

Research Article

Assessing the Effectiveness of an Educational Program on Compliance with Hand Hygiene in a Pediatric Intensive Care Unit

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Objective. To identify the impact of an educational intervention on compliance of health professionals with hand hygiene. **Method.** The survey involved nurses, doctors, and physiotherapists who work in pediatric intensive care unit of a pediatric hospital. A multifaceted hand hygiene educational program was introduced with compliance assessed during successive observational surveys. **Results.** The total healthcare professionals' compliance increased from 31.8% in the baseline period to 51.5% immediately after the first educational intervention, and it remained at improved levels (45.9%) six months later, while after the completion of the second educational intervention it increased to 67.7%. The nurses' and doctors' compliance increased from 30.4% and 28.3% at baseline period to 71.5% and 60.2%, respectively, during the study phases. Finally, physiotherapists' compliance increased from 37.5% at baseline period to 73.9% after the completion of the second educational intervention. **Conclusion.** The degree of the staff's compliance with hand hygiene in the pediatric intensive care unit after the educational program increased substantially. The continuing education and training of health professionals contribute to increasing the degree of compliance with the international recommendations for hand hygiene.

1. Introduction

Healthcare associated infections (HAIs) represent a very serious health issue worldwide with tremendous consequences for the patients, their families, and the healthcare system as a whole. They are the cause of health threatening complications, as well as increased mortality rate, and ultimately increase the hospitalization time and cost [1, 2].

Either with soap and water or an alcohol-based hand rub, hand hygiene (HH) is widely recognized as the single most effective means of reducing HAIs. Despite the fact that the HH is very simple and straightforward, the lack of

compliance between the health professionals is considered a worldwide problem. Many health service providers globally have developed policies, protocols, and training programs regarding this issue [2]. World Health Organization (WHO) demonstrates that the compliance of the healthcare professionals is estimated to be between 5% and 81%, with an average below 40% [3].

An intervention study with a 9-month follow-up estimates the compliance with HH among healthcare professionals. Overall compliance with HH improved gradually from 42% to 54% across study phases [4]. In a similar research, the overall compliance rate in an emergency department and

an intensive care unit of a large pediatric hospital was 38.4% (2136 episodes of HH per 5568 indications for HH) [5].

Many sources clearly state that direct observation of healthcare workers is the gold standard of measurement as opposed to indirect methods, such as measuring the volume of soap or alcohol-based hand rub products used over time [2]. Observation of care has important advantages, such as allowing you to directly link the activity of hand hygiene to the indication for HH. However, the observation method also has inherent limitations and potential biases (such as the Hawthorne effect, in which people change behavior because they know they are being observed) [6].

The aim of this study was to identify the effect of an educational intervention on healthcare workers compliance with HH guidelines in a pediatric intensive care unit (PICU) at a tertiary care children's hospital.

2. Method

This study was conducted from 15 November 2012 to 15 November 2013 in a PICU of the General Pediatric Hospital of Athens. The participants were all healthcare professionals involved in direct patient care with the hospitalized pediatric patients during that period. The PICU consists of eight beds and is staffed by 12 doctors, 19 nurses, and two physiotherapists. Study protocol was approved by the Scientific Council of the hospital. Additionally, the healthcare professionals were orally informed about the study but they had no information about the onset of study and the person who would make the observations in order to avoid the "Hawthorne effect."

2.1. Procedure. The study was conducted in three discrete phases. The first phase included estimation of healthcare professionals' HH compliance with direct observation before the application of the educational intervention (baseline period). In order to estimate the compliance, we used the document "Observation & Calculation Form-World Health Organization: Hand Hygiene Technical Reference Manual" of WHO. All opportunities for HH which were observed were classified as one of five moments: before patient contact; before an aseptic task; after body fluid exposure risk; after patient contact; and after contact with patient surroundings [2]. The observations were made of trained nurse, who works in this PICU, during her work shift.

The observation procedure regarding the compliance with the HH throughout the study was one hour every day for 7 weeks (work days and weekends) during the three work shifts of the hospital. This period could have been lengthened by 10 minutes, so that the indication of the HH was completed and the result recorded (whether the protocol was applied or not). Throughout the course of the study, there was no change in the HH products, while the selection of healthcare professional that would be screened was random [2].

For the second phase, several posters were used regarding the hygiene indications and the application method throughout the PICU (announcement board, HH places, and utility room). At the same time, the educational program included

theoretical classes and practical orientation. All healthcare workers were obligated to participate.

The teaching material was aiming at the epidemiological characteristics of HAIs in a PICU, the risk factors, the consequences on the patients, and the prevention methods. Special emphasis was given to the ways that microorganisms are transmitted, in the indications of HH, the duration, the technique, and the completeness of hand rubbing (e.g., rubbing of the hand back, the palm of the hand, wrists, finger tops, and thumbs). The content of the theoretical classes and the posters based on literature and mainly in Guidelines of WHO [2, 3]. The observation procedure regarding the compliance with the HH was repeated immediately and after 6 months in order to evaluate the program.

After completing the second phase of the program, we went on with the third and final one. In the third phase of the program, a new theoretical course was conducted in which healthcare professionals were informed about their own poor overall compliance with HH, a strategy aimed to enhance responsibility awareness and behavioral change. The staff got written guidelines and educational material regarding HH indications, reminders, and application methods. In addition to the abovementioned, all healthcare workers received performance feedback on personal HH practices. Immediately after the completion of the program, the staff observation procedure was repeated. During the study period, we collected all the observation documents privately in order to ensure anonymity.

2.2. Data Analysis. The three phases were compared so that we could evaluate the impact of the educational program on the hygiene compliance of the healthcare professionals. Chi-square test was used to compare differences in compliance between different phases. Statistical Package for Social Sciences (IBM SPSS) version 19.0 was used for statistical analysis. A two-sided P value <0.05 was considered as statistically significant.

3. Results

Throughout the course of the research, 194 children were hospitalized in the PICU with a mean length of stay of 4.6 days (standard deviation = 4.7). The patient-to-nurse ratio fluctuated from about 1.3 to 1. During the baseline period, the percentage of compliance with HH was 31.8% (138 observations of compliance from a total of 434). In particular, doctors' compliance was 28.3% (26 observations of compliance from a total of 92), nurses' compliance was 30.4% (70 observations of compliance from a total of 230), and physiotherapists' compliance was 37.5% (42 observations of compliance from a total of 112).

Immediately after completing the first circle of the educational courses, the percentage of compliance with HH went up to 51.5% (211 observations of compliance from a total of 409). The nurses' compliance was 54.2% (182 observations out of 336), the doctors' compliance was 40.3% (25 out of 62), and the physiotherapists' compliance was 36.3% (4 observations out of 11).

There was a small decline in the compliance 6 months after the completion of the first educational intervention and it reached 45.9% (174 observations of compliance from a total of 379). The doctors' compliance was 40.4% (49 observations from a total of 121), the nurses' compliance was 47.2% (103 out of 218), and the physiotherapists' compliance was 55% (22 out of 40). Immediately after the second round of courses, the compliance soared up to 67.7% (307 observations of compliance out of 453). The compliance percentage for the doctors reached 60.2% (94 out of 156 observations), for the nurses went to 71.5% (196 out of 274), and for the physiotherapists reached 73.9% (17 out of 23 observations).

The total healthcare professionals' compliance increased from 31.8% in the baseline period to 51.5% immediately after the first educational intervention ($\chi^2 = 33.2, P < 0.001$) and remained at improved levels (45.9%) 6 months later ($\chi^2 = 16.5, P < 0.001$), while after the completion of the second educational intervention it increased to 67.7% ($\chi^2 = 16, P < 0.001$). Notably, the nurses' compliance increased from 30.4% to 54.2% immediately after the first educational program ($\chi^2 = 30.2, P < 0.001$) and remained at high levels (47.2%) after 6 months ($\chi^2 = 12.7, P < 0.001$), while after completing the second educational intervention the increase was remarkable (71.5%) ($\chi^2 = 12.6, P < 0.001$). Doctors' compliance percentage increased from 28.3% during the baseline period to 40.3% immediately after the first educational intervention and to 40.9% 6 months after that period ($\chi^2 = 1.9, P = 0.17$ and $\chi^2 = 2.9, P = 0.09$, resp.). Doctors' compliance after the completion of the second educational intervention was increased from 28.3% during the baseline period to 60.2% ($\chi^2 = 22.5, P < 0.001$). The number of observations about physiotherapists was extremely low and so Chi-square test was not performed.

4. Discussion

Even though HH is a quite simple and necessary procedure, it appears that the compliance of the healthcare professionals with the HH is a quite difficult occurrence to comply with [2]. This study provides the first data on opportunities for compliance with HH in pediatric critical patients in our hospital and Greece and supports that the systematic and continuous education of healthcare professional increases compliance with HH.

Our study estimates the HH baseline compliance of the healthcare professionals at 31.8%. Similar survey, by Larson, found a 41% compliance rate for HH activities at a PICU and the participants provided various reasons for noncompliance with HH, such as forgetfulness, being in a hurry, wearing gloves, and thinking that the hands were unsoiled. Neither health professional participated in the last 5 years in educational program on HH [6].

The application of the program in the current research shows that there is a significant improvement in the HH compliance in the PICU. The compliance has increased from 31.8% during the baseline period of the audit and at a staggering 67.7% immediately after the second round of courses. Many researches of the field are in an absolute agreement

that after educating the staff there is a big improvement in the compliance with the HH procedures as far as the international standards for HH are concerned [4, 7, 8]. In a similar research, the compliance at a neonatal intensive care unit was observed to be 6.3% and after a seven-month educational program was increased to a staggering 81.2% [9].

In a similar case study, Martino et al. increased the compliance of healthcare professionals from 14.3% to 44.9% immediately after the intervention, while the compliance percentage remained high at 45.2% a full year after the intervention [10].

An important finding of this research is that while the compliance of the staff was increased immediately after the intervention, it was reduced 6 months after the first educational program from 51.5% to 45.9%. It is widely acceptable that the compliance improvement can be achieved only through multiproduct and interdisciplinary strategy. Many studies show that just one intervention is not enough and does not affect compliance, while periodically repeating the interventions showed tremendous compliance increase [7, 8, 11].

Also, the compliance with HH among healthcare professionals varies significantly. Many researchers found that nurses' compliance is better compared to the doctors' [12, 13]. Our research agrees with the above since the doctors' compliance was significantly lower than the nurses' compliance. Respectively, Scheithauer et al. observed compliance rates in PICU at 53% and found them to be significantly higher in nurses (57%) than in physicians (29%) [14].

It is a challenge for most hospitals and every health service in general to improve the staff's compliance with HH. Many interventions have been implemented in hospitals but none has been applied for a long period and of course it has not become an integral part of the infection control program.

On the other hand, since HH and compliance are a state of mind and in essence behavioral, many other strategies have been proposed such as patient education, setting the standard as "a good example," a person that elicits the respect of the team (most of the time elicits the respect of the supervisors), an administrative sanction or reward that generally improves the team's trust in each other, easy access, and availability of the HH products [15]. WHO supports that the participation of the healthcare professionals in programs that prevent infections and improvement of the compliance level will mobilize and increase their interest with potential benefits when integrated into the infection prevention team [2]. Therefore, the administration of health services should organize comprehensive programs that will include all of the above methods of increasing compliance that achieves maximum results.

The findings of the study suggest that hospitals across all wards should implement HH promotion programs among healthcare personnel by using multiple and continuous interventions together. Healthcare workers should be aware of compliance with HH in section working and actively participate in the program which improves compliance.

Our study has several limitations. During the study period, there was never a chance to compare the results with the percentage of HAIs in PICU. Additionally, while the study

was ongoing, the only evaluation was on the HH compliance of the healthcare professionals, whereas the timing and the way that was implemented were not evaluated. Also, we did not estimate interrater reliability with members of the research team. An additional limitation of our study is that although health professionals are not aware of the exact time of the observation they had been informed about the conduct of the study and the possibility of a “Hawthorne Effect” is unavoidable. In conclusion, we did not correlate the HH compliance and the workload of the healthcare professionals as well as the manning of the PICU, factors that play a significant role in the compliance degree.

On the basis of our results, we suggest that any future research must aim at the development of a complete and continuous HH promotional program in PICUs that traditionally are areas of increased danger due to the nature of the patients, which will include a combination of the above methods for improving HH, while at the same time it will provide a personalized environment for the staff’s needs.

5. Conclusions

In conclusion, even though the HH compliance among healthcare professionals remains low, this study shows that the compliance can be increased by the implementation of a training program that will be ongoing and will be repeated at regular intervals based on the needs of staff. PICUs should implement hand hygiene promotion programs among all personnel by using both multiple and continuous interventions in order to ensure a high level of appropriate hand hygiene practices among healthcare professionals.

Conflict of Interests

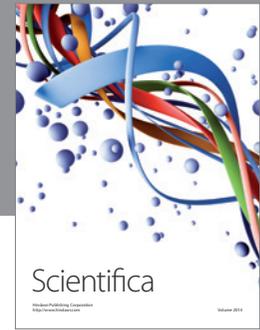
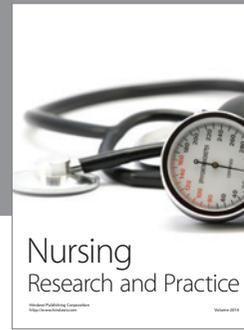
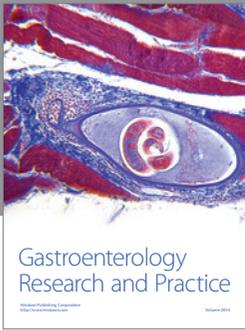
The authors declare that there is no conflict of interests regarding the publication of this paper.

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