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ORIGINAL

Compliance with the five moments for hand hygiene of healthcare workers in a pediatric hospital. A prospective observational study

Adherencia a los cinco momentos del lavado de manos de los profesionales de la salud de un hospital pediátrico. Estudio observacional prospectivo

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Conflicts of interests

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ABSTRACT

Introduction: Healthcare-associated infections (HAIs), also known as nosocomial infections or hospital-acquired infections, begin within 48 hours of hospitalization, within 30 days after hospital discharge, or 90 days after undergoing surgical procedures**. Objective:** The study aimed to describe the compliance with the five moments for hand hygiene (HH) of the healthcare workers (HCWs) in a hospital. **Methods:** A prospective observational study was conducted from June 1 to 30,2020 in a pediatric hospital. HCWs compliance with the five moments of HH was registered by direct observation blindly to the participants, using the fact sheet for HH of the WHO. In the rows, the five moments of contact with the patients were recorded: before touching a patient, before clean aseptic procedure, after body fluid exposure risk, after touching a patient and after touching patient surroundings. The actions performed, also was registered: hand washing, alcohol hand friction, omission, or use of gloves. Data were analyzed in SPSS V 21. The protocol was approved by the institutional review board. **Results:** During the study period, 2.595 observations to 104 HCWs were made. They were pediatric residents 38.5 %, nurses 32.7 % and pediatricians 28.8 %. A global compliance with the five moments of HH of the participants were 64.5% (1673/2595). Before touching a patient, the adherence was 86,9%. The nurses adhered in 69%, pediatrician in 68.6 % and the pediatric residents in 57.2%. **Discussion:** The global percentage of compliance with the five moments of HH of the medical and nursing staff of the pediatric hospital was 64.5%. Nurses had the highest percentage of adherence. Handwashing compliance was higher before contact with the patients.

Keywords: hand hygiene; infection, prevention; healthcare workers; hospital

RESUMEN

Introducción: Las infecciones asociadas a la atención médica (IAAS), también conocidas como infecciones nosocomiales o infecciones adquiridas en el hospital, comienzan dentro de las 48 horas posteriores a la hospitalización, dentro de los 30 días posteriores al alta hospitalaria o 90 días después de someterse a procedimientos quirúrgico**s. Objetivo:** El estudio tuvo como objetivo describir el cumplimiento con los cinco momentos para la higiene de manos (HH) de los trabajadores de la salud (TDS) en un hospital. **Metodología:** Se realizó un estudio observacional prospectivo del 1 al 30 de junio de 2020 en un hospital pediátrico. La adherencia de los TDS con los cinco momentos de HH fue registrada por observación directa de manera ciega a los participantes, utilizando la hoja informativa para HH de la OMS. En las filas se registraron los cinco momentos de contacto con los pacientes: antes de tocar a un paciente, antes de un procedimiento aséptico limpio, después de exponerse a fluidos corporales, después de tocar a un paciente y después de tocar el entorno del paciente. También se registraron las acciones realizadas: lavado de manos, fricción con alcohol en gel, omisión o uso de guantes. Los datos fueron analizados en SPSS V 21. El protocolo fue aprobado por el comité de ética institucional. **Resultados:** Durante el período de estudio, se realizaron 2,595 observaciones a 104 TDS. Eran residentes pediátricos en un 38.5%, enfermeras en un 32.7% y pediatras en un 28.8%. La adherencia global a los cinco momentos de HH de los participantes fue del 64.5% (1673/2595). Antes de tocar a un paciente, la adherencia fue del 86.9%. Las enfermeras se adhirieron en un 69%, los pediatras en un 68.6% y los residentes pediátricos en un 57.2%. **Discusión:** El porcentaje global de cumplimiento con los cinco momentos de HH del personal médico y de enfermería del hospital pediátrico fue del 64.5%. Las enfermeras tuvieron el mayor porcentaje de adherencia. El cumplimiento del lavado de manos fue mayor antes del contacto con los pacientes.

Palabras clave: higiene de manos; infección; prevención; trabajadores de la salud; hospital.

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INTRODUCTION

Healthcare-associated infections (HAIs), also known as nosocomial infections or hospital-acquired infections, begin within 48 hours of hospitalization, within 30 days after hospital discharge, or 90 days after undergoing surgical procedures (1).

HAIs are the most serious threat to patient safety worldwide and have a major impact on healthcare costs. In the U.S., the total annual cost was estimated to be approximately $9.8 billion and it the sixth leading cause of death (2,3). In developing countries, both the frequency and mortality of HAIs are much higher than in developed countries (4). Antibiotic resistance greatly contributes to the high mortality observed in countries with lower access to treatment (5, 6). Surveillance systems and implementation of prevention strategies are effective in reducing the prevalence of HAIs (7).

HAIs are mainly transmitted through contaminated hands of health workers. Lack of or inadequate adherence to prevention measures, including hand hygiene, is associated with an increased risk of HAIs (8). People's hands are the resident and transient microbial flora. The latter is acquired from contact with patients or surfaces in their environment, and is commonly associated with HAIs. They can be removed by hand washing and alcohol-based disinfectants (9).

Several factors are associated with neglect in hand hygiene, such as forgetfulness, access to the sink or hand rub, failure to complain with good practice, among others. Low HCWs' knowledge about HH was associated with poor hand hygiene compliance (10,11). Based on the Swiss national hand hygiene campaign, the WHO released evidence-based guidelines (12). "My five moments for hand hygiene" were defined according to the care areas of the patients. This highlights the washing indications that can be used for both training and monitoring in hospitals and health centers. The five indications or moments considered were: 1) before touching a patient, 2) before clean/aseptic procedure, 3) after body fluid exposure risk, 4) after touching a patient, and 5) after touching the patient's surroundings. This concept describes the time when hand hygiene is required to interrupt the transmission of microorganisms during contact with patients and their environment. This tool facilitates monitoring compliance with adequate hand hygiene by health personnel (13). The implementation of interventions to improve handwashing compliance has been associated with decreased HAIs (14).

The Children's General Hospital of Acosta Ñu is a third-level public university hospital and the only hospital that exclusively receives the pediatric population of the country. It treats approximately 400 000 children annually in all pediatric specialties and is the hospital where it performs the largest number of heart transplants in children and the only place for bone marrow transplantation in children with acute lymphoblastic leukemia (ALL). During the COVID 19 pandemic, hospitals have implemented general and specific preventive measures. Access to the hospital was restricted, and temperature was controlled prior to admission. Health personnel were trained in the use of protective equipment and emphasized the technique of handwashing. The aim of this study was to determine the compliance with the five moments of hand hygiene of the three groups of hospital in the pandemic period.

METHODS

Study design and population

This observational prospective study was conducted from June 1 to June 30, 2020.Three groups of HWs were included: pediatrician pediatric residents and nurses, who performed their functions with hospitalized patients, in the emergency department, intermediate care room, and internal medicine department.

Sampling and recruitment

Using non-probabilistic sampling, one of the researchers (GP) evaluated, by direct observation, the compliance of the five moments of HH on five patients (opportunities) each HW. The observations were carried out in each participating room and during different working hours. The availability of the infrastructure necessary for hand washing and drying (sinks, soap, alcohol, and towels) was also recorded.

Data collection

Direct observations were conducted blindly by participants. The fact sheet of the technical reference manual for hand hygiene addressed to health worker trainers and observers of hand hygiene practices was used to collect the data. The number of opportunities was recorded in the first column, which corresponded to contact with the patient. There were five opportunities for patients. In the rows, the five moments of contact with the patients were recorded: before touching a patient, before clean/aseptic procedure, after body fluid exposure risk, after touching a patient, and after touching patient surroundings in the following four columns The actions performed were recorded: hand washing, alcohol hand

friction, omission, or use of gloves. Hand washing and alcohol–hand friction were considered correct. The adequacy of the washing technique in terms of duration was not assessed. The service where the observation was conducted was also collected.

Data were analyzed using SPSS version 21 (IBM, New York, USA) using descriptive and inferential statistics. The results are presented as percentages. Qualitative variables were compared using the chi-squared test.

Ethics statement

The monitoring and evaluation of the technique of hand washing by health personnel is part of the standards established by the Ministry of Public Health of the country in hospitals within the framework of the surveillance of IHAIs. For this reason, informed consent was not requested. The research protocol was evaluated and approved by the Institutional Review Board (IRB number 00006311, from the Office for Human Research Protection of the National Health. USA), respecting principles of autonomy, justice, and beneficence.

RESULTS

During the study period, 2595 observations of 104 health workers were made regarding adherence to the five moments of hand hygiene. There were 40 pediatric residents, 30 pediatricians, and 34 nurses. The actions were described as hand washing, alcohol hand friction, and omission or use of gloves. In relation to the place where the research was conducted, they were the Pediatric Emergency Department in 47.2% (1224/2598) of the observations, Internal Medicine in 39.5% (1024 / 2598) and the Intermediate Care Unit in 13.4% (347 / 2598).

The distribution of direct observations according to the group of personal workers was as follows: residents 38.3 % (995/2595), nurses 32.7% (850/2595), and pediatricians 28.9% (750/2595).

Global compliance with the five moments of hand hygiene of the participants was 64.5% (1673/2595). The compliance with the five moments is shown in Table 1.

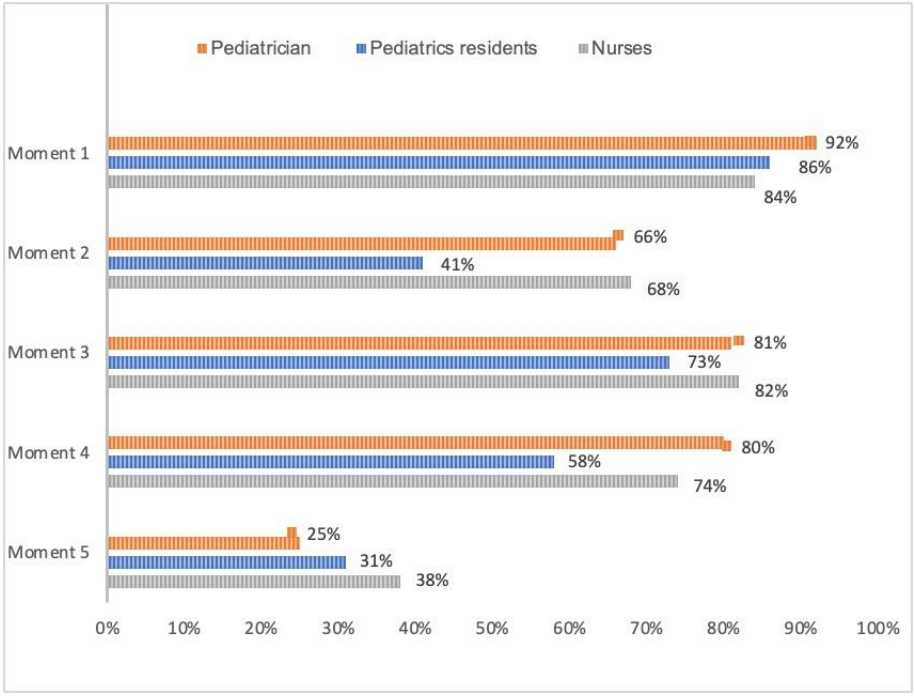
TABLE 1. GLOBAL COMPLIANCE OF PAEDIATRICIANS, PAEDIATRIC RESIDENTS, AND NURSES WITH THE 5 MOMENTS OF HAND HYGIENE. N=2595 OBSERVATIONS

Moments	Adhesion	Omission or incorrect performance
	n (%)	n (%)
Before touching a patient*	451 (86,9)	68 (13.1)
Before clean/ aseptic procedure	297(57.2)	222(42.8)
After body fluid exposure risk	402 (77,5)	117 (22,5)
After touching a patient	361 (69,6)	158 (30.4)
After touching patient surroundings	162 (31,2)	357 (68.8)
Total observations	1.673 (64.5)	922(35.5)

Analyzing the compliance of the five moments for HH and the number of opportunities for each moment, in the three groups of HWs, moments 1 before touching a patient and 3 after body fluid exposure risk had a higher percentage of compliance (Figure 1). The frequency of compliance with the five measures of HH for each group of health personnel was analyzed. Pediatricians had 68.6% compliance (515/750). The details of these five moments and actions are listed in Table 2.

The adherence of residents to HH was 57.3% (571/995 observations). The details of the moments and actions are presented in Table 3. The nurses showed 69% compliance (587/850) (Table 4). The nurse's compliance with hand hygiene guidelines was greater than pediatric residents 69% vs. 57.2 % (p=0,001). However, no differences were found between pediatricians and nurses in compliance with the five stages of HH (68.6% and 69%, respectively; p=0,90). The availability of the necessary elements for proper hand washing, there was 1 sink for every 40 patients in the internal medicine department, 1 sink for every 10 patients in the emergency department and 1 sink for every 10 patients in the intermediate care room. The alcohol-based preparations were observed for each patient unit.

FIGURE 1. COMPLIANCE OF HEALTH WORKERS (PEDIATRICIAN, PEDIATRICS RESIDENTS AND NURSES) WITH THE FIVE MOMENTS OF HAND HYGIENE.



Pediatrician: 150 opportunities (observations) for each moment Pediatrics Residents: 199 opportunities for each moment Nurses: 170 opportunities for each moment

TABLE 2. THE FIVE MOMENTS OF HAND HYGIENE: PEDIATRICIANS. 750 OBSERVATIONS.

	Actions							
Moments	**Hand rubbing with alcohol**		**Handwashing**		**Omission**		**Use of gloves**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Before touching a patient	89	59.3	49	32.6	6	4	6	4
Before clean/ aseptic procedure	93	62	6	4	24	16	27	18
After body fluid exposure risk	9	6	112	74.7	0	0	29	19.3
After touching a patient	115	76.7	5	3.3	3	2	27	18
After touching patient surroundings	34	22.7	3	2	113	75.3	0	0

TABLE 3. FIVE MOMENTS OF HAND WASHING: RESIDENTS. 995 OBSERVATIONS

	Actions							
Moments	Hand rubbing with alcohol		Handwashing		Omission		Use of gloves	
	n	%	n	%	n	%	n	%
Before touching a patient	136	68.3	35	17.6	28	14	0	0
Before clean/ aseptic procedure	77	38.6	5	2.5	103	51.7	14	7
After body fluid exposure risk	47	23.6	95	47.7	42	21.1	15	7.5
After touching a patient	103	51.7	12	6	69	34.7	15	7.5
After touching patient surroundings	59	29.6	2	1	138	69.3	0	0

TABLE 4. THE FIVE MOMENTS OF HAND HYGIENE: NURSES. 850 OBSERVATIONS.

Moments	Actions							
	Hand rubbing with alcohol		Handwashing		Omission		Use of gloves	
	n	%	n	%	n	%	n	%
Before touching a patient	80	47.6	62	36.9	24	14.2	4	1.2
Before clean /aseptic procedure	96	56.5	20	11.8	44	25.9	10	5.9
After body fluid exposure risk	35	20.6	104	61.2	21	12.4	10	5.9
After touching a patient	115	67.6	11	6.5	34	20	10	5.9
After touching patient surroundings	42	24.7	22	12.9	106	62.4	0	0

DISCUSSION

There is a discrepancy in the proper method to evaluate hand hygiene compliance. It can be performed by observation, surveillance, and self-administered surveys. One study found that the percentage of compliance by observation was 76.8%, while in a survey, it was 95% in the same participants (8). According to the WHO, observation is the gold standard for evaluation (12). With the emergence of the COVID-19 pandemic hand hygiene was among the first measures recommended

In the present study, carried out during the pandemic, by direct observation, we found that 6 out of 10 health workers had compliance with hand hygiene, although we think it is a suboptimal result, which is similar to several published studies on hand hygiene compliance during the COVID 19 pandemic, in both developed and developing countries. A study conducted in 2020 in a hospital in Cuba, which included 200 observations of doctors, nurses, and health technicians, reported 60% compliance with hand hygiene (15). In a tertiary hospital in Mexico, 65% of the omission of hand washing and the use of protective equipment was reported in a study conducted in a tertiary hospital during the pandemic (16). In India, handwashing compliance by health workers was 65%, in a hospital-based population meanwhile in a population-based study the hang hygiene compliance was between 60 and 72%, according to the region of the country (17).

A study of continuous monitoring for three years, including the pandemic period, in a Spanish hospital reported an increase in adherence to the moments of hand hygiene from 42.5% in 2019 to 59.2 in 2020 (18).

Studies conducted before the pandemic reported lower adherence to HH than those reported during the SARS- CoV-2 pandemic. In Spain, adherence to the five moments of hand hygiene in medical students was evaluated with more than 400 observations, which revealed 44% compliance (19). Health workers' compliance with HH in intensive care units was also low according to a multicenter study carried out in the intensive care units of Italy (20).

According to a systematic review of 61 studies, most of them were conducted in developed countries; the average compliance with hand hygiene by health personnel was 59.6%, with a marked difference between developed and developing countries being 64.5% and 9.1%, respectively (21).

Monitoring compliance with hand hygiene practices should be carried out in conjunction with surveillance of HAIs. A higher percentage of adherence has been associated with a decrease in HAIs (14,22). With the pandemic, hygienic measures have increased, leading to a decrease in the nosocomial transmission of SARS CoV-2 (23). There are also reports of a decrease in nosocomial bacterial infections, both by S. aureus and by C. difficile because of the implementation of strict hygiene measures, including hand hygiene (24).

Regarding the moments of HH, we observed a higher percentage of compliance before contact with the patient and after exposure to bodily fluids. Similar results were reported in a study that found that during the pandemic period, HCWs compliance with HH improved as a way of self-protection (25). Considering health personnel, the highest compliance with HH was observed in nurses, as in other studies (21,26). Nurses demonstrated greater adherence to HH guidelines than pediatric residents; however, there were no differences compared to pediatricians.

The equipment, availability of washes, alcohol, and knowledge and attitudes of health personnel are elements that facilitate the best fulfilment of the moments of hand hygiene (27). In the present study, a lack of sink in relation to the number of patients was also observed in one hospital department.

Although our study was conducted in a single hospital and did not cover all wards, such as the surgery, oncology, and intensive care departments, where greater restriction measures were applied because of the pandemic, it is a starting point for monitoring hand hygiene and applying improvement measures.

Programs at the institutional and personal levels, which include all variables addressed to factors related to reduced compliance, should be considered. Monitoring hand hygiene and communicating the compliance rate to HCWs and incorporating it into personnel performance can be a strategy to improve it.

AUTHORS CONTRIBUTIONS

LG: Conception and design of the study, manuscript writing, data analysis, and approval of the final version of the manuscript. GP: Collection and obtaining of the results, manuscript writing, data analysis, and approval of the final version of the manuscript. MNM: study design, data analysis and interpretation, critical review of the manuscript, and approval of the final version of the manuscript.

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