonatal, Pediatric, and Adult ICUs.

MATERIALS AND METHODS

A *quasi*-experimental, interrupted time series analysis of a group was carried out, with evaluation before and after the intervention.

The research was divided into three periods: (1) pre-intervention period, carried out in 2017 by observing hand hygiene compliance among health care workers and alcohol gel usage; (2) intervention period, carried out in 2018 with the multimodal educational program; (3) post-intervention period, in which a new investigation with the same methodology of the first period was carried out, aiming to evaluate the effectiveness of the educational program by comparing the data.

After data collection, the results referring to the pre- and post-intervention periods were compared to assess the effectiveness of the educational program.

The study was conducted in the Neonatal, Pediatric, and Adult ICU of a medium-complexity state hospital that serves 25 cities in the Midwest region of the State of São Paulo.

The theoretical framework used in the research and the forms used in data collection were extracted and adapted from the project “*Mãos limpas são mãos mais seguras*” (Clean hands are safer hands) of the São Paulo Health Department (SESSP, 2011). This project was proposed by the Epidemiological Surveillance Center in 2011 and consists of the implementation of the WHO multimodal strategy adapted for the hospitals in the state of São Paulo.

During the pre-intervention period, data on hand hygiene compliance were collected through direct

observation of the work routine in the ICUs, using a specific form. In addition, data on alcohol gel usage during the period was obtained from the service.

These forms, proposed by the World Health Organization, include the identification of the unit (country, city, hospital, and department); initials of the observer; observation date; start time, end time, and session duration; period number; session number and form number⁶.

The period is the stage at which compliance is measured, whether before or after the interventions. There must be at least 200 observed opportunities for each period. The established duration of each session is 20 minutes (plus or minus 10 minutes), depending on the activity being observed. Each form corresponds to a page of data, so multiple forms can be used during one session.

The observation grid has four columns, each dedicated to a professional category: nurse (code 1), nursing assistant and technician (code 2), doctor (code 3), and physical therapist (code 4). Each column is independent of the other, so the order of the data is not necessarily the same in all columns. This depends on the number of opportunities observed by professional category.

The number of health care workers observed in each session was unlimited. This number was registered by a vertical mark (I) in the item “number”. If there were multiple observed opportunities with interruption of the same professional, they were counted only once. It is worth mentioning that only one professional was observed at a time.

The observation grid has eight lines. Each row corresponds to an opportunity, where indications and observed actions are entered. Indications are: before touching a patient, before aseptic procedure, after body fluid exposure risk, after touching a patient and after touching patient surroundings. The actions are: hand hygiene with alcohol-based formula, hand hygiene with soap and water, and lack of action in response to the identified opportunity.

The square-shaped box (□) means that no item is unique. Thus, if several items may be applied to the opportunity, they should all be marked. A mark on the circle-shaped box (○) means that the others are blank.

Hand hygiene compliance was calculated by the ratio between the number of actions and the number of opportunities. This adherence was calculated globally, by professional category, and by indication.

The same data was collected in the pre- and post-intervention periods and then compared.

Alcohol gel usage in ICUs was calculated monthly by the Hospital Infection Control Service of the institution studied, according to the ratio between the amount of alcohol used in mL and the number of patient-days in the unit that month. Therefore, this data was obtained directly from the service. These data were also compared before and after the educational intervention.

In the intervention period, an educational program

was developed in three different modalities: in-service education, visual communication, and leadership support.

In-service education was carried out using the active teaching method of Team-Based Learning (TBL).

TBL is an educational strategy composed of a set of sequenced teaching-learning practices aimed at providing teams with opportunities to engage in meaningful learning tasks.

In this research, the strategy was applied through an educational game with questions and answers on the theme “hand hygiene”. The participants did not have access to the content beforehand, so they had to use their own knowledge, which differs from other TBL applications.

The questions were multiple choice or true or false and addressed the hand hygiene technique, the importance of this technique for the prevention of HAIs, and the concept of point of care.

For the game, the questions were presented to players, who participated in pairs or teams, depending on the number of participants. Then, at the signal of the judge, all the participants showed their answers written in colored ethyl vinyl acetate (EVA) sheets. The pair or team that answered correctly got a point and those with the most points won the game. After each question, the judge gave a theoretical explanation of the content addressed to ensure that the information was learned.

The participants of this in-service education activity were health care professionals who worked routinely, at least 20 hours per week, in Neonatal, Pediatric and Adult ICUs, encompassing nursing assistants and technicians, nurses, physical therapists, and physicians. Professionals who only treat patients in these units sporadically and those who provided consultations as requested were excluded.

Visual communication was carried out with posters and banners with messages and reminders about the five moments for hand hygiene and hand hygiene technique, which were placed on strategic locations.

A letter was sent to the leaders explaining the purpose of the project with the objective of establishing a safety culture through the commitment of the leaders and their support of the educational program on hand hygiene.

Data processing included creating files in the Statistical Package for the Social Sciences (SPSS) program to enter these data and conduct statistical analysis. The quality of the database was monitored by entering the data twice.

The project was approved by the Human Research Ethics Committee (Opinion No. 2.252.720/2017). In compliance with the regulations for research involving human beings provided for in Resolution 466/12 (Brasil, 2012), the participants were informed about the objectives of the study, and, before data collection, they signed an Informed Consent Form.

RESULTS

In the in-service education stage, in which TBL (team-based learning) was applied in the Neonatal ICU, Pediatric ICU and Adult ICU, there were 68 health professionals participating, of which 26 were nursing assistants, 20 were nursing technicians, 12 were nurses, four were physical therapists and six were physicians. The professionals were divided into pairs within the ICU where they worked, with 12 pairs in the Neonatal ICU, eight in the Pediatric ICU and 14 in the Adult ICU.

The Neonatal ICU team consists of 14 nursing assistants, two nursing technicians, four nurses, two physical therapists and two physicians. The Pediatric ICU team consists of three nursing assistants, eight nursing technicians, three nurses, one physical therapist and one doctor. And, finally, the Adult ICU team is composed of nine nursing assistants, 10 nursing technicians, five nurses, one physical therapist and three doctors.

The TBL was implemented through a question and answer game composed of nine questions, of which three had five alternatives, with only one correct answer, and six were true and false questions addressing hand hygiene and Health Care-Associated Infections (HAIs).

The first question addressed the importance of hand hygiene in the prevention of HAIs and 100% of the pairs answered this question correctly, responding that this practice is very important for the prevention of infections, since any procedure performed without proper hand hygiene can lead to HAIs, longer hospital stays, higher costs for the health system, and increased morbidity and mortality.

The second question was about the main factor responsible for the transmission of health care-associated infections to the patient. Just like the previous question, the result was satisfactory, with 100% of professionals choosing the correct answer, which stated “the hands when they are not sanitized”. It is known that hands have a great capability to transmit pathogens and that the activities carried out with different patients in a short space of time favor this transmission.

When asked about the definition of point of care, there were differences in the rate of correct answers among the pairs of each ICU. The alternative with the correct definition, “Place where three elements are present: patient, health care professional and assistance or treatment involving contact with the patient”, was chosen by 83.33% of the pairs of the Neonatal ICU, 87.50% of the pairs of the Pediatric ICU and 85.71% of the pairs of the Adult ICU.

The professionals were asked if the statement “hand hygiene with alcohol-based formula is faster than hand hygiene with soap and water” was true or false, and 100.00% of the participants correctly answered “true”. Hand hygiene with alcohol-based formula takes around 20 to 30 seconds, while hygiene with soap and water takes about 40 to 60 seconds. Therefore, hygiene with alcohol-based formula takes half the time, so the statement was true.

Another statement that had to be identified as true or false indicated that hand hygiene with alcohol-based formula was more efficient against microorganisms than hand hygiene with soap and water. The correct answer was “true”, which was chosen by 91.67% of the pairs of the Neonatal ICU, 100.00% of the pairs of the Pediatric ICU and 92.86% of the pairs of the Adult ICU. The greater efficiency and practicality of alcohol-based formula is demonstrated in “My 5 moments for Hand Hygiene”.

In the following question, it was necessary to judge the veracity of the statement “The alcohol-based formula must cover all surfaces of both hands”. The correct answer was “true”, considering that one of the steps of the hand hygiene technique with this type of formula is using a sufficient amount of the product to cover the entire surface of both hands. In this question, 100.00% of the participants chose the correct answer.

In the seventh statement, which addressed the need for hands to be dry before applying alcohol-based formula, the correct answer was “true”, as other products on the surface of the hands (for example, water) can interfere with the effectiveness of the procedure of rubbing hands with alcohol. Like the previous question, 100.00% of the pairs answered it correctly.

The next statement indicated they could dry their hands with paper towel after rubbing them with alcohol-based formula. The correct answer was “false”, because, after hand hygiene with this type of product, the recommendation is to let hands dry naturally and not use any type of towel or paper for this purpose. The analysis of the answers revealed that 100.00% of the pairs correctly answered this question.

Finally, the last question addressed the minimum time of hand rubbing for a proper elimination of microorganisms, stating that this time is 20 seconds. The correct answer was “true”, as, with the correct amount of alcohol-based formula and the correct hand hygiene technique, this time is enough to eliminate microorganisms and prevent HAIs. This question also had slightly different answers. In the Neonatal and Pediatric ICU, 100.00% of the pairs got the right answer, while in the Adult ICU, this rate was a little lower: 92.86%.

The data shows that the rate of correct answers was between 83.33% and 100.00%. Despite these rates, it is extremely important to continue investing in in-service education for the prevention of HAIs, with a view to training and updating the knowledge of health professionals and providing theoretical and practical support to transform their work environments into safer places for their practice and for the patient who will receive their care.

Hand hygiene compliance among health care workers

A total of 640 hand hygiene opportunities were observed. These opportunities were evenly distributed between daytime (330 opportunities) and nighttime (310

opportunities) and between the units, with 220 opportunities in the NICU, 200 in the PICU and 220 in the AICU. In the pre-intervention phase, 661 opportunities were observed, with 335 during the day and 326 at night, and 216 in the NICU, 213 in the PICU and 232 in the AICU.

Of the total of hand hygiene opportunities, 327 hand hygiene actions were performed, showing a compliance rate of 51.09%. The daytime had greater compliance (52.42%) compared to nighttime (49.67%). In the pre-intervention period, there were 355 actions, showing a compliance rate of 53.71%. As for the period with higher compliance, daytime had a compliance rate of 54.93% against 52.45% at nighttime.

The distribution of observations between the professional categories was not homogeneous. Of the 640 opportunities, 375 (58.59%) were among nursing assistants and technicians, 150 (23.44%) were among nurses, 60 (9.38%) were among physical therapists and 55 (8.59%) among physicians. Hand hygiene compliance was greater among physicians (74.54%), followed by nurses (62.00%), physical therapists (46.66%) and nursing assistants/technicians (44.00%). In the pre-intervention phase, the observations were also not homogeneously distributed between the professional categories: of the total of 661 opportunities, 455 (68.84%) were among nursing assistants and technicians, 96 (14.52%) among nurses, 55 (8.32%) among physical therapists and 55 (8.32%) among physicians. In this period, hand hygiene compliance was greater among physical therapists (65.45%), followed by physicians (61.82%), nurses (56.25%) and nursing assistants/technicians (50.77%).

As for the hand hygiene indications, there was greater compliance “after touching a patient” (63.58%), followed by “after body fluid exposure risk” (61.11%), “before touching a patient” (59.15%), “before aseptic procedures” (56.25%), “after touching patient surroundings” (24.28%). In the pre-intervention phase, the hand hygiene indication with greater compliance was also “after touching a patient” (61.31%), followed by “before touching a patient” (58.47%), “after touching patient surroundings” (52.15%), “after body fluid exposure risk” (35.29%) and “before aseptic procedures” (25.58%).

Alcohol gel usage

In the NICU, alcohol gel usage between January and September 2018 was 27.05 mL/patient-day, with a minimum of 9.1 mL/patient-day in September and a maximum of 46.4 mL/patient-day in August. In the PICU, alcohol gel usage was 27.30 mL/patient-day, with a minimum of 7.5 mL/patient-day in June and a maximum of 41.10 mL/patient-day in August. In the AICU, alcohol gel usage in the same period was 26.70 mL/patient-day, with a minimum of 16.30 mL/patient-day in July and maximum of 35.50 mL/patient-day in August. In the pre-intervention phase, alcohol gel usage between January

and September 2017 in the NICU was 40.70 mL/patient-day, with a minimum of 14.20 mL/patient-day in January and a maximum of 60.60 mL/patient-day in June. In the PICU, alcohol gel usage was 44.80 mL/patient-day, with a minimum of 26.70 mL/patient-day in September and a maximum consumption of 85.50 mL/patient-day in January. And in the AICU, in the same period, it was 43.90 mL/patient-day, with a minimum of 35.60 mL/patient-day in August and a maximum of 57.10 mL/patient-day in June.

DISCUSSION

Monitoring hand hygiene compliance reduces the incidence of infections and the length of hospital stays and lowers the transmission of pathogens and the risk of complications for patients. Thus, it is the simplest and cheapest way to prevent and reduce mortality rates⁷.

According to *ANVISA*, hand hygiene compliance in health care workers is on average 40%⁸. However, in this study, the mean compliance rate was 51.09%, which is above the recommended value, but below the value achieved in the pre-intervention period, which was 53.71%.

According to a study carried out at the Emergency Department of a University Hospital in the state of São Paulo, hand hygiene compliance increased from 28.6% to 38.9% after an intervention⁷.

The educational activities of the research carried out in the Emergency Department lasted one week and encompassed four strategies: presentation of the data collected in the pre-intervention period to the participants; a film about hand hygiene; placement of posters from the Ministry of Health on strategic locations; distribution of colored brooch pins as reminders of hand hygiene; and distribution of bottles of alcohol gel to the participants. It is worth noting that the data collection of the post-intervention period was carried out one month after the educational actions, through direct observation using the WHO questionnaire, which was completed by the researcher, ensuring anonymity of the participants. The observations had a duration of 60 hours in both the pre- and post-intervention periods, totaling 120 hours of observation and 5,061 opportunities⁷.

When comparing the method used in the pre- and post-intervention periods in the Emergency Department with the one applied in this study, it is noted that this study also used the WHO observation form, completed through direct observation of the hand hygiene actions of health care workers, in sessions with an average duration of 20 minutes, alternating between the Intensive Care Units. A total of 1301 opportunities were observed in the pre- and post-intervention periods. and the time interval between collections was one year. In this period, a drop in the compliance rate from 53.71% to 51.09% was noted.

Therefore, it was possible to demonstrate the

importance of intervention strategies to improve the hand hygiene compliance. In addition, it could be noted that the time elapsed between the pre- and post-intervention period can influence the final numbers of the compliance rate, as longer time intervals may be associated with variation of factors, such as a change of the professionals present during data collections. Shorter time intervals can assess momentary learning, but may not reflect the application of this knowledge over a longer period of time, which can make it difficult to analyze the effectiveness of the program. Compliance rates must be periodically evaluated, and intervention strategies must be implemented to keep these rates growing.

Adherence in the daytime (52.42%) was higher than at nighttime (49.67%) in the post-intervention and pre-intervention periods. This fact may be explained by the greater number of procedures and patient handling situations in the morning, as well as the greater number of health professionals visiting the patient, in addition to other activities⁹.

Regarding the actions by category, both the pre-intervention and post-intervention data showed that nursing assistants/technicians had the lowest hand hygiene compliance rates. A study carried out in a public university hospital in Belo Horizonte corroborates the objective data in this study. A possible cause would be their work overload, due to the large number of patients assisted in a short period of time and the large number of procedures performed¹⁰.

This low compliance is concerning, as these workers spend the most time in patient care and perform the largest number of procedures, putting the patient at greater risk of acquiring infections⁴.

Another study showed that the professional category with the lowest compliance were physicians. Of the 80 opportunities observed, only 14 hand hygiene actions were performed, which is not in alignment with the results referring to the post-intervention period, when of 55 observed opportunities, 41 actions were performed by physicians, who had the highest HH compliance in this study¹¹.

Regarding adherence to the five moments for hand hygiene, the pre-intervention and post-intervention data showed that “after touching the patient” was the moment with the most HH actions. A study by Primo et al.¹¹ corroborates these results, indicating that the justification lies in the greater risk of contamination and acquisition of diseases, with increased compliance in regions with greater risk of contamination and body fluid exposure, demonstrating self-care on the part of professionals⁴.

In the pre-intervention period, the moment “before aseptic procedures” had the lowest compliance and, in the current study, compliance remained low. This was also demonstrated in a study by Souza et al.⁴, who pointed out that the use of gloves during procedures works as a barrier

to HH compliance, as it creates a false impression of HH not being necessary in the interval between one procedure and another.

Regarding alcohol gel usage, there was a decrease in usage between the months of January and September 2017 and 2018, going from 40.70 mL/patient-day to 27.05 mL/patient-day, which is still above the WHO recommendation (20 mL/patient-day). A study showed that, after a multimodal strategy with the presentation of the HH protocol, there was an increase in alcohol gel usage, which was not found in this study. Therefore, it was possible to conclude that the multimodal strategy is indeed a valid instrument to increase alcohol gel usage, demonstrating the right moments for correct HH¹².

Support: Educational Foundation of the Municipality of Assis. Cientific initiation Program.

Participation of the authors in the text: *Carolina Serapião Grejo*: study design, data collection and analysis, text writing and review. *Michell Lansoni Gambero*: study design, data collection and analysis, text writing and review. *Leonardo Abdala Marini*: study design, data collection and analysis, text writing and review. *Alexis Cândido Rodrigues Bueno*: study design, text writing and review. *Daniel Augusto da Silva*: study design, data collection and analysis, text writing and review. *Camila Marroni Roncon*: study design, data collection and analysis, text writing and review. *Verusca Kelly Capellini*: study design, data collection and analysis, text writing and review. *Paula Fernandes Chadi*: study design, data collection and analysis, text writing and review.

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CONCLUSION

In conclusion, the educational program implemented resulted in effective hand hygiene compliance, as compliance presented a decrease compared to the pre-intervention period but was still above the recommended value. The mean alcohol gel usage in the period also remained above the recommended, but if the individual months are considered, there were periods with lower consumption, which reinforces the need for constant encouragement of hand hygiene.

The results demonstrated the need to implement constant interventions, such as multimodal health education programs, so that these rates remain satisfactory and/or increase.

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Received: September 14, 2021

Accepted: June 03, 2022