TABLE 2. Patient Factors That Medical Students Reported as Important in Deciding When to Use Personal Protective Equipment (PPE)

Patient factor	No. (%) of respondents (N = 169)
Positive for HIV/AIDS	169 (100)
Positive for hepatitis[a]	160 (95)
Type of surgery or procedure	158 (94)
Known intravenous drug user	125 (74)
Trauma	106 (63)
Age	46 (27)
Sex	35 (21)

NOTE. Participants could check more than 1 answer. AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus.

[a] Including hepatitis A and hepatitis B.

or "all" of the procedures, and few reported use of additional personal protective equipment, such as double sleeves (8% of respondents), plastic aprons (11%), or double gloves (11%). Details on the number of medical students who reported use of personal protective equipment during "most" or "all" procedures are shown in Table 1. The main factors identified by medical students as being important in their decision to use personal protective equipment were knowledge of patient's HIV/AIDS status (100% of respondents), active hepatitis (95%), and type of surgery or procedure (94%). Patient factors that medical students reported as important in deciding when to use personal protective equipment are summarized in Table 2.

Although use of universal precautions has been recommended for more than 2 decades, medical students in our study reported that they did not routinely comply with these precautions, and many underestimated the risk of acquiring bloodborne pathogens and were not knowledgeable about the benefit of postexposure prophylaxis after a needlestick injusry involving an HIV-positive patient. Furthermore, underreporting of needlestick injuries (only 46% were reported) was common among medical students, as has been previously reported in studies of HCWs in developed countries.[5,6] Within the recognized limitations of retrospective studies, these data suggest that medical students in Thailand had inadequate knowledge and suboptimal use of universal precautions and underused important safety strategies for prevention of occupational exposure. This emphasizes the need for focused educational interventions that address the epidemiology of bloodborne pathogen transmission risk, appropriate use of personal protective equipment, procedures for reporting needlestick injuries, and current recommendations for postexposure prophylaxis against HIV.

The protection of HCWs in developing countries is largely neglected in national healthcare priorities and by the international organizations that fund healthcare initiatives. However, these countries should not delay the implementation of effective preventive strategies while awaiting additional data. Developing countries should develop national guidelines for safe work practices, postexposure prophylaxis guidelines, and HCW vaccination programs. They should also implement practical, low cost, and simple preventive strategies. Surveillance and infection control measures to prevent bloodborne pathogen transmission and cost-benefit analyses of needleless and safer sharps devices in developing countries are needed.

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Effect of a Training Program for Hospital Cleaning Staff on Prevention of Hospital-Acquired Infection

TO THE EDITOR—Education of hospitalized patients and all healthcare providers and the control of applications following training are very important in the prevention of nosocomial infections.[1] The main target populations in infection control should also include the cleaning staff, in addition to the doctors and nurses. The aim of this study was to assess

the degree of knowledge regarding nosocomial infections among the cleaning staff of a university hospital in Turkey and to assess the effectiveness of the training programs with respect to participants' level of knowledge.

This study was performed between December 2003 and July 2004 in our hospital (Kocatepe University Hospital, Afyon, Turkey), and all the cleaning staff of the hospital were included in the study. Information was collected from staff regarding age, sex, previous history of working in a hospital, and history of education about nosocomial infections and/or hospital cleaning before they had worked in the hospital. The staff were also asked if they had been screened for infectious diseases, and, if so, which diseases had been screened for were noted. The cleaning staff who had been previously trained about both nosocomial infections and hospital cleaning comprised group 1, staff previously trained only about hospital cleaning comprised as group 2, and participants who were not previously trained on any issue comprised group 3 (Table).

The first questionnaire had 14 questions and was completed by all groups during a face-to-face interview with each participant just prior to a training program. The questionnaire included questions on the definition and importance of nosocomial infections, the handling of hospital waste, the importance of hand washing, infections transmitted by blood and body fluids and prevention of exposure to them, surface cleaning in hospitals, and regulations about entrance to operating rooms and intensive care units. These questions were prepared by infectious diseases specialists. After all questionnaires were completed, participants were trained; these training sessions included explanations for all the questions asked in the first questionnaire. Training sessions were designed by the local Infection Control Committee and were delivered as didactic sessions once per month by 2 infectious diseases specialists. Following completion of the training program, the same questionnaire was again completed by all participants during a face-to-face interview.

The first and second questionnaires were evaluated by the infectious diseases specialists who taught the training program. The highest possible score on the questionnaire was 100. The mean scores for the first and second questionnaires were determined for each group.

For statistical analysis, we used the Student t test for parametric data and the Mann-Whitney U test for nonparametric data, as well as the Fisher exact test and the χ^2 test. A P value of less than .05 was considered statistically significant.

Forty-one participants (14 women and 27 men) aged 19-40 years (mean age ± SD, 28.66 ± 6.56 years) were included in the study. The mean score (±SD) for all participants was 42.68 ± 15.89 on the first questionnaire and was 56.73 ± 16.86 on the second questionnaire ($P = .001$). For the first questionnaire, the mean scores (±SD) were 61.17 ± 10.02 for group 1 ($n = 6$), 54.73 ± 7.22 for group 2 ($n = 11$), and 32.67 ± 11.26 for group 3 ($n = 24$). The mean score for group 3 was statistically lower than those for group 1 and group 2 ($P = .0001$ for both comparisons). For the second questionnaire, the mean scores (±SD) were 72.67 ± 7.71 for group 1, 67.00 ± 10.00 for group 2, and 48.00 ± 16.48 for group 3. Statistical analysis revealed that the scores on the second questionnaire showed significant increases for group 2 ($P = .001$) and group 3 ($P = .0001$), compared with the scores on the first questionnaire.

TABLE. Characteristics of the Participants and Study Groups

Characteristic	Proportion (%) of participants
Sex	
Female	14/41 (34.1)
Male	27/41 (65.9)
Prior history of work in another hospital	10/41 (24.4)
History of training	
Both NIs and hospital cleaning (group 1)	6/41 (14.6)
Hospital cleaning only (group 2)	11/41 (26.8)
Neither NIs nor hospital cleaning (group 3)	24/41 (58.6)
Screened for infectious diseases	9/41 (21.9)
Knowledge of which diseases had been screened for	0/9 (0)

NOTE. NI, nosocomial infection.

One of the missions of the Infection Control Committee at our hospital is to train hospital staff regularly, to minimize nosocomial infections.[1] In the literature, it has been reported that the frequency of nosocomial intravascular device–associated bloodstream infections and ventilator-associated pneumonia decreases with increasing education of hospital staff.[2,3] To the best of our knowledge, this study is the first report to investigate the degree of knowledge of hospital cleaning staff regarding nosocomial infections.

It is well established that cleaning staff, as well as healthcare professionals, are important sources involved in nosocomial infections; therefore, they should be well trained on this issue. Cleaning staff are responsible for surface cleaning, collection of wastes, and cleaning of beds and devices in the hospital. They should be familiar with nosocomial infections, their importance and associated preventive measures, before they start to work in the hospital.[1] Our results suggests that the level of knowledge among cleaning staff of the hospital increases with provision of education.

The level of knowledge among workers who had previously been trained about hospital cleaning was higher for both questionnaires in our study. In addition, the level of knowledge increased significantly from the first to the second questionnaire among previously untrained participants, which indicates that regular training increases the knowledge of the cleaning staff, which may be an important factor for prevention of nosocomial infections.

We found that 58.6% of the cleaning staff had begun working in the hospital without any prior training. The level of knowledge revealed by the first questionnaire was significantly lower in this group, compared with that of other groups. As in many other hospitals in our country, private companies are responsible for cleaning of the hospital, and these com-

panies are responsible for the selection of the cleaning staff. Our study suggests that these companies do not train these staff sufficiently before they start working in the hospital.

In our study, 21.9% of the participants reported they had undergone screening for pathogens; however, they did not have any idea on the exact content of this procedure. Healthcare workers, including cleaning staff, are likely to transmit community-acquired infections to patients and other healthcare workers.[4,5] Therefore, healthcare workers should be screened for infections transmissible by blood and other body fluids and should be vaccinated.

Our study has a limitation in that we could only measure the level of knowledge of staff; we did not observe them to see whether they actually use this knowledge in daily practice. However, other studies suggest that training improves the habits of healthcare workers with respect to practices for prevention of nosocomial infections.[6-9]

We found that the level of knowledge regarding nosocomial infections and their prevention among previously untrained cleaning staff was quite low in our study. The level of knowledge among previously trained participants was higher than among untrained ones, whose knowledge increased significantly after training. These results suggest that training of the cleaning staff of the hospital—who may be a source of transmission of pathogenic microorganisms causing nosocomial infections—prior to employment and periodic training programs among cleaning staff as well as healthcare professionals are key factors in prevention of nosocomial infections.

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