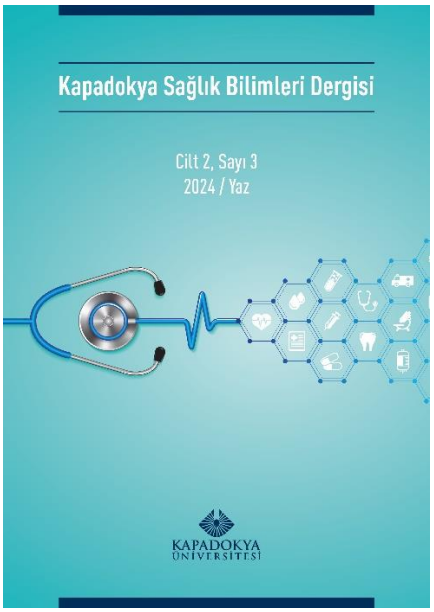

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Research Article

Nurses' Compliance with Infection Control Measures in the Evaluation of Vital Signs

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Nurses' Compliance with Infection Control Measures in the Evaluation of Vital Signs

Abstract

Objective: This study aims to examine nurses' compliance with infection control measures during the assessment of vital signs.

Methods: The research was conducted as a descriptive and quantitative study among nurses working in Turkey. According to the 2022 report by the Ministry of Health of the Republic of Turkey, the study population consisted of 243.565 nurses, with a sample of 384 nurses included at a 95% confidence level. Data were collected through an online survey between December 3, 2022, and February 28, 2024. The survey consisted of questions evaluating the sociodemographic characteristics of the nurses and their attitudes towards infection control measures. The data were analyzed using SPSS 22.0 software.

Results: The average age of the participants is 32.7±7.79, and the average years of experience in the profession is 10.45±8.19. The majority of the nurses are women (71.3%) and hold a bachelor's degree (70.8%). The compliance rate with hand hygiene among nurses is 98.9% after removing gloves, but it drops to 32.2% before wearing gloves. The percentage of those who believe gloves should be worn when measuring blood pressure is 18.7%, while 93.4% stated that gloves should be changed for each patient.

Conclusion: This study reveals varying attitudes and behaviors among nurses towards infection control measures. While there is strong adherence to post-procedure hand hygiene and glove changing protocols, significant gaps exist in pre-gloving hand hygiene and consistent disinfection of non-critical medical devices.

Keywords: Infection control, vital signs, disinfection, nursing.

Hemşirelerin Yaşam Bulgularının Değerlendirilmesi Sürecinde Enfeksiyon Kontrol Önlemlerine Uyumları

Öz

Amaç: Bu çalışma, hemşirelerin yaşam bulgularının değerlendirilmesi sürecinde enfeksiyon kontrol önlemlerine uyumlarının incelenmesini amaçlamaktadır.

Yöntem: Araştırma, Türkiye'de görev yapan hemşireler arasında tanımlayıcı tipte ve nicel araştırma yöntemi kullanılarak gerçekleştirilmiştir. Araştırmanın evrenini Türkiye Cumhuriyeti Sağlık Bakanlığı'nın 2022 raporuna göre 243.565 hemşire oluşturmuştur ve %95 güven düzeyinde 384 hemşire örnekleme dahil edilmiştir. Veriler, 03.12.2022-28.02.2024 tarihleri arasında çevrimiçi bir anket aracılığıyla toplanmıştır. Anket, hemşirelerin sosyodemografik özelliklerini ve enfeksiyon kontrol önlemlerine yönelik tutumlarını değerlendiren sorulardan oluşmaktadır. Veriler SPSS 22.0 programı kullanılarak analiz edilmiştir.

Bulgular: Katılımcıların yaş ortalaması 32,7±7,79, meslekte çalışma yılı ortalaması ise 10,45±8,19'dur. Hemşirelerin çoğu kadın (%71,3) ve lisans mezunudur (%70,8). Hemşirelerin el hijyenine uyum oranı, eldiven çıkardıktan sonra %98,9 iken, eldiven giymeden önce %32,2'ye düşmektedir. Kan basıncı ölçerken eldiven kullanılması gerektiğini düşünenlerin oranı %18,7, her hasta için eldiven değiştirilmesi gerektiğini belirtenlerin oranı ise %93,4'tür.

Sonuç: Bu çalışma hemşirelerin enfeksiyon kontrol önlemlerine yönelik farklı tutum ve davranışlarını ortaya koymaktadır. İşlem sonrası el hijyeni ve eldiven değiştirme protokollerine güçlü bir bağlılık olsa da, eldiven giyme öncesi el hijyeni ve kritik olmayan tıbbi cihazların dezenfeksiyonu konusunda önemli boşluklar bulunmaktadır.

Anahtar kelimeler: Enfeksiyon kontrolü, yaşam bulguları, dezenfeksiyon, hemşirelik.

INTRODUCTION

The success of the recovery process for patients is not only related to the effectiveness of the treatment they receive but also to the hygiene of the environment where they receive their treatment and care. For patients to recover within the recommended or expected time frame, their surroundings must be clean. When patients come to the hospital for treatment, they are often exposed to unexpected hospital-acquired infections (AlThubaity & Mahdy Shalby, 2023). Patients spend the most time with nurses in the clinics where they receive inpatient treatment. Nurses are the healthcare team members who know the patient environment best, can detect potential risks to the patient early, and take the necessary precautions. Nurses are primarily responsible for ensuring that their patients receive care in a safe environment (Wolle & Isacson, 2023). The high number of patients that nurses are responsible for, the use of products that require cleanliness in care and treatment, the excessive workload, and the varying hygienic conditions of hospitals increase the risk of patients encountering pathogenic microorganisms (Kaya & Güvenir, 2020; Phan et al., 2019; Çelik et al., 2020; Yenigün & Arslan, 2021). Recent studies on improving the quality of cleaning and disinfection in hospitals have shown that microbial contamination exists in many areas despite high-level cleaning efforts (Carling et al., 2010). The literature includes studies on the identification of potential pathogens that have been present on inanimate surfaces for a long time. These studies highlight that infectious agents are found on medical equipment such as blood pressure cuffs, stethoscopes (Polat et al., 2018), hemodialysis machines, and thermometers (Saleh et al., 2018), which can cause patient infections and the spread of disease. Medical equipment in numerous contacts with patients and healthcare workers is prone to colonization by pathogenic microorganisms. Stethoscopes, sphygmomanometers, thermometers, oxygen flow meters, pulse oximeters, glucometers and the like are non-critical medical equipment that have direct or indirect contact with patients and healthcare workers (Weldegebreal Fitsum & Desalegn Admassu, 2019). If these medical equipment are not handled and cleaned as recommended, there is a high likelihood that these items could be colonized by microorganisms. A study conducted in India reported that bacterial colonization occurred in 50.8% and 60% of stethoscopes (Jeyakumari et al. 2017; Venkatesan et al., 2019).

A study evaluating contamination through DNA analysis demonstrated that pathogens could spread from a television remote control to patients' hands, room surfaces, monitors, and medication carts (Alhmidi, 2017). Therefore, portable medical devices, if not properly cleaned, can cause the transmission of pathogens within patient rooms and among patients. The Centers for Disease Control and Prevention (CDC, 2019) recommends disinfecting "non-critical"

surfaces (such as blood pressure cuffs, stethoscopes, hemodialysis machines, pulse oximeters, and thermometers) with low-level (%<50 ethyl or isopropyl alcohol, %0.4-5 phenol and phenol compounds, quaternary ammonium compounds) or intermediate-level disinfectants (%60-95 ethyl or isopropyl alcohol, %0.4-5 phenol and phenol compounds) after each use on a patient (DAS, 2019). This study aims to evaluate nurses' compliance with infection control measures during the process of measuring vital signs.

METHODS

Type of Research

This study was carried out in descriptive type using quantitative research methods.

Population and Sample

The population of the study consists of 243.565 nurses working in Turkey, according to the 2022 report of the Turkish Ministry of Health's Turkish Health Statistics Yearbook. Using the known population sampling method, the study aimed to reach 384 nurses with a 95% confidence level. The study was completed with 384 nurses.

Data Collection

Data were collected online from volunteers who agreed to participate in the study via Google Forms between December 3, 2022, and February 28, 2024. IP address restriction has been made to prevent repeat fills.

Data Collection Instruments

In this study, data were collected using a questionnaire developed by the researchers based on a literature review (CDC, 2019; DAS, 2019). The questionnaire included 5 questions related to the sociodemographic characteristics of the participants and 20 questions regarding the assessment of vital signs, with response options of "yes," "no," "undecided," and "not applicable." Before using the questionnaire, a pilot study was conducted (n=5), and the form was subsequently updated.

Data Analysis

The collected data were analyzed using SPSS 22.0 software with descriptive statistics.

RESULTS

The average age of the participants was found to be 32.7±7.79 years, and the average number of years in the profession was 10.45±8.19 years. The majority of the nurses included in the study were female (71.3%) and had a bachelor's degree (70.8%). The highest proportion of participating nurses worked in emergency services (21.4%) and intensive care units (18.4%) (Table 1).

Table 1. Distribution of nurses' sociodemographic characteristics

Variables	**Number (n)**	**Percent (%)**
Gender		
Female	274	71.3
Male	110	28.7
Education		
High school	55	14.3
Licence	272	70.8
Graduate	57	14.8
Clinic		
Emergency Service	82	21.4
Intensive Care	71	18.4
Surgical Service	55	14.3
Community Health Center	38	9.9
Children's Service	49	12.8
Internal Medicine Service	24	6.3
Other*	65	16.9
Total	**384**	**100**

***** *Other: Physical therapy service, operating room, dialysis, orthopedics, pulmonology, gynecology.*

The responses to the statements related to hand hygiene revealed a high level of compliance with the hand hygiene practices of the nurses with an impressive rate of 98.9%, especially after removing the gloves, while the rate of compliance with hand hygiene before wearing gloves decreased significantly with only 32.2% (Table 2). Data on the use of gloves show varying responses according to the type of clinical task. Only 18.7% believed that gloves should be worn when measuring blood pressure; in contrast, 93.4% stated that gloves should be changed for each patient (Table 2). The responses regarding device disinfection practices show that 81.6% of respondents believe that disinfection is unnecessary if the patient is infection-free, and only 20% of respondents support disinfection of blood pressure cuffs for each patient (Table 2).

Table 2. The responses to statements related to infection control

	Yes	**No**	**Undecided**	**Not applicable**

Hand hygiene	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Hand hygiene should be performed for every patient before measuring vital signs without wearing gloves.	249	64.9	76	19.9	46	11.7	13	3.5
Hand hygiene should be performed before wearing gloves.	124	32.2	25	6.5	41	10.6	194	50.5
Hand hygiene should be performed after removing gloves.	380	98.9	1	0.2	0	0.0	3	0.9
Glove Usage	**Yes**		**No**		**Undecided**		**Not applicable**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gloves should be worn when measuring a patient's blood pressure.	72	18.7	22	5.7	26	6.7	264	68.9
Gloves should be worn when measuring a patient's oxygen saturation with a pulse oximeter.	58	15.2	15	3.9	34	8.8	277	72.1
Gloves should be worn when measuring a patient's body temperature.	118	30.7	42	11.0	85	22.2	139	36.1
Gloves are not necessary for measuring vital signs if the patient is infection-free.	224	58.3	28	7.2	132	34.3	0	0.0
Gloves should be changed for every patient.	359	93.4	11	2.8	7	1.9	7	1.9
Device and Equipment Disinfection	**Yes**		**No**		**Undecided**		**Not applicable**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Disinfection of devices is not necessary for measuring vital signs if the patient is infection-free.	313	81.6	28	7.2	42	11.0	1	0.2
Blood pressure cuffs should be changed for every patient.	141	36.7	9	2.3	7	1.9	227	59.1
Blood pressure cuffs should be disinfected for every patient.	77	20.0	15	3.9	49	12.8	243	63.3
Ethyl alcohol should be used for at least 1 minute to disinfect the blood pressure cuff.	54	14.0	62	16.2	184	47.9	84	21.9
Thermometers/tips should be changed or disinfected for every patient.	151	39.3	9	2.3	7	1.9	217	56.5
Spraying with 70% alcohol is sufficient for disinfecting thermometers.	132	34.3	58	15.2	76	19.9	118	30.6
Pulse oximeters should be changed for every patient.	60	15.6	48	12.5	55	14.3	221	57.6
Pulse oximeters should be disinfected for every patient.	58	15.2	41	10.6	34	8.8	251	65.3
Vancomycin-Resistant Enterococci (VRE) can be transmitted to the patient with blood pressure cuffs/pulse oximeters/thermometers during vital signs measurement.	349	90.8	11	2.8	17	4.5	7	1.9
Pulse oximeters, blood pressure cuffs, stethoscopes, and thermometers should be cleaned with low/medium-level disinfectants.	84	21.9	9	2.3	284	73.9	7	1.9

Pulse oximeters, blood pressure cuffs, stethoscopes, and thermometers should be cleaned with high-level disinfectants.	54	14.0	62	16.2	221	57.6	47	12.2
Pulse oximeters, blood pressure cuffs, stethoscopes, and thermometers are non-critical devices.	113	29.4	110	28.6	121	31.5	40	10.5

When comparing responses to infection control-related statements with sociodemographic data, statistically significant differences were observed between age and educational level variables (Table 3). Responses to questions about hand hygiene were found to significantly differ based on age and educational level. Similarly, age and educational level were also found to create significant differences in responses regarding glove usage and device/equipment disinfection ($p<0.05$). However, no significant differences were observed for gender and the variable of the clinic where the participants worked ($p>0.05$).

Table 3. Comparison of sociodemographic data with responses to statements related to infection control

Variables	**Gender**	**Age**	**Education**	**Clinic**
Hand hygiene	X^2= 0.217, p=0.975	X^2= 13.261, **p=0.039**	X^2=36.948, **p=0.03**	X^2=19.457, p=0.364
Glove Usage	X^2= 2.031, p= 0.566	X^2= 14.212, **p=0.041**	X^2=24.234, **p=0.03**	X^2=13.012, p=0.464
Device and Equipment Disinfection	X^2= 2.231, p= 0.746	X^2= 13.232, **p=0.034**	X^2= 28.112**,** **p=0.023**	X^2=28.954, p=0.587

DISCUSSION

In this study, the compliance of nurses with infection control measures was examined. The responses to the statements related to hand hygiene indicate a strong consensus on the importance of hand hygiene in clinical settings. A significant majority of respondents (64.9%) agreed that hand hygiene should be performed before measuring vital signs without gloves, reflecting a high level of compliance with standard infection control protocols. However, only 32.2% of respondents believed that hand hygiene should be performed before glove donning, indicating a gap in adherence to comprehensive hand hygiene practices. Hand hygiene after glove removal was endorsed by almost all respondents (98.9%). In the literature, studies on

hand hygiene compliance have reported a high level of compliance with hand hygiene before and after patient contact (Tyagi et al., 2018; Yang et al., 2021). It is also reported that hand hygiene practices can be improved with structured protocols and frequent follow-up (Tyagi et al., 2018).

In responses to statements about glove use, a significant proportion of respondents (58.3%) believed that gloves are not needed to measure vital signs in non-infected patients, which is in line with guidelines recommending the use of gloves primarily when contact with body fluids is expected (CDC, 2019; Mahdizadeh et al., 2021; Benner, 2001). However, a large majority (93.4%) agreed that gloves should be changed for each patient, indicating a high level of commitment to prevent cross-contamination. There were mixed views on the need for gloves for measuring blood pressure (18.7%), oxygen saturation (15.2%) and body temperature (30.7%), indicating a need for clearer guidelines in these areas.

Stethoscopes, sphygmomanometers, thermometers, oxygen flow meters, pulse oximeters, glucometers, etc. are non-critical medical equipment that have direct or indirect contact with patients and healthcare workers (Weldegebreal et al., 2019). The Center for Disease Prevention and Control (CDC) recommends low-level disinfection for non-critical medical equipment (CDC, 2019). This equipment should be disinfected before and after patient contact, once a day or once a week. If this is not possible, this equipment should be cleaned at least when visibly soiled (Birlie et al., 2021). In a study examining the behaviors of nurses regarding device disinfection, it was reported that 1.3%-5.3% of nurses cleaned stethoscopes, thermometers, pulse oximeters and glucometers after using them for patients, and none of them disinfected the devices before measurement (Birlie et al., 2021). In another study, it was reported that the rate of stethoscope or sphygmomanometer contamination was 77% as a result of healthcare workers not performing regular device disinfection before and after patient examination (Weldegebreal et al., 2019). There is a significant awareness among respondents of the necessity of device disinfection, but the details of implementation vary. A significant majority (81.6%) felt that disinfection was not necessary if the patient was free of infection, which may reflect a pragmatic approach to resource utilisation. However, the high proportion (90.8%) recognising the potential for VRE transmission through devices underlines the critical importance of strict disinfection protocols. The data show a preference for replacing thermometers/tips (39.3%) and disinfecting pulse oximeters (15.2%) and blood pressure cuffs (20.0%) for each patient, reflecting adherence to recommended practices. There was also significant support (73.9%) for

the use of low/intermediate level disinfectants, whereas opinions on high level disinfectants were more divided, indicating the need for standardised disinfection protocols.

The findings indicate significant differences in attitudes and behaviors regarding infection control measures based on variables such as age and educational background.In our study, significant differences were identified between age and educational level of nurses in relation to hand hygiene practices. It was observed that as age increases, there is a greater tendency towards positive attitudes in hand hygiene practices (X^2= 13.261, p=0.039). Similarly, as educational level increases, correct practices regarding hand hygiene also increase (X^2= 36.948, p=0.03). This finding is consistent with Benner's theory of clinical skill development, which suggests that with increased experience, there is an enhancement in clinical decision-making and application (Benner, 2021).

Our findings on glove usage indicate significant associations with age and educational level. An increase in age correlates with improved knowledge and practices in glove usage (X^2= 14.212, p=0.041). Likewise, higher educational attainment contributes to better adherence to correct glove usage (X^2= 24.234, p=0.03). These results align with literature emphasizing the importance of continuous education in enhancing nurses' attitudes and behaviors towards glove usage. Previous studies have also demonstrated that continuous education programs improve nurses' attitudes and behaviors towards glove usage (Debela et al., 2024).

Regarding device and equipment disinfection, our findings indicate significant relationships with age and educational background. As age increases, more positive attitudes towards device and equipment disinfection are observed (X^2= 13.232, p=0.034). Higher education levels are associated with more accurate practices in device and equipment disinfection (X^2= 28.112, p=0.023). This finding is consistent with literature suggesting that nurses with higher education levels implement infection control measures more effectively (Russell et al., 2018; Uoda & Ali, 2019).

No significant differences were found in attitudes and behaviors towards infection control measures based on gender and the clinical setting where nurses work (p>0.05). This finding suggests that nurses' attitudes towards infection control measures are similar regardless of gender and workplace environment. Similar findings have been reported in some studies in the literature (Parmeggiani et al., 2010).

CONCLUSION

This study reveals that nurses' attitudes and behaviours towards infection control measures differ. Findings indicate a strong understanding and implementation of infection control practices among nurses, especially strong in post-procedure hand hygiene and glove changing protocols. However, there are significant gaps in pre-gloving hand hygiene and consistent disinfection of non-critical medical devices. Addressing these gaps through continuous education, clear guidelines and strict adherence to infection control protocols is crucial to improve patient safety and minimise the risk of infection. The data emphasise the need for a holistic infection control approach that integrates comprehensive hand hygiene, appropriate glove use and strict device disinfection practices.

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Conflict of interest: No conflict of interest between the authors

Ethical Considerations: Before starting the study, ethical approval was obtained from the Cappadocia University Ethic Committee (Approval number: E-64577500-050.99-30752, Decision no: 22.20, Date: October 31, 2022), and informed consent was obtained from the participants.

Author Contributions: Conception and design: AYI, EZMG; Data collection: AYİ, EZMG, AB; Data analysis and interpretation: AYİ, EZMG; Manuscript writing: AYİ, EZMG, AB; Critical review: AYİ.

REFERENCES

Alhmidi, H., Koganti, S., Cadnum, J. L., Jencson, A. L., John, A., & Donskey, C. J. (2017). Dissemination of a nonpathogenic viral DNA surrogate marker from high-touch surfaces in rooms of long-term care facility residents. *Am J Infect Control*, 45, 1165-1167. https://doi.org/10.1016/j.ajic.2017.04.007

AlThubaity, D. D., & Mahdy Shalby, A. Y. (2023). Perception of health teams on the implementation of strategies to decrease nursing errors and enhance patient safety. *J Multidiscip Healthc,* 693-706. https://doi.org/10.2147/JMDH.S401966#d1e147

Benner, P. (2001). From novice to expert: Excellence and power in clinical nursing practice (Commemorative ed.). London: Prentice-Hall International.

Birlie, T. A., Amare, A. T., Tassew, S. F., Emiru, T. D., Feleke, D. G., & Chanie, E. S. (2021). Nurses' cleaning practice of non-critical medical equipment in the era of COVID 19: A cross-sectional study in Debre-Tabor comprehensive specialized hospital. *Heliyon,* 7(7). https://doi.org/10.1016/j.heliyon.2021.e07626

Carling, P. C., Parry, M. F., Bruno-Murtha, L. A., & Dick, B. (2010). Improving environmental hygiene in 27 intensive care units to decrease multidrug-resistant bacterial transmission. *Critical Care Medicine*, 38(4), 1054-1059. https://doi.org/10.1097/CCM.0b013e3181cdf705

Centers for Disease Control and Prevention. (2019). Guideline for disinfection and sterilization in healthcare facilities. Retrieved April 22, 2023, from https://www.cdc.gov/infection-control/hcp/disinfection-and-sterilization/index.html

Çelik, B., İbrahimoğlu, Ö., & Mersin, S. (2020). Sağlık profesyonellerinde tükenmişliğin sağlık hizmeti ilişkili enfeksiyonlar üzerine etkisi. *Türkiye Sağlık Bilimleri ve Araştırmaları Dergisi*, 3(1), 61-68.

Debela, S. A., Tefera, Y. M., Endeshaw, M., Daba, C., Debela, E. A., Luke, A. O., ... & Gebrehiwot, M. (2024). Personal protective equipment utilization and its association with educational status among industry workers in Ethiopia: A systematic review and meta-analysis protocol. *Plos one*, 19(4), e0299957. https://doi.org/10.1371/journal.pone.0299957

Dezenfeksiyon Antisepsi Sterilizasyon Derneği. (2019). Dezenfeksiyon Antisepsi Sterilizasyon Rehberi. Retrieved April 22, 2023, from https://www.das.org.tr/kitaplar/DASRehber2019V10.pdf

Jeyakumari, D., Nagajothi, S., Kumar, P., Ilayaperumal, G., & Vigneshwaran, S. (2017). Bacterial colonization of stethoscope used in the tertiary care teaching hospital: a potential source of nosocomial infection. *Int J Res Med Sci*, 5(1), 142-145.

Kaya, U., & Güvenir, M. (2020). El yıkama, eldiven kullanımı ve dirençli bakteri enfeksiyonlarının önlenmesi. *Arşiv Kaynak Tarama Dergisi*, 29(4), 303-308. https://doi.org/10.17827/aktd.855738

Mahdizadeh, S. M., Sany, S. B. T., Sarpooshi, D. R., Jafari, A., & Mahdizadeh, M. (2021). Predictors of preventive behavior of nosocomial infections in nursing staff: A structural equation model based on the social cognitive theory. *BMC Health Services Research*, 21, 1-8. https://doi.org/10.1186/s12913-021-07205-6

Parmeggiani, C., Abbate, R., Marinelli, P., & Angelillo, I. F. (2010). Healthcare workers and health care-associated infections: knowledge, attitudes, and behavior in emergency departments in Italy. *BMC infectious diseases*, 10, 1-9.

Phan, L. T., Maita, D., Mortiz, D. C., Bleasdale, S. C., & Jones, R. M. (2019). Environmental contact and self-contact patterns of healthcare workers: Implications for infection prevention and control. Clin Infect Dis, 69(3), 178-184. https://doi.org/10.1093/cid/ciz558

Polat, Z. M., Altındiş, M., Aslan, F. G., İnci, M. B., Kılıç, Ü., Demiray, T., ... & Çıkrıklar, H. İ. (2018). Ambulans kaynaklı enfeksiyonlar ve hijyen. *Süleyman Demirel Üniversitesi Sağlık Bilimleri Dergisi*, 9(2), 6-12. https://doi.org/10.22312/sdusbed.411379

Russell, D., Dowding, D. W., McDonald, M. V., Adams, V., Rosati, R. J., Larson, E. L., & Shang, J. (2018). Factors for compliance with infection control practices in home healthcare: findings from a survey of nurses' knowledge and attitudes toward infection control. *Am J Infect Control*, 46(11), 1211-1217. https://doi.org/10.1016/j.ajic.2018.05.005

Saleh, H. N., Kavosi, A., Pakdel, M., Yousefi, M., Asghari, F. B., & Mohammadi, A. A. (2018). Assessment health status of ICU medical equipment levels at Neyshabur hospitals using ICNA and ACC indices. *MethodsX*, 5, 1364-1372. https://doi.org/10.1016/j.mex.2018.10.016

Tyagi, M., Hanson, C., Schellenberg, J., Chamarty, S., & Singh, S. (2018). Hand hygiene in hospitals: An observational study in hospitals from two southern states of India. *BMC Public Health*, 18, 1-9. https://doi.org/10.1186/s12889-018-6219-6

Uoda, B., & Ali, A. (2019). Knowledge, attitudes and practices for dialysis nursing staff regarding personal protection means from hospital acquired in Mousl hospital. *Mosul Journal of Nursing* (Print ISSN: 2311-8784 Online ISSN: 2663-0311), 7(2), 92-99. https://doi.org/10.33899/mjn.2019.163661

Venkatesan, K. D., Chander, S., & Victor, K. (2019). Stethoscopes: a potential source of hospital acquired infection. *Int. J. Adv. Med*, 6(4), 1322-1325. http://dx.doi.org/10.18203/2349-3933.ijam20193294

Weldegebreal, F., Admassu, D., Meaza, D., & Asfaw, M. (2019). Non-critical healthcare tools as a potential source of healthcare-acquired bacterial infections in eastern Ethiopia: a hospital-based cross-sectional study. *SAGE Open Med.* 7, 2050312118822627. https://doi.org/10.1177/2050312118822627

Wolle, D., & Isacson, E. (2023). A descriptive qualitative empirical study describing how basic hand hygiene is conducted in Lesotho as well as the healthcare staffs' thoughts on it. *J Multidiscip Healthc*, 1-36.

Yang, Q., Wang, X., Zhou, Q., Tan, L., Zhang, X., & Lai, X. (2021). Healthcare workers' behaviors on infection prevention and control and their determinants during the COVID-19 pandemic: A cross-sectional study based on the theoretical domains framework in Wuhan, China. *Arch Public Health*, 79(1), 118. https://doi.org/10.1186/s13690-021-00641-0

Yenigün, M. Y., & Arslan, S. (2021). Hastanede çalışan hemşirelerin izolasyon önlemlerine uyumu. *Sağlık ve Toplum*, 31(3), 137-145. https://doi.org/10.22312-sdusbed.411379-541210