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MEDICAL SCIENCES / DAHİLİ TIP BİLİMLERİ

The Importance of Education in the Compliance of Healthcare Workers with Hand Hygiene

Sağlık Çalışanlarının El Hijyenine Uyumunda Eğitimin Önemi

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Abstract

Objectives: Hospital infections occur generally as a result of inappropriate patient care practices. At the present time, providing behavioral change in health care workers is among the most compelling fields in infection control. Compliance rate of healthcare workers with hand hygiene recommendations is below 50% on average worldwide. In that respect, the role of infection control team in detection and prevention of hospital infections is very important.

Materials and Methods: In this prospective and observational study, we aimed to investigate the behaviours of healthcare workers about the compliance with hand hygiene, in three different adult ICUs of Ankara Numune Training and Research Hospital between October 2006 and January 2007. One of the ICUs (General Surgery) was classified as the study group (Group A), and other 2 ICUs (Reanimation 1 and 2) (Group B and C) were collectively termed as the control group. The study was conducted in three consecutive stages as uninformed observation, post-educational and post-feedback observation.

Results: The compliance of seventy-four health care workers with hand hygiene were observed during 2072 patient hours and 13263 patient contacts were investigated. In the 1st stage, the incompatibility was 93% in all groups. In the A group, the incompatibility rate of 92% at the 1st stage fell to 58% and 24% in the 2nd and 3rd stages, respectively ($p<0.05$). In the control group, there was no statistically significant change between 1st and 2nd stage incompatibility rates (96% and 94%, respectively, $p=0.5$).

Conclusion: The compliance rates of our ICU healthcare workers with hand hygiene were found to be low. It has been demonstrated that interactive and applied education were found to be effective in increasing compliance with hand hygiene as well as theoretical instruction transfer; however, it was not as successful as giving personal feedback.

Key Words: Hand Hygiene, Education, Feedback

Öz

Amaç: Hastane enfeksiyonları büyük oranda uygun olmayan hasta bakım uygulamalarının sonucunda ortaya çıkmaktadır. Sağlık çalışanlarında davranış değişiminin sağlanması, günümüzde enfeksiyon kontrolünün en zorlayıcı alanlarından birisidir. Sağlık çalışanlarının el hijyeni önerilerine uyumu evrensel olarak ortalama %50'nin altında kalmaktadır. Enfeksiyon kontrol ekibinin hastane enfeksiyonlarının saptanması ve önlenmesinde rolleri bu açıdan çok önemlidir.

Gereç ve Yöntem: Bu prospektif ve gözlemsel çalışmada, Ekim 2006 ile Ocak 2007 tarihleri arasında Ankara Numune Eğitim ve Araştırma Hastanesi'nin 3 farklı erişkin YBÜ'de, sağlık çalışanlarının el hijyenine uyumu ile ilgili davranışları incelendi. Yoğun bakım ünitelerinden birisi çalışma, diğer ikisi kontrol grubu olarak alındı. Çalışma habersiz gözlem, eğitim sonrası gözlem ve geribildirim sonrası gözlem olmak üzere üç aşamada yapıldı.

Bulgular: Toplam 74 çalışanın el hijyenine uyumu 2072 hasta saati süresince gözlendi ve 13263 hasta teması incelendi. Birinci aşamada, sağlık çalışanlarının el hijyeni uyumsuzluğunun ortalama %93 oranında olduğu gözlendi. İkinci aşamada, eğitim verilen A ünitesinin uyumsuzluk oranlarının %92'den %58'e düştüğü, üçüncü aşamada ise uyumsuzluk oranlarının %58'den %24'e gerilediği saptandı. Bu sonuçlar istatistiksel olarak anlamlı

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bulundu. B ve C ünitelerinde ise birinci aşamaya göre karşılaştırıldığında ikinci aşamada anlamlı bir değişiklik gözlenmedi

Sonuç: Çalışmamızda hastanemiz YBÜ'lerinde sağlık çalışanlarının el hijyeni uyumsuzluk oranlarının yüksek olduğu belirlenmiştir. Teorik bilgi aktarımının yanı sıra interaktif ve uygulamalı eğitimin el hijyenine uyumu artırmakta etkili olduğu; ancak bireysel geribildirim verilmesinin el hijyenine uyumun artmasında daha başarılı bir yöntem olduğu gösterilmiştir.

Anahtar Kelimeler: El Hijyeni, Eğitim, Geri Bildirim

Introduction

It is thought that the correct and proper application of hand hygiene procedure is the most important method in the prevention of nosocomial infections. However, the rate of compliance of healthcare workers with hand hygiene procedure falls below 50% (1,2). Reasons for non-compliance with hand hygiene procedure were recorded as lack of motivation and ignorance, structural limitations (insufficient sink, etc.), insufficient number of personnel and workload (3).

In order to increase compliance with hand hygiene procedure, training and motivation programs and patient training programs have been applied to healthcare workers, however it has been observed that it is very difficult to change the rate of compliance of healthcare workers with hand hygiene (4-6). Despite all efforts, an increase of more than 12% in average compliance rates could not be achieved. However, Pittet et al. (3) reported that with the multi-purpose training and incentive programs in which performance feedback is provided to healthcare workers, a continuous increase in hand hygiene compliance rates was achieved, and the rate of hand hygiene compliance increased from 48% to 66% within 3 years.

Our study was planned to determine the hand hygiene compliance level of the intensive care unit (ICU) workers in our hospital, which provides tertiary health care services, and to investigate the effect of the training program applied later on hand hygiene compliance.

Materials and Methods

In this prospective and observational study, which was conducted in 3 different adult ICUs called A, B and C units of Ankara Numune Training and Research Hospital between October 2006 and January 2007, the compliance of healthcare workers with hand hygiene recommendations and the effects of training and performance feedback on compliance with hand hygiene recommendations were examined.

In the first stage, workers in the A-B-C unit were observed without warning, in the second stage, hand hygiene training was given only to those working in the A unit, in the third stage, feedback was given to the A unit along with the training, and relevant posters were hung. B and C units were considered as the control group. In parallel with the aim of the study, the healthcare workers were not informed in the first stage of the study because they were observed if they were obeying hand hygiene rules at this stage. However, at the beginning of the second stage during education about hand hygiene, all the healthcare workers were informed about the study and verbal consent were obtained.

Statistical Analysis

STATA 9.0 was used for statistical comparisons. P-value <0.05 was accepted as statistical significance level. Categorical variables were compared with the chi-square test, and continuous variables were compared with the t-test. Logistic regression analysis was performed in multivariate evaluation. In this analysis, non-compliance was defined as the dependent variable. Occupational groups, gender, working hours (morning or afternoon), contamination risk, use of gloves were included in the model as independent variables.

Results

In the study, hand hygiene compliance of a total of 74 workers in three ICUs was observed during 2072 patient hours, and 13263 patient contacts were examined. Fourty-three of 74 healthcare workers examined (58%) were woman; 27 of them (37%) doctor, 29 (39%) nurse and 18 (24%) auxiliary staff. Seven thousand two hundred and seventy-eight (55%) of the contacts were made in the morning and 5985 (45%) were made in the afternoon. Of these contacts, 6744 (51%) were low-risk in terms of contamination risk, while 6519 (49%) were high-risk. While environmental contact (n=3360, 25%) constituted the majority of contacts, this was followed by patient contact (n=1915, 14.4%), IV drug administration (n=1449, 10.9%) and nurse observation (n=1301, 9.8%). The least contact was due to the oral drug administration (n=38, 0.3%).

In the first stage of the study, 534 patient hours in unit A, 174 patient hours in unit B, 228 patient hours in unit C; in the second stage of the study, 542 patient hours in unit A, 180 patient hours in unit B, 234 patient hours in unit C, and in the third stage of the study 186 patient hours in unit A were observed.

In all ICUs, situation in which hand hygiene should be applied per patient care hour was found to be 7.9 on average in

the first stage, 5.1 on average in the second stage, in the A unit 8.6 in the first stage, 5.5 in the second stage and 4.6 in the third stage, and in the B and C units 7.1 in the first stage and 4.8 in the second stage.

In the first stage of the study, non-compliance with hand hygiene was found to be 92% in unit A, and 96% in units B and C, which are the control group. It was observed that physicians' non-compliance was less in both groups (86% in the study group, 84% in the control group) (Table 1).

The hand hygiene non-compliance rates in the first and second stages of our study are shown in Table 2. The non-compliance rate, which was 93% in the first stage of our study, decreased to 73% in the second stage (p<0.001). In addition, hand hygiene non-compliance rates were compared according to the type of occupation, contamination risk of contact, working hours, whether or not gloves were used, and gender, and it was observed that there was a statistically significant decrease in hand hygiene non-compliance rates in all of them at the second stage.

The hand hygiene non-compliance rates of unit A, which is the only ICU with training, were compared before and after the training. While non-compliance with hand hygiene protocols was 92% in the pre-training period, it decreased to 58% after the training (p<0.001). In addition, when hand hygiene non-compliance rates were compared by occupation type, contact contamination risk, working hours, whether or not gloves were used, and gender, it was observed that hand hygiene non-compliance rates decreased significantly in all analyzes. The highest rate of decrease was found in the hand hygiene non-compliance after glove use.

Although the non-compliance rate, which was 96% in the first stage, decreased to 94% in the second stage, this decrease was not statistically significant (p=0.5) in all contacts in the control ICUs that were not trained. In addition, when hand hygiene non-compliance rates were compared by occupation type, contact contamination risk, working hours, whether or not gloves were used, and gender, no significant decrease was observed in the second stage.

In the third stage, the decrease in the hand hygiene non-compliance rate in unit A became more pronounced and decreased to 24% (Figure 1). As a result, a total of 68% reduction in hand hygiene non-compliance rate was recorded in the post-training and feedback period compared to the pre-training period in unit A. After feedback, it was seen that high-risk contacts had the lowest hand hygiene non-compliance rate of 11% (Table 3).

In the first stage, hand hygiene non-compliance rates were found to be similar with 92% and 96% in unit A and control group B and C ICUs. However, in the second stage, the rate of non-compliance of 58% found in unit A was significantly lower than the rate of non-compliance of 94% in control ICUs (p<0.001). It was determined that the rate of non-compliance decreased to 24% in the third stage with the feedback applied only in unit A (Figure 1).

Table 1: Hand hygiene non-compliance rates of unit A and control ICUs B and C in the first stage

	First stage Unit A Non-compliance/situation where hand hygiene procedure should be applied (%)	First stage Units B and C Non-compliance/situation where hand hygiene procedure should be applied (%)
Total	4218/4599 (92)	2748/2859 (96)
Job		
Doctor	744/869 (86)	285/338 (84)
Nurse	2719/2894 (94)	1588/1628 (98)
Auxiliary staff	755/836 (90)	875/893 (98)
Risk of contamination		
High	2119/2379 (89)	1348/1417 (95)
Low	2099/2220 (95)	1400/1442 (97)
Working hour		
Morning	2348/2584 (91)	1643/1702 (97)
Afternoon	1870/2015 (93)	1105/1157 (96)
Use of gloves		
Yes	3838/4198 (91)	2410/2507 (96)
No	380/401 (95)	338/352 (96)
Gender		
Male	961/1076 (89)	1076/1132 (95)
Female	3257/3523 (93)	1672/1727 (97)

In the first stage, the factors that may affect hand hygiene non-compliance were examined by multivariate analysis. It is seen that being a doctor as a worker type reduces non-compliance by approximately 3 times (odds ratio: 0.342, 95% confidence interval: 0.279-0.420, p<0.001). In addition, the high risk of contact (p<0.001) and the fact that the ICU studied was a unit A (p<0.001) were also found to be another independent factor in the reduction of hand hygiene non-compliance.

In the second stage, the factors that may affect non-compliance with hand hygiene protocols were examined by

Table 2: Comparison of hand hygiene non-compliance rates in the first and second stages in all units

	First stage Non-compliance/case where hand hygiene protocols should be applied (%)	Second stage Non-compliance/case where hand hygiene protocols should be applied (%)	p-value
Total	6966/7458 (93)	3591/4952 (73)	<0.001
Job			
Doctor	1029/1207 (85)	525/915 (57)	<0.001
Nurse	4307/4522 (95)	2059/2734 (75)	<0.001
Auxiliary staff	1630/1729 (94)	1007/1303 (77)	<0.001
Risk of contamination			
High	3467/3796 (91)	1600/2300 (70)	<0.001
Low	3499/3662 (96)	1991/2652 (75)	<0.001
Working hour			
Morning	3991/4286 (93)	1843/2525 (73)	<0.001
Afternoon	2975/3172 (94)	1748/2427 (72)	<0.001
Use of gloves			
Yes	6248/6705 (93)	3175/4303 (74)	<0.001
No	718/753 (95)	416/649 (64)	<0.001
Gender			
Male	2037/2208 (92)	1306/1850 (71)	<0.001
Female	4929/5250 (94)	2285/3102 (74)	<0.001

Table 3: Comparison of hand hygiene non-compliance rates of unit A before training and after feedback

	Pre-training Non-compliance/case where hand hygiene protocols should be applied (%)	After feedback Non-compliance/case where hand hygiene protocols should be applied (%)	p-value
Total	4218/4599 (92)	205/853 (24)	<0.001
Job			
Doctor	744/869 (86)	47/185 (25)	<0.001
Nurse	2719/2894 (94)	112/439 (26)	<0.001
Auxiliary staff	755/836 (90)	41/229 (20)	<0.001
Risk of contamination			
High	2119/2379 (89)	48/423 (11)	<0.001
Low	2099/2220 (95)	157/430 (37)	<0.001
Working hour			
Morning	2348/2584 (91)	113/467 (24)	<0.001
Afternoon	1870/2015 (93)	92/386 (24)	<0.001
Use of gloves			
Yes	3838/4198 (91)	170/742 (23)	<0.001
No	380/401 (95)	35/111 (32)	<0.001
Gender			
Male	961/1076 (89)	81/382 (21)	<0.001
Female	3257/3523 (93)	124/471 (26)	<0.001

multivariate analysis. Being a doctor (p<0.001), having a high risk of contact (p<0.001) and the fact that the ICU studied was a unit A (p<0.001) were found to be independent factors that decrease hand hygiene non-compliance, while wearing gloves (p<0.001) and working in the morning (p=0.04) were independent factors that increased hand hygiene non-compliance.

In the post-feedback period in which only unit A was examined, multivariate analysis revealed that high risk of contact (p<0.001) was an independent factor that decreased non-compliance with hand hygiene protocols, while female gender (p=0.02) was an independent factor that increased non-compliance.

In addition to the effect of training and feedback on hand hygiene compliance, the products used for hand hygiene were also examined. For this purpose, alcohol and soap use rates were compared pre- and post-training period in unit A (Figure 2). Hand hygiene in the pre-training period was achieved with soap at a rate of 97%. After the training, it was determined that the use of soap decreased by 55%, and the use of alcoholic hand sanitizer increased at this rate. In the post-feedback period, the usage rate of alcoholic hand sanitizer increased to 68%.

Discussion

Hand washing has been recognized as an infection control measure for over a century. Most epidemics of nosocomial infections result from the spread of pathogens on the unwashed hands of healthcare workers. In the analysis of extensive studies, it was observed that the frequency of nosocomial infections was decreased significantly by hand hygiene protocol (7-9). Although hand hygiene is the most effective method in the prevention of nosocomial infections, hand hygiene compliance rates of healthcare workers are below 50% (1).

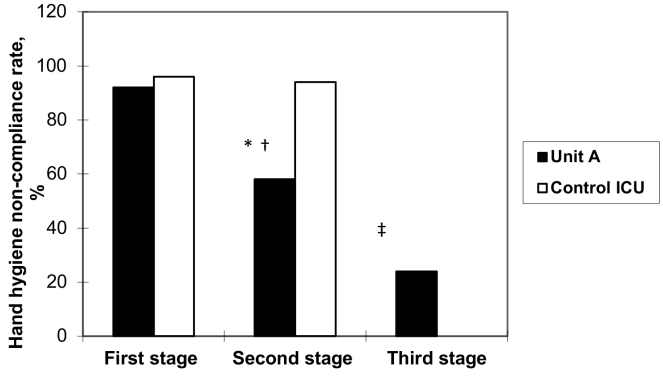

Figure 1: Hand hygiene non-compliance rates in the first stage, second stage and third stage in the A unit and control intensive care units (ICU) groups

*: p<0.001 vs control ICU

†: p<0.001 vs pre-training

‡: p<0.001 vs post-training

It has been shown that healthcare workers do not comply with hand hygiene protocols qualitatively and quantitatively enough. Reasons for non-compliance with hand hygiene protocols were recorded as insufficiency of motivation and ignorance, structural limitations (insufficient sink, etc.), insufficient number of personnel and workload (5). In order to increase compliance with hand hygiene protocols, training and motivation programs and patient training programs have been applied to healthcare workers, however it has been observed that it is very difficult to change the rate of compliance of healthcare workers with hand hygiene (11). In our study, the compliance of healthcare workers with hand hygiene protocols in ICUs in Ankara Numune Training and Research Hospital, which is one of the tertiary healthcare institutions, and the effect of training and performance feedback on compliance with hand hygiene protocols were investigated.

In the observation made during the pre-training period in all ICUs in our study, it was determined that non-compliance with hand hygiene protocols was at a very high rate of 93%. The non-compliance rate found in our hospital is considerably higher than the reported general hand hygiene non-compliance rates (12). In the literature, hand hygiene compliance rates in ICUs in the United States are reported to be between 17-75% (13). Although there are methodological differences between studies, hand hygiene compliance rates in general still remain at very low levels. It was observed that hand hygiene non-compliance varied according to the departments studied, non-compliance was the least in pediatric services and the highest in ICUs (3). It was thought that the fact that only ICUs were examined in our study caused the high non-compliance rates. In a study conducted in Argentina, it was reported that hand hygiene non-compliance rates in ICUs were around 77% (14). In another study, Albert and Condie (15) reported that hand

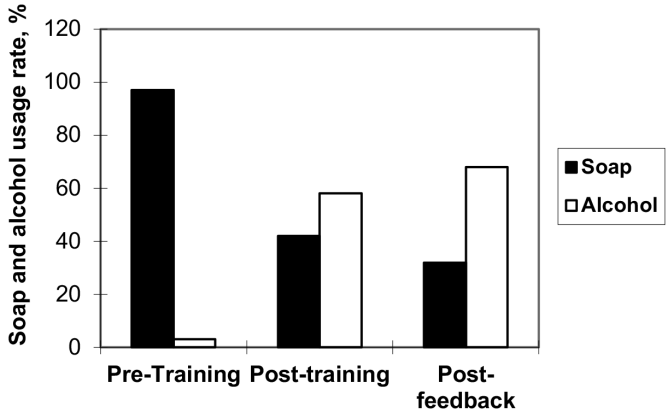

Figure 2: The pre-training, post-training and post-feedback rates of soap and alcohol use in contacts that comply with hand hygiene in unit A

*: p<0.001 vs control ICU

†: p<0.001 vs pre-training

‡: p<0.001 vs post-training

hygiene non-compliance was 86% in private hospitals. It was emphasized that the reason for this might be the workload in private hospitals. Also in our study, the high workload in ICUs also caused hand hygiene non-compliance to be high. Pittet et al. (3) showed that heavy workload is one of the main causes of non-compliance with hand hygiene protocols. In the same study, it has been determined that non-compliance with hand hygiene is less on weekends compared to working hours on weekdays when the workload is heavy. One of the reasons for the high inconsistency in our study was that observations were made only during the weekdays.

It was reported that the most important indicator of workload was the case where hand hygiene protocol should be applied per patient care hour, and there was a positive correlation between the case where hand hygiene protocol should be applied per patient care hour and hand hygiene non-compliance (3). In our study, the case in which hand hygiene protocol should be applied per patient care hour in the pre-training period was 8 and the non-compliance rate was 93% in all ICUs. In a study conducted in pediatric ICUs, it was reported that the case in which hand hygiene protocol should be applied per patient care hour was 2.8, and the non-compliance rate was 60% (16). The case in which hand hygiene protocol should be applied and the non-compliance rate are considerably lower than the results in our study, which can be explained by the differences in the workload intensity.

Considering the effect of training on compliance with hand hygiene protocol, which is the main goal of our study, in all ICUs, a significant reduction in hand hygiene non-compliance rate was achieved in the second stage. At this stage, when only the contacts in unit A were evaluated, it was observed that the hand hygiene non-compliance rates decreased significantly after the training, and there was no decrease in the hand hygiene non-compliance rates in the control ICUs that were not trained. It was noted that the decrease in hand hygiene non-compliance rate continued with the feedback applied in the third stage in unit A. It was shown that the training and the performance feedback had positive effects on hand hygiene. It was emphasized in many previous studies that training accompanied by performance feedback had positive effects on increasing the frequency and effectiveness of hand hygiene (9). However, in these studies, it is reported that the improvement in hand hygiene compliance is at different rates (1).

In addition to training and feedback, it has been found that posters reminding hand hygiene protocol and that hand hygiene reduces the frequency of infection are effective in reducing hand hygiene non-compliance by hanging them at the bedside of patients and in easily visible places (10,17,18). In our study, it was thought that placing cartoons and posters near the sink, at the entrance of the unit, next to the nurse's desk and other places that can be seen easily in unit A after the training played a role as a reminder of hand washing.

In the study of Creedon (1), which is similar in design to our study, educational brochures were distributed, posters were hung and performance feedback was provided. After training and feedback, hand hygiene non-compliance rates decreased from 49% to 17%, a decrease of 32%. The authors stated that it was not possible to predict to what extent training and feedback separately contributed positively to hand hygiene practices. In our study, observation was made before and after the training, performance feedback was applied at the end of this period and a separate observation was made for a while. The hand hygiene non-compliance rate, which was 92% at baseline, gradually decreased to 58% after training and to 24% after performance feedback. In other words, a total of 68% reduction was achieved in hand hygiene non-compliance with both training and performance feedback. It was observed that such a significant contribution could not be achieved even in studies that provided long-term training without the application of performance feedback (19).

Lam et al. (16) reported a 20% decrease in hand hygiene non-compliance from 61% to 41% with a one-year training period, while Won et al. (19), on the other hand, were able to provide a 37% reduction with a decrease from 57% to 20% as a result of a 2-year training. The low rate of decline in these studies was thought to be due to the lack of performance feedback. Compared to the study of Creedon (1), a more significant decrease was observed in hand hygiene non-compliance rates in our study. Although the study designs are similar, the existence of such a difference may be due to the fact that the observer was recognized by the healthcare workers while training was given in our study, and the observations after the training and feedback were made by the same observer. As it has been suggested in previous studies, the fact that healthcare workers know that their hand hygiene practices are monitored by an observer affects their behavior in this regard (20).

It was clear that education and feedback had positive effects on hand hygiene, but how long these effects lasted was not examined in our study. Conly et al. (5) provided a significant decrease in hand hygiene non-compliance and infection frequency with the training program, but observed that the positive effects of the training disappeared after 3 years. Similar to our study, in the study of Mayer et al. (11), in which feedback was given to healthcare workers in the form of daily reminders of hand hygiene frequencies, it was found that hand hygiene non-compliance increased again after 6 months. Therefore, for the continuity of hand hygiene practices, training programs should be more specific and repeated at regular intervals. Pittet et al. (10) reported that in a large hospital-wide study in which training and feedback were given at regular intervals for 3

years, the hand hygiene compliance rate, which was 48% at the beginning, increased to 66% at the end of 3 years. This study by Pittet et al. (10) emphasizes the importance of continuous and regular training.

In our study, it was determined by multivariate analysis that being a doctor was an independent factor in the decrease of hand hygiene non-compliance in the pre- and post-training periods. While our data are consistent with the findings of Lam et al. (16), they contradict the study of Pittet et al. (3). Pittet et al. (3) noted with multivariate analysis that non-compliance with hand hygiene protocol was least observed in nurses. It is not easy to explain this difference between our studies, but it was thought that it may be due to the fact that the studies were carried out in different countries and under different conditions and that health workers were trained at different levels on hand hygiene. Another reason why doctors' compliance with hand hygiene is higher than that of nurses can be explained by the fact that nurses have more contact with patients. The rate of compliance of nurses with hand hygiene protocol decreases due to the fact that their contact with the patient is more frequent and the time between contacts is less.

High-risk contacts for contamination are another independent factor that reduces hand hygiene non-compliance in stage 1. This result is very positive in terms of reducing the transmission of microorganisms between patients. However, since the effect of hand hygiene on the frequency of nosocomial infections was not examined in our study, it is difficult to make a definitive judgment. Different results have been reported on the effects of contamination risk on hand hygiene compliance (3,21). Similar to our study, Raboud et al. (21) also reported that hand hygiene non-compliance is less in high-risk contacts in terms of contamination. On the other hand, Pittet et al. (3) reported that the rates of non-compliance with hand hygiene protocol are higher in contacts with a high risk of contamination.

High-risk contacts appeared to be an independent factor reducing hand hygiene non-compliance in the second stage, similar to the first stage. In addition, the lowest non-compliance rate was observed in high-risk contacts in the third stage. This result suggested that after the training, healthcare workers became more aware of nosocomial infections and began to act more carefully, especially in contacts with a high risk of contamination. In a study conducted by Lam et al. (16) in the neonatal ICU, they reported that non-compliance rates decreased more significantly in high-risk contacts after training compared to low-risk contacts.

Working in unit A was also determined as another independent factor that reduced hand hygiene non-compliance in the 1st stage. The work intensities of the ICUs where our study was conducted were similar. The case in which hand hygiene protocol should be applied per patient care hour in unit A and control ICUs was 8.6 and 7.1, respectively. However, an important difference that should be emphasized was thought to be the location of the sinks in ICUs. The sink used for washing hands in unit A is in the middle, in an easily accessible place, while in other ICUs it is in the back room and in a hard-to-reach place. This may explain why working in unit A is an independent factor for the reduction in hand hygiene non-compliance. It is known that easy accessibility of hand hygiene tools is necessary for optimal compliance with hand hygiene recommendations (3).

The use of gloves is recommended for all patient care activities involving contact with blood or body fluids that may be contaminated with blood (22). In our study, when the factors affecting hand hygiene non-compliance after training were examined with multivariate analysis, it was observed that glove use was an independent factor that increased hand hygiene non-compliance, unlike the pre-training period. In the post-training period, the hand hygiene non-compliance rate was 74% for the contact with gloves, while it was 64% for the contacts without gloves. There are studies reporting different results on this subject. In some studies, it was reported that the healthcare worker who wore gloves followed hand hygiene protocols less (23) and in others more (24). In our study, it was thought that less hand hygiene practice of healthcare workers wearing gloves after the training may be due to lack of knowledge. The thought that wearing gloves will completely eliminate contamination may have reduced the rate of compliance with hand hygiene. However, studies showed that hands can be contaminated despite wearing gloves (25). For this reason, it was recommended to apply hand hygiene protocol after removing the gloves (22). Another reason for poor compliance with hand hygiene after glove use may be skin irritation as a result of the interaction of residual glove powders with alcoholic hand antiseptic. Since the effects of hand hygiene in terms of skin irritation were not examined in our study, it would not be correct to make a definite determination on this issue.

Another independent factor that increases the non-compliance in the post-training period is that the working time is in the morning. This finding is in compliance with previous studies. Pittet et al. (3) reported that the highest rates of non-compliance were in the morning and during working hours on weekdays. The same authors suggested that there is a positive relationship between workload and hand hygiene non-compliance rates. In addition, insufficient number of healthcare workers was reported as a risk factor for hand hygiene non-compliance (26). In the ICUs followed in our study, the number of contacts per patient care hour, which was an indicator of the workload related to patient care, was not significantly different during morning and afternoon working hours. Observations in all units were made at equal times in the morning and afternoon. For this reason, it may not be correct to perceive the workload

as just the excess of patient care work. For example, all bedside visits with doctors and nurses in the ICUs observed in our study were conducted in the morning hours and lasted for an average of one hour. In addition, some records and correspondence required to be done by nurses were usually done in the morning. Therefore, the time for patient care work in the morning was less than in the afternoon.

It has been shown in previous studies that alcoholic hand antiseptics increase compliance with hand hygiene (1). Although alcoholic hand antiseptics were available at every bedside in all observation periods in the ICUs we followed in our study, the share of alcoholic hand antiseptics was initially found to be 3% in contacts where hand hygiene was complied with. This rate increased to 58% in the second stage and to 68% in the third stage. Alcoholic hand sanitizers are preferred because they are less time consuming, microbiologically more effective and less irritating to the skin and therefore, they are thought to play a key role in the development of hand hygiene practices (27). Bissett (28) reported that alcoholic hand sanitizers increased the compliance with hand hygiene guidelines by 25%. In our study, there was an increase in hand hygiene compliance with training and feedback, and alcoholic hand antiseptics were preferred more as a cleaning agent. Ratio of alcoholic hand antiseptics to soap use in guidelines was recommended to be 10:1 (27). In our study, this rate could be just increased to 2:1. Another observation we made was that there was no difference between the amount of alcoholic hand sanitizer consumed before and after the training. It was determined that the reason for this was the use of alcoholic hand antiseptics for surface cleaning rather than hand hygiene before the training, and this misuse was corrected with the training.

Another important point detected in our study is that the cases requiring hand hygiene per patient care hour decreased in the post-training period compared to the pre-training period. When unit A and control ICUs are considered together, the case where hand hygiene protocols should be applied per patient care hour, which was 8 in the pre-training period, decreased to 5.2 after the training. Lam et al. (16) reported that, similar to our study, they found a decrease in the average number of cases where hand hygiene protocols should be applied per patient care hour after the training. The authors explained this decrease with the principle of minimum contact and clustering care of nurse, which is an element of modern nursing service understanding. By performing the short-term care and treatments one after the other applied to the same patient, the necessity of cleaning hands separately after each contact is eliminated, and thus, the problem of time loss, which is a major obstacle in cases of heavy workload, can be eliminated and hand hygiene non-compliance can be reduced.

Conclusion

Hand hygiene non-compliance rates of healthcare workers in the ICUs examined in our study were found to be quite high. A significant reduction in hand hygiene non-compliance was achieved with the training meeting organized for a small group, which included hand hygiene indications and techniques, interactive, practical, and visual factors that reminded hand hygiene. It was seen that the training we applied in our study was more effective than the training meetings held for all hospital staff and containing theoretical information. In addition, the reduction in hand hygiene non-compliance became much more evident by giving performance feedback including daily hand hygiene compliance and observed errors to the trained healthcare workers.

Ethics

Ethics Committee Approval: Ethics committee approval was not obtained because the article was my thesis dated 2007 and ethics committee approval was not required on that date.

Informed Consent: In parallel with the aim of the study, the healthcare workers were not informed in the first stage of the study because they were observed if they were obeying hand hygiene rules at this stage. However, at the beginning of the second stage during education about hand hygiene, all the healthcare workers were informed about the study and verbal consent were obtained.

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Authorship Contributions

Concept: N.A., Ş.E.G., Design: N.A, Ş.E.G., Data Collection or Processing: N.A., Analysis or Interpretation: N.A., Ş.E.G., Literature Search: N.A., Writing: N.A, Ş.E.G.

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