

## Training to prevent healthcare associated infections

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### ABSTRACT

**Objectives.** Aim of this study was to investigate pre-education information level, efficiency of training, persistence of acquired information, and factors affecting information level of recently employed nurses about healthcare associated infections. **Methods.** One hundred and thirty-two nurses who have just started work were trained about “healthcare associated infections and infection control measures”. Tests were performed pre, post training and one year after training. Factors affecting test success were investigated. **Results.** Nurses who continued education after high school were more successful ( $p=0.002$ ). Duration of work-hours, unit where they work and presence of previous training didn't affect test success ( $p=0.705$ ,  $p=0.040$ ,  $p=0.105$ ; respectively). Test results were assessed over 100 points. Mean score before the training was  $67.95\pm 10.5$  and it increased to  $85.06\pm 7.6$  after the training ( $p=0.000$ ). Mean test score at test repeated one year later was  $80.04\pm 8.77$ . Unit where they have worked during previous year, application of isolation in their unit and presence of training didn't affect general success in the test ( $p=0.344$ ,  $p=0.316$ ,  $p=0.259$ ; respectively). **Conclusions.** Training programs using individualized, regularly repeated and approved training methods should be conducted in accordance with needs determined by these studies. Next target after knowledge increase will be reflection of this increase to daily practice and behaviour change.

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**Keywords:** Healthcare associated infections; education; nurse

### Introduction

Hospital infections which are commonly referred to as "Healthcare associated infections (HCAI)" recently are the most frequent complications in hospitalized patients [1]. HCAI is an important indicator of the quality in healthcare services and patient safety [2].

HCAI which increases length of hospitalisation, cost, morbidity and mortality is still observed amid improved healthcare [3-6]. At least one infection occurs in 5 to 10% of hospitalized patients [1-7]. Some of HCAs occur due to transmission of pathogens by healthcare staff [3]. At least 20% of

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HCAIs may be prevented by complying with infection control measures during daily activities in hospitals [8]. Therefore appropriate infection control measures should be applied to decrease HCAIs [3-9].

Training of healthcare staff about infection control measures are among basic preventions that should be used to decrease HCAI [10-12]. Lack of information about HCAI and infection control measures negatively affect the compliance with infection control measures [3, 4, 9, 13]. Inadequate placement of appropriate measures results in increased incidence of hospital infections [3]. Well-informed and skilled staff is required. To achieve this training is important. Training will also increase motivation of the employees and help them to work more efficiently [4]. Application of regular training programs and preparation of guidelines decrease HCAI incidence and healthcare costs [6, 10, 15-20].

Aim of this study was to investigate pre-education information level, efficiency of training, persistence of acquired information and factors affecting information level of recently employed nurses about HCAI.

## Methods

In 2010 a training program was organized to 132 recently employed nurses about "HCAI and Infection Control Measures" under the scope of orientation to hospital. A questionnaire including demographic data, education level of participants, unit where they work and duration of workhours and whether they were trained about nosocomial infections was applied to participants (Appendix 1). A preliminary test including 30 questions about definition and prevention of HCAI, hand hygiene, use of gloves, blood borne diseases, hospital cleaning, disinfection and waste management was performed (Appendix 2). Knowledge level of participants about HCAI was evaluated. Efficiency of the training was also evaluated by performing a final test with same questionnaire applied after the training. One year after, same questionnaire was applied to 91 nurses who continued to work in our hospital and unit in which they have worked during

previous year, whether patient isolation was applied in their unit and whether they were trained about HCAI were noted (Appendix 3). By applying same questionnaire after a year, persistence of acquired information was investigated. Test success was assessed over 100 points.

Effects of education level, unit where participants have worked, length of their workhours and training of participants about nosocomial infections to success from the first test were determined. One year later, effect of education level, the unit where participants have worked during this period, whether patient isolation is applied in the unit of the participants, and whether they were trained during this period to the success of the test were investigated.

### *Statistical analysis*

Data was computerized and preanalysis controls and groupings were performed. Wilcoxon Signed Ranks Test was used for repetitive measurements. Comparison of samples involving more than two groups was performed with Kruskal-Wallis analysis of variance. Significant parameters were also compared using Mann Whitney U test with Bonferroni correction. Comparison of two groups was performed with Mann Whitney U test. Significance level was accepted as  $p < 0.05$

## Results

Totally 132 nurses including 37 males and 95 females with a mean age of 27.12 (19-42 years) were involved in training program. Among nurses who participated in training, 47 (35.6%) of them were high-school graduates, 85 (64.4%) of them had associate's graduate, bachelor or master's degree. Sixty-six (50%) nurses were working in patient follow-up clinics, 27 (29.5%) were working in ICU and 39 (20.5%) were working in other units. Professional experience of 132 nurses who participated in this study was as follows; 70 (53.0%) 1 to 5 years, 40 (30.3%) less than 1 year and 22 (16.7%) more than 5 years. Sixty-three (47.7%) nurses reported that they were previously trained about nosocomial infections.

**Table 1.** Test results before the training

	Score	General information	Hand hygiene	Gloves	Blood borne infection	Isolation measures	Invasive device	Cleaning	Waste management
<b>General average</b>	67.95	90.15	66.67	68.94	70.15	79.36	62.88	58.48	83.84
<b>Education</b>									
<b>High school (n=47)</b>	63.69	82.98	61.70	61.70	67.23	76.06	57.45	56.60	79.43
<b>Other*(n=85)</b>	70.31	94.12	69.41	72.94	71.76	81.18	65.88	59.53	86.27
<b>pvalue</b>	0.002	0.000	0.059	0.081	0.287	0.353	0.036	0.255	0.214
<b>Experience</b>									
<b>Clinic (n=66)</b>	67.68	91.41	65.53	66.67	71.82	79.17	62.12	57.88	82.32
<b>ICU (n=27)</b>	69.74	88.03	71.15	76.92	66.15	83.97	70.51	57.95	85.47
<b>Other (n=39)</b>	66.05	90.12	62.96	62.96	71.85	75.00	53.70	60.74	85.19
<b>pvalue</b>	0.401	0.702	0.302	0.089	0.635	0.277	0.005	0.532	0.756
<b>Period</b>									
<b>&lt; 1 year (n=40)</b>	67.67	92.50	61.87	76.25	68.50	80.63	60.63	59.50	82.50
<b>1-5 years (n=70)</b>	68.48	88.10	70.71	68.57	71.43	79.29	63.57	57.71	84.29
<b>&gt;5 years (n=22)</b>	66.82	92.42	62.50	56.82	69.09	77.27	64.77	59.09	84.85
<b>pvalue</b>	0.705	0.455	0.059	0.092	0.802	0.910	0.669	0.861	0.660
<b>Previous Training</b>									
<b>Yes (n=63)</b>	69.10	91.53	71.03	73.02	72.70	78.97	64.29	55.87	84.13
<b>No (n=69)</b>	66.91	88.89	62.68	65.22	67.83	79.71	61.59	60.87	83.57
<b>pvalue</b>	0.105	0.168	0.208	0.312	0.227	0.191	0.210	0.170	0.207

\* Associate's graduate, bachelor or master's degree

Mean score in pre-training test was  $67.95 \pm 10.5$ . Effects of previous training and education level, the unit where participants work, length of their workhours and whether they were previously trained about nosocomial infections to the test success were summarized in Table 1. Mean score in post-training test increased to  $85.06 \pm 7.6$ .

Same test was applied for the third time to 91 nurses who continued to work in our hospital (132 nurses answered first test). Mean score from this test was  $80.04 \pm 8.77$ . Among nurses who were tested for third time, 34 (37.4%) were high-school graduates, 57 (62.6%) had associate's graduate, bachelor or master's degree. During previous year 51 (56.0%) nurses worked in in-patient clinics, 26 (28.6%) worked

in ICU and 14 (15.4%) worked in other units; patient isolation was applied in units of 63 (69.2%) nurses and 64 (70.3%) were trained about nosocomial infections during surveillance efforts. Contact isolation was applied to all isolated patients and additionally 3 of them were subject to droplet isolation.

Effects of patient isolation, HCAI training and education level to success from the third test were summarized in Table 2.

Mean scores in 3 tests are shown in Figure 1. Comparison of pre-training test result with post training test result and 1st year test result with pre and post training test results are summarized in Table 3.

Table 2. Results of the third test

	Score	General information	Hand hygiene	Gloves	Blood borne infection	Isolation measures	Invasive device	Cleaning	Waste management
<b>General average</b>	80.04	94.51	77.75	76.37	79.56	84.89	75.27	64.84	97.07
<b>Education</b>									
<b>High school (n=34)</b>	75.78	89.22	69.12	70.59	77.65	79.41	74.26	58.24	98.04
<b>Other* (n=57)</b>	82.57	97.66	82.89	79.82	80.70	88.16	75.88	68.77	96.49
<b>p value</b>	0.001	0.002	0.010	0.152	0.598	0.026	0.885	0.003	0.210
<b>Experience</b>									
<b>Clinic (n=51)</b>	78.63	92.81	78.43	77.45	78.04	82.35	72.06	63.53	95.42
<b>ICU (n=26)</b>	82.31	96.15	74.04	86.54	82.31	88.46	81.73	63.85	100.00
<b>Other (n=14)</b>	80.95	97.62	82.14	53.57	80.00	87.50	75.00	71.43	97.62
<b>p value</b>	0.344	0.320	0.526	0.001	0.642	0.356	0.202	0.267	0.188
<b>Isolated patient (follow-up)</b>									
<b>Yes (n=63)</b>	68.73	93.65	77.38	81.75	80.32	85.32	76.19	63.49	96.83
<b>No (n=28)</b>	70.12	89.29	78.57	64.29	77.86	83.93	73.21	67.86	97.62
<b>p value</b>	0.316	0.325	0.809	0.003	0.731	0.448	0.685	0.297	0.882
<b>Training</b>									
<b>Yes (n=64)</b>	81.09	94.79	77.73	79.69	80.94	87.50	76.17	65.00	97.92
<b>No (n=27)</b>	77.53	93.83	77.78	68.52	76.30	78.70	73.15	64.44	95.06
<b>p value</b>	0.259	0.735	0.803	0.110	0.423	0.022	0.741	0.869	0.408

\* Associate's graduate, bachelor or master's degree

Table 3. Statistical comparison of the tests performed before, after and 1 year after the training.

	Score	General information	Hand hygiene	Gloves	Blood borne infection	Isolation measures	Invasive device	Cleaning	Waste management
<b>1.-2. test p value</b>	0.000	0.067	0.000	0.000	0.000	0.038	0.000	0.000	0.000
<b>1.-3. test p value</b>	0.000	0.157	0.002	0.035	0.002	0.115	0.000	0.063	0.000
<b>2.-3. test p value</b>	0.000	0.670	0.004	0.003	0.000	0.730	0.000	0.080	0.796

## Discussion

Infection control trainings are difficult and time consuming. Therefore every opportunity should be used to get the highest efficiency from trainings. Training programs should be individualized according to the group of healthcare staff [12]. Participation of all healthcare staff and hospital companions in infection control measures should be provided [2, 9, 21]. Nurses who have the closest contact with the patient play an important role in application of infection control measures. Therefore it is important to increase knowledge level of nurses about HCAs and improve their attitudes and behaviours. This will be possible with in-house trainings [9-11, 22, 23]. Most of the nurses reported in questionnaires that they want to improve their knowledge level and trainings have increased their interest to work [14, 22]. Nurses request that training programs should be organized to complete their knowledge deficiencies, should include professional developments, and training topics should be determined taking into account opinions of participants [14]. We organized our training program, chose topics and test questions considering knowledge and practice deficiencies

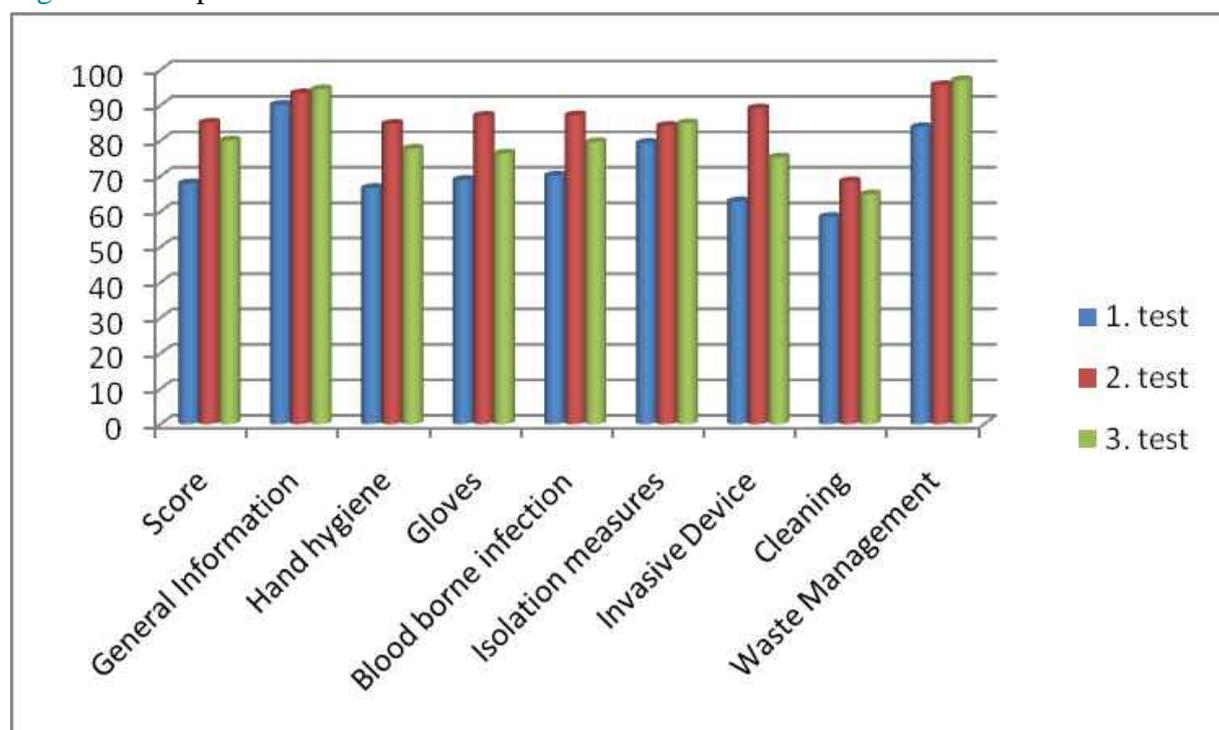
detected during surveillance studies. Our purpose was to convey information about determined topics in the light of up to date and scientific data.

It is difficult to determine the most efficient training model to prevent HCAs [10]. Video images, oral presentations, brochures, infection control bulletins, user guides and electronic media are among tools that may be used during training studies [2, 9, 13, 24]. Our training program involved seminars in which visual materials were also used.

Mean age of the nurses participated in our training program was 27.12 (19-42 years) and professional experience of 83.3% (n=110) were less than 5 years.

We can say that we had a young nurse group. Some studies investigating relation between professional experience and knowledge, attitude, and behavioural compliance of nurses detected a positive correlation [2, 3, 9]. Yamazhan *et al.* [21] in their studies where they have measured knowledge levels of cleaning personnel, has not detected any correlation between professional experience and knowledge level. In our study there wasn't a significant difference between professional experience and success in pre-post training tests and 1st year test. No statistically

Figure 1. Comparison of test scores



significant difference was observed between professional experience and success from the test ( $p=0.401$ ). Our nurses were recently employed and they had achieved professional experience in different organizations and working conditions. Therefore they didn't have same knowledge background. In previous studies a significant relation between education level of the nurses and their knowledge level about infection control measures was observed [2-22]. From our nurses who participated in the training 47 (35.6%) were high school graduates, 85 (64.4%) had associate degree, bachelor degree or master degree after the high school. Among nurses who were tested third time, 34 (37.4%) were high-school graduates, 57 (62.6%) had associate's graduate, bachelor or master's degree. Nurses who continued education after high school were more successful on all 3 tests performed before the training, after the training and at 1st year ( $p=0.002$ ,  $p=0.001$ ,  $p=0.001$ ; respectively).

In studies using questionnaires, nurses who were trained about HCAs were better in awareness of nosocomial infections and compliance with nosocomial infection control measures [2, 4, 9, 25]. In Indonesia, McDermott *et al.* [26] investigated effect of previous training of midwives in their practices related with delivery. Success of midwives were 71% in those who have taken in-service training, 62% in those who have taken an internship program and 51% in those who were not trained at all. Studies suggest giving occupational information to the employees through intensive training programs [2, 4, 9, 25]. However, Yamazhan *et al.* [21] found no effect of previous training on knowledge level of cleaning personnel. They suggested that inadequacy or discontinuity of training might be the cause. Sixty three (47.7%) nurses who participated in our training reported that they were previously trained about nosocomial infections. Although test success of the group previously trained was higher, this difference was not statistically significant ( $p=0.105$ ) (Table 4). Our nurses came to our hospital after working in different institutions. We didn't have sufficient information about content and form of their previous trainings other than their personal accounts. Parameters we have measured might not include topics they have trained before.

In literature, target group in most training studies

performed to prevent HCAs were intensive care unit staff [6, 10, 14-16, 25]. However considerable part of HCAs appear in general hospital units and units where long term care is provided. There are only a few studies which determine effect of trainings to the employees who work in these units [10]. We planned to train nurses working in all units. Among nurses who participated in training, 66 (50%) were working in in-patient clinics, 27 (29.5%) were working in ICU and 39 (20.5%) were working in other units. No statistically significant difference was observed on general success from the test between ICU staff, in-patient clinic staff and other units' staff ( $p=0.401$ ). Nurses having ICU experience were more successful on questions about invasive devices and waste management than nurses who do not have ICU experience in the first test ( $p=0.005$ ). Nurses with ICU experience were more successful in questions related with waste management in the second test than those who work in other units. Although general success was similar, observing a difference in more specific practices show that working areas affect knowledge level.

In Taiwan, Lin *et al.* [2] trained patient companions and non-relative caregivers about HCAI. Awareness of participants about infection control measures showed a statistically significant increase after training. Suchitra *et al.* [3] Detected a significant difference in correct answer rates in questionnaires applied before and after the training. Aytac *et al.* [25] detected mean 13.45 correct answers in their 20 item questionnaire. They recommended continued training efforts on topics which participants were lacking information. Results of the test which included 30 questions applied before and after our training program were assessed over 100 points. Mean score before the training was  $67.95 \pm 10.5$ , and after the training was  $85.06 \pm 7.6$ . There was a statistically significant difference between two test results ( $p=0.000$ ). Although these results suggest that our training program has been efficient, as the target score of 100 has not been achieved, this warrants continuing training programs.

Training program, when applied once, causes short-term changes in knowledge level healthcare staff. Persistence of knowledge can't be achieved by such a program. Similarly, effect of written training

applied once is not clear [13]. To improve the quality of practice long term, regularly repeated, well defined, multi-dimensional training programs should be applied [13, 21, 23]. Angelillo *et al.* [27] investigated knowledge, attitudes and behaviours of nurses working in operating theater about sterilization and disinfection. They suggested that participation to continuous trainings about nosocomial infections improves compliance with infection control measures and barrier methods. Suchitra *et al.* [3] applied questionnaires in two consecutive years and they noted a decrease in success in second test. They also reported that annual training programs would increase knowledge about nosocomial infections and their prevention and help to improve compliance on attitudes and behaviours for nosocomial infection prevention. To determine permanence of information we repeated questionnaire which we had applied previous year and mean score was  $80.04 \pm 8.77$ . Although this score was lower than the score after the training ( $80.04 \pm 8.77$  vs  $85.06 \pm 7.680$ ,  $p=0.000$ ), it was still higher than score in questionnaire performed before the training ( $80.04 \pm 8.77$  vs  $67.95 \pm 10.5$ ,  $p=0.000$ ). Investigation of subscales showed that success from the test on hand hygiene, use of gloves, blood borne diseases and invasive tool related infections has decreased significantly ( $p=0.004$ ,  $p=0.003$ ,  $p=0.000$ ,  $p=0.000$ ; respectively). Score on hospital cleaning has also decreased (from 68.55 to 64.84), but this was not statistically significant ( $p=0.080$ ). Scores on isolation measures remained same. Scores on definition and prevention of HCAI and waste management have increased, however this increase was not statistically significant ( $p=0.796$ ).

Factors, affecting the success of the test performed one year later were determined. From 91 nurses who continued to work in our hospital 26 (28.6%) have worked in ICU, 63 (69.2%) stated that patient isolation measures (contact isolation in all and contact and droplet isolation in 3 of them) were applied in their units and 64 (70.3%) were shortly trained for nosocomial infections during surveillance studies and got long term education about medical waste separation. Unit where participants have worked for previous year, application of isolation measures and training didn't affect general success from the test

( $p=0.344$ ,  $p=0.316$ ,  $p=0.259$ ; respectively). However success levels differed regarding subtopics. Nurses who work in ICU and in clinics where patient follow-up is performed were more successful on questions related with use of gloves; those who were trained were more successful on questions related with isolation methods ( $p=0.001$ ). We conclude that regular training programs should be performed hospital-wide on all topics to increase permanency of information.

Nurses lacking knowledge about preventing HCAI's are known to comply with control measures less [2, 4, 9, 25]. However it is also observed that improved knowledge level achieved via trainings is not always reflected to clinical practice [3, 13]. Tvedt *et al.* [13] applied a training program to healthcare staff involving monthly infection control bulletins and slide shows. Although 92.9% of the nurses who followed the bulletins stated that their knowledge is updated only 72.1% noted changes their behaviours. Therefore next step of training programs should be to encourage behavioural improvement.

## Conclusion

Knowledge level of healthcare staff about HCAI and infection control measures should be detected. Training programs including individualized, regularly repeated, approved training methods should be applied through needs which are determined taking into account service areas of healthcare staff. Next target should be to encourage reflection of such improved knowledge levels to behaviours and to establish behaviour change. More studies are required to develop the most efficient model for healthcare staff training, to provide change in practices and to search effects of these improvements on nosocomial infection rate.

### Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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## Questionnaire form

### Appendix 1. Demographic data of the nurses who has participated into the training

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1. Name, Surname:

2. Age- Gender:

3. Education Level:

- High School       Undergraduate       Graduate       Master

3. Describe your professional experience:

The institution and the department that you have worked:

Working period:

- 1. ....
- 2. ....
- 3. ....

4. Have you taken any education about nosocomial infections in institutions where you have worked before?

- Yes       No

5. In which department do you work now? .....

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## Appendix 2. Preliminary tests

### QUESTIONS

1. Which of the following definitions is correct about nosocomial infections?
  - a) Nosocomial infections only cause death in newborns and elders.
  - b) Nosocomial infections appear within the first 48 hours after the birth.
  - c) Hand washing does not prevent nosocomial infections.
  - d) Nosocomial infections are infections which develops after patients apply to the hospital, are not in the incubation period at the time of application and appears after 48-72 hours after the hospitalization.
  - e) The patient meets the microorganism before the hospitalization and infection symptoms and findings appear at the hospital.
2. Which of the following definitions is correct for nosocomial infections?
  - a) Nosocomial infections are a medical defect which is possible to prevent.
  - b) They are infections which appear within the first 48-72 hours after hospitalization.
  - c) Nosocomial infections may appear after discharge.
  - d) Healthcare staff and contaminated tools cause nosocomial infections.
  - e) Nosocomial infections only cause epidemics.
3. Which of the following is not among applications to prevent nosocomial infections?
  - a) To comply with instructions determined by Infection Control Team.
  - b) To prevent epidemics by discharging infected patients.
  - c) To comply with hand hygiene.
    - d) To use right antibiotic medication.
    - e) To use clean tools and materials.
4. Which of the following application related with alcohol based hand disinfectant is wrong?
  - a) We should rub our hands to provide them wet with a hand disinfectant for 30 seconds.
  - b) We should immediately use a hand disinfectant when blood is contacted to our hand.
  - c) Gloves should be worn after using hand disinfectant.
  - d) We should absolutely wait our hand to dry after using the hand disinfectant.
  - e) Hand disinfectant removes microorganisms rapidly and efficiently.
5. Which of the following is wrong about gloves usage?
  - a) We should take off the gloves after contacting to the patient.
  - b) We should use hand antiseptics before and after wearing gloves.
  - c) We should change the gloves when providing care between patients.
  - d) To use hand antiseptic over gloves decreases transmission rate of microorganisms.
  - e) The gloves should be changed for different interventions on the same patient.
6. Which of the following applications a non-sterile clean gloves may be worn?
  - a) In urinary catheter interventions
  - b) Before surgical procedures
  - c) In peripheral venous catheter applications
  - d) In aspiration of respiratory secretions
  - e) During central venous catheter placement
7. Which of the following diseases is not transmitted via blood?
  - a) Hepatitis D
  - b) Hepatitis C
  - c) Hepatitis B
  - d) Hepatitis A
  - e) HIV
8. Which if the following statement is wrong related with blood borne infections?
  - a) We should accept all patients' bloods infected.
  - b) There is a vaccine for Hepatitis B.
  - c) We should not hang diagnosis of the patients who were infected with Hepatitis B, C and HIV on their bed heads.
  - d) Blood of a patient who is anti HCV positive may be used in blood transfusion.
  - e) Hepatitis B virus may stay alive on inorganic surfaces.
9. Which of the following is not one of the preventions that we will take in hazardous injuries?
  - a) The injury area should be washed with water and soap.
  - b) If mucosa contact is present, it should be washed with water.
  - c) The injury area should be pressed and made bleed, thus the infected blood should be discharged.
  - d) The injury area may be swabbed by antiseptic solutions.
  - e) If the source is not known, it should be screened for Hepatitis markers.
10. Which of the following is wrong?
  - a) We should throw needle tips to sharp object box without covering.
  - b) We should apply contact isolation to patients who were infected with MRSA and VRE or were colonized.
  - c) Different isolation preventions are applied to a patient with HIV and a patient with tuberculosis.
  - d) We should separate patients infected with Hepatitis virus B and Hepatitis virus C from other patients.
  - e) We should use gloves, mask and apron when providing care to isolated patients.
11. Which of the following is not one of standard methods used to prevent nosocomial infections?
  - a) Disposable materials should be immediately thrown after using.
  - b) Gloves should be worn before touching objects contaminated with blood, body fluids, secretions and excreta and disintegrated skin.
  - c) Patient thermometers should be disinfected via alcohol after every use.
  - d) If there is not a visual contamination on gloves used, it is not necessary to change them.
  - e) Non-sterile clean apron is worn during procedures which have possibility to splash body fluids, secretions, excreta and blood.
12. Which of the following is not one of the preventions that we will take in a patient whom contact isolation is applied?
  - a) The patients should be taken into a single room, if possible.
  - b) We should wear gloves before contacting the patient and surfaces in her/his room.
  - c) In cases that more contact with the patient or surfaces in her/his room is expected, the patient has urinary or fecal incontinence, ileostomy, colostomy or open drainage, a non-sterile clean apron should be worn addition to the gloves when entering into the room.
  - d) We should take off gloves and the apron and provide hand hygiene before leaving the room.
  - e) Object and medical material transfer may be done between rooms or patients.

## Appendix 2. Preliminary tests (continued.)

13. Which of the following is not one of the preventions that we will take in a patient whom airway isolation is applied?
  - a) Special ventilation conditions are not necessary.
  - b) The door of the room should be kept closed.
  - c) If the patient is required to get out of the room, surgical mask should be worn.
  - d) N95 respiratory mask should be placed on patients with tuberculosis.
  - e) Pregnant women should not enter into the patient room.
14. Which of the following is wrong?
  - a) Sterile material should be used in urinary catheter applications.
  - b) Hand hygiene should be provided before every contact with the urinary catheter.
  - c) Regular catheter change should be applied to prevent urinary system infections.
  - d) The urinary catheter should be fixed on the leg for patients on lying position.
  - e) Urinary catheter bags should be held under bladder level and hang on the bed without contacting the ground.
15. Which of the following statements is wrong about bleach using?
  - a) The bleach should be prepared in appropriate concentrations according to the purpose.
  - b) Bleach is a highly efficient disinfectant.
  - c) The bleach prepared should be poured on the surface contaminated with blood and body fluids.
  - d) 1/10 bleach is used when blood and body fluid contamination is present.
  - e) After disinfection procedure with the bleach, it is flushed.
16. Which of the following is wrong?
  - a) Service corridors are areas with low risk, therefore cleaning with water and detergents is sufficient.
  - b) The cleaning solution which was prepared for areas cleaned with water and detergent is not required to be changed until the cleaning is terminated.
  - c) Unless contamination with blood and body fluids occurs, the cleaning should be performed with water and detergent.
  - d) No liquid soap should be added on fluid soap dispensers including detergent.
  - e) The cleaning always should be performed from the clean area to the contaminated area.
17. Which of the following statements related with medical waste separation is wrong?
  - a) Red litter bags should be used for medical wastes.
  - b) Blue litter bags should be used for recyclable wastes.
  - c) Black litter bags should be used for domestic wastes.
  - d) Broken vials should be thrown into the blue litter bag.
  - e) If a medical waste is seen in a blue or black litter bag, this bag should be put into a red litter bag and removed as a medical waste.
18. Which of the following is wrong?
  - a) Used intravenous fluid sets should be thrown into the red litter bag.
  - b) Medical waste collecting personnel should be separate.
  - c) Used serous fluid bottles should be thrown into the blue litter bag if they are not contacted with the patient.
  - d) Infected needle tips used should be thrown into the red waste bag.
  - e) We should not carry medical wastes and domestic wastes together in the same carrier.
19. Which of the following is wrong?
  - a) Humidifier containers should be changed periodically.
  - b) Sterile distilled water should be used in humidifier containers.
  - c) When humidifier containers are not used, they should be kept ready by putting water into them.
  - d) Humidifier containers should be used by disinfecting.
  - e) Humidifier containers should not be used commonly by the patients.
20. Which of the following statements is wrong about preventing intravenous catheter infections?
  - a) The person who placed the catheter should record the catheterization date.
  - b) Sterile gloves are not required when placing the peripheral venous catheter.
  - c) Peripheral venous catheters should be changed daily.
  - d) When temperature increase and erythema develops in catheter entrance area or it is detected that the catheter does not operate properly, peripheral catheter should be changed immediately.
  - e) Catheter entrance areas should be observed every day and dirty covers should be changed.
21. Surfaces such as patient bed, cabinets, dining tables should be cleaned via bleach in clinics without high risk.
  - a- Correct      b-False
22. Hand washing does not prevent nosocomial infections.
  - a- Correct      b-False
23. Hands should be disinfected by an alcohol based hand disinfectant after washing the hands with water and soap.
  - a- Correct      b-False
24. Hand hygiene should be provided before and after every intervention related with urinary and venous catheters.
  - a- Correct      b-False
25. Antibiotic pomade should be used during placement or maintenance of urinary and central venous catheters.
  - a- Correct      b-False
26. Hepatitis B virus dies instantly on surfaces at room temperature.
  - a- Correct      b-False
27. There is not any efficiency proven vaccine and immunoglobulin for hepatitis C.
  - a- Correct      b-False
28. Medical waste bags and sharp object boxes should be immediately changed with new ones when 3/4 of them are filled.
  - a- Correct      b-False
29. Surfaces where blood and body fluids poured should be disinfected with 10% (1/10) diluted bleach.
  - a- Correct      b-False
30. Patient rooms should be cleaned daily, when contaminated and the patient was discharged.
  - a- Correct      b-False

Appendix 3. The questionnaire applied before the third test

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Name, Surname:

- 1- In which units have you worked for the last 1 year?
  - 2- Have you ever performed isolated patient follow-up in your unit?
  - 3- If it is done, which isolation method was applied?
  - 4- Have you taken any information or training related with infection preventions told after the training program 1 year ago (including notifications done by infection control committee during your work)?  
In which subjects?
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