Jpn. J. Infect. Dis., 68, 381–386, 2015

Original Article

Healthcare-Associated Infections in Pediatric Intensive Care Units in Turkey: a National Point-Prevalence Survey

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SUMMARY: Health care-associated infections (HCAIs) cause considerable morbidity and mortality in pediatric intensive care units (PICUs). The objective of this point prevalence study was to assess the burden of HCAIs in PICUs in Turkey. Fifty PICUs participated in this study. Data regarding demographics, microbiological findings, therapeutic interventions, and outcomes were collected for all PICU inpatients. A total of 327 patients participated in the study: 122 (37%) experienced 1 or more HCAI. The most frequently reported site of infection was lower respiratory tract ($n=77$, 63%). The most frequently isolated pathogens were *Pseudomonas aeruginosa, Acinetobacter* species, and *Candida* species. Two hundred and forty-seven patients (75%) were receiving antimicrobial therapy at the time of the survey, and the most frequently administered antimicrobials were third generation cephalosporins. Hospital type, male, PICU stay >7 days, and mechanical ventilation were found to be independent risk factors for HCAIs. At the 4-week follow up, 43 (13%) patients had died, 28 (65%) of whom died of HCAIs. Endotracheal intubation, urinary catheter, male, and HCAIs were independent risk factors for mortality. This national, multicenter study documented a high prevalence of HCAIs in Turkey. In light of the 'primum non nocere' principle, the prevention of these infections should be a priority of public health policy.

INTRODUCTION

Healthcare-associated infections (HCAIs), or nosocomial infections, are a significant cause of morbidity and mortality. HCAI surveillance is important for effective infection control. Although cross-sectional prevalence studies cannot establish causality, these types of studies can help characterize the epidemiology of HCAIs and their associated risk factors. HCAIs are more common in intensive care units than in any other hospital ward (1–3). Because of more frequent medical device use and contact with healthcare workers. Most of the current HCAI literature focuses on adults, therefore, data regarding pediatric intensive care unit (PICU)-acquired HCAIs and related risk factors are limited. Previous studies have shown that prevalence of PICU-acquired infections ranges from 9.1% to 42.5% (2,4–8).

Although its HCAI surveillance system has been in place since 2003, data regarding infection rates, device utility rates, and antimicrobial resistance rates in Turkey, a country that is still developing, are limited. Furthermore, HCAI risk factors and related co-morbidities and mortalities have not been examined. In addition, no nationwide, multicenter studies have investigated HCAIs and risk factors in PICU patients.

In light of this gap in the literature, this study investigated the prevalence and risk factors associated with PICU-acquired HCAIs in Turkey. We also examined microbiological data, antimicrobial usage, and device utilization. This represents the first PICU-focused, multicenter, point-prevalence survey of HCAIs in Turkey.

MATERIALS AND METHODS

A point-prevalence survey was conducted in PICUs certificated by the Ministry of Health and part of the Pediatric Emergency and Intensive Care Association. Pediatric specialists and pediatric infectious disease specialists at all 58 PICUs in state, university, or training/research hospitals in Turkey were invited to participate. Among them, 50 PICUs agreed to participate in the study, while 8 were excluded because of non satisfactory compliance. Neonatal intensive care units, pediatric surgery intensive care units, adult intensive care units, and private hospitals were also excluded from the study. Parental informed consent forms and PICU-acquired HCAI questionnaires were sent to all participating PICUs. Guidelines regarding the definition of HCAIs and criteria for specific types of infections in the acute care setting outlined by the Center for

Received September 3, 2014. Accepted November 17, 2014.
J-STAGE Advance Publication March 13, 2015.
DOI: 10.7883/yoken.JJID.2014.385

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Disease Control and Prevention (CDC) were used to identify the type of infection (9). All hospitals that participated in this study had a hospital infection control committee for the prevention and follow up of HCAIs. The survey was conducted on September 27, 2012.

The study population was defined as all patients occupying a bed in the PICU on the day of the survey. Data were collected via questionnaire. Demographic information (i.e. age and sex), primary diagnosis, date of hospital and PICU admission, co-morbidities (e.g., renal or hepatic insufficiency, malignancy, or surgical wound), type of therapeutic intervention (e.g., central intravascular catheters, urinary catheters, endotracheal intubation/mechanical ventilation, tracheostomy, nasogastric or nasoduodenal feeding tubes, chest tubes, extracorporeal membrane oxygenation, or dialysis catheters), total parenteral nutrition (TPN), the types of antimicrobial agent administered, total PICU patient-days, and hospital patient-days were recorded for each patient. The standard definition for HCAI was used (9). The data were collected by a pediatric, PICU, or pediatric infectious disease specialist. All data were reviewed by a HCAI control program-certificated pediatric infectious disease specialist prior to the final analysis. The data were re-evaluated by participating authors if necessary. Patient outcomes were evaluated 1 month post-survey by comparing the number of overall and HCAI-related deaths among the study participants. Informed consent forms were signed by the parents of each participating patient. No parent refused to participate in this non-interventional study. Records, questionnaires, and informed consent forms were centrally collected. The Marmara University Medical Faculty Ethical Committee and Review Board served as the central ethics committee and approved the study for all participating hospitals on September 20, 2012.

Statistical analysis: Data were entered into Microsoft Office Excel 2007 (Microsoft, Redmond, WA, USA) and analyzed using Stata 10.0 Statistics/Data Analysis (StataCorp, Lakeway Drive, TX, USA). The prevalence of PICU-acquired HCAIs was calculated by dividing the number of infections by the total number of patients. Chi-square and Fisher's exact tests were used for univariate analyses of categorical variables. A multivariate analysis to evaluate the effects of potential confounders was performed using stepwise forward logistic regression modeling. The device utility ratio was calculated by dividing the total number of device use-days by the number of patient-days.

RESULTS

Hospital and PICU profiles: Fifty hospitals from 27 different cities, serving 67% of the Turkish population participated in this study. Eleven (22%) were state hospitals, 29 (58%) were university hospitals, and 10 (20%) were training/research hospitals. All hospitals had 1 general PICU with a median of 7 beds (range, 3–22; mean, 9).

Patient demographics: At the time of the survey, 327 patients were hospitalized in the 50 participating PICUs. All 327 PICU patients were surveyed. The median age of the patients was 20 months (range, 1–216 months; mean, 48 months) and more than half (56%) were male. One hundred and two patients (31%) were treated at state hospitals, while 225 (69%) were treated at university or training/research hospitals. The most frequently reported primary diagnostic categories were lower respiratory tract infections with concomitant diseases (38%) (e.g., neuromuscular disorders, congenital heart diseases, immune deficiencies, or malignancy), neuromuscular disorders (15%) (e.g., epilepsy, myopathy, encephalitis, or meningitis), and sepsis (5%). On the day of the survey, the participating patients had been in the hospital for a median of 14 days (range, 1–1,825 days; mean, 61 days) and in the PICU for a median of 10 days (range, 1–1,825 days; mean, 54 days).

Therapeutic interventions: The type of therapeutic intervention is presented in Table 1. One-third of patients received at least 1 major therapeutic intervention (e.g., a central venous catheter (n = 100, 31%), urinary catheter (n = 102, 31%), or endotracheal tube (n = 114, 35%) and half of the patients (n = 158, 48%) received mechanical ventilation.

Prevalence of PICU-acquired HCAIs: PICU-acquired infections were reported by all participating hospitals. A total of 122 patients (37%) were diagnosed with PICU-acquired HCAIs at the time of the survey (9). Of these, 17 (14%) patients had more than 1 type of infection. The most common HCAI was ventilator-associated pneumonia (VAP). Table 2 shows the prevalence of each type of HCAI.

HCAI microbiological data: Causative microorgan-

Table 1. Therapeutic interventions on survey date

Therapeutic intervention	No. of patients n (%)	Mean duration day	Median duration day	Device utility ratio[1)]
Central venous catheter	100 (30.6)	5 ± 19 (range, 0–280)	9	0.084
Urinary catheter	102 (31.2)	4 ± 11 (range, 0–102)	7	0.063
Endotracheal tube	114 (34.9)	12 ± 90 (range, 0–1,490)	9	0.203
Mechanical ventilation	158 (48.3)	52 ± 199 (range, 0–1,825)	18	—
Tracheostomy	48 (14.7)	29 ± 153 (range, 0–1,825)	58	—
Total parenteral nutrition	73 (22.3)	4.8 ± 18 (range, 0–244)	9	—
Nasogastric feeding tube	202 (61.8)	25 ± 140 (range, 0–1,825)	4	—
Chest tube	12 (3.7)	8 ± 13 (range, 1–49)	2	—
Gastrostomy	23 (7.0)	384 ± 555 (range, 0–2,190)	210	—
Port catheter	7 (2.1)	67 ± 73 (range, 3–210)	60	—
Peritoneal dialysis catheter	6 (1.8)	2 ± 13 (range, 1–39)	8	—
Hemodialysis catheter	10 (3.1)	36 ± 71 (range, 1–237)	13	—
Ventriculoperitoneal shunt	10 (3.1)	748 ± 1,753 (range, 17–5,700)	125	—
H2 blocker	120 (36.7)	25 ± 62 (range, 1–545)	9	—
Steroid treatment	72 (22.0)	15 ± 25 (range, 1–180)	5	—
Extracorporeal membrane oxygenation	0 (0.0)	—	—	—

[1)]: Device utility ratio, device utility day(s)/patient day(s).

Table 2. Pediatric intensive care unit-acquired healthcare-associated infection (HCAI) prevalences on survey date

HCAI		No. of patients (total, 327) *n* (%)
Lower respiratory tract infection	Lower respiratory tract infection other than pneumonia	2 (0.6)
	Pneumonia	32 (9.8)[1)]
	Ventilator-associated pneumonia	43 (13.1)[1)]
Blood stream infection (BSI)	Laboratory-confirmed BSI	24 (7.3)[1)]
	Clinical sepsis	10 (3.1)
	Central line-associated BSI	4 (1.2)[1)]
Urinary tract infection (UTI)	Symptomatic UTI	3 (0.9)
	Asymptomatic bacteriuria	2 (0.6)
	Catheter-associated UTI	5 (1.5)[1)]
Gastrointestinal system infection		3 (0.9)[1)]
Skin and soft tissue infection		5 (1.5)[1)]
Eye, ear, nose, throat, or mouth infection		2 (0.6)[1)]
Surgical site infection		1 (0.3)
Central nervous system infection		3 (0.9)[1)]
Cardiovascular system infection		0 (0.0)
Systemic infection		0 (0.0)
Reproductive tract infection		0 (0.0)
Total		139 infections/ 122 patients[1)]

[1)]: Seventeen patients had more than 1 type of HCAI.

isms were isolated in 71 (58%) patients with HCAIs. A single causative agent was responsible for the infection in 52 patients (43%), whereas the infection was polymicrobial for 19 patients (16%). The most frequently reported isolates for PICU-acquired HCAIs were: *Pseudomonas aeruginosa* cases (n = 30, 25%), *Acinetobacter* species cases (n = 18, 15%), and *Candida* species cases (n = 9, 7%) (Table 3). The carbapenem susceptibility rate of *Pseudomonas* isolates was 71%. According to the antimicrobial susceptibility test results, 10 of 12 *Acinetobacter* isolates were susceptible to colistin, while 2 were found to be intermediately susceptible. Causative microorganisms were isolated in 14 of 32 pneumonia patients and in 23 of 43 VAP patients. The most common isolates in both cases were *Pseudomonas* species. In addition, the most common isolates in laboratory-confirmed bloodstream infections were *Candida* species.

Antimicrobial interventions: At the time of the suvey, 247 patients (76%) were receiving antimicrobial therapy. Of these, 101 received antibiotic monotherapy while 73 received 2 different antibiotics, 55 received 3, 15 received 4, and 3 received 5. The most frequently administered antibiotics were third-generation cephalosporins (n = 61, 19%), followed by carbapenems (n = 44, 13%), and glycopeptide antibiotics (n = 31, 9%).

Risk factors for PICU-acquired HCAI: The univariate analysis and multivariate analysis identified significant risk factors for PICU acquired-HCAIs (Table 4). Hospital type, PICU stay (>7 days), central venous catheter, central venous catheter duration (>7 days), urinary catheter, urinary catheter duration (>7 days), endotracheal tube, mechanical ventilation, TPN, TPN duration (>7 days), nasogastric feeding tube, and nasogastric feeding tube duration (>7 days) were identified as risk factors for PICU acquired-HCAIs in the univariate analysis. Hospital type, male, PICU stay (>7 days), and mechanical ventilation were identified as independent risk factors for PICU acquired-HCAIs in the multivariate analysis.

PICU-acquired HCAI-related mortality and associated risk factors: Mortality data were available for all 327 patients. Forty-three patients (13%) died in the PICU within 1 month of the survey date; of these, 28 (65%) died because of HCAI. The presence of HCAI, male, endotracheal intubation, and urinary catheter were found to be significant, independent risk factors for HCAI-related mortality in the univariate and multivariate analyses (Table 5).

DISCUSSION

This national, multicenter, point-prevalence study documented the burden of PICU-acquired HCAIs in Turkey. At the time of the survey, 122 of 327 patients (37%) in 50 PICUs were reported to have ≥1 PICU-acquired HCAI. The HCAI rates in PICUs reported in other regions such as the United States of America (USA), Europe, Hong Kong, and Canada (6–12%, 23%, 15%, and 8.7%, respectively) are markedly lower than the HCAI rates in Turkish PICUs (2,3,5,6,10). Since the early 2000s, Turkey has increased the amount of infection control training programs and infection control studies in hospitals nationwide. However, the National Hospital Infections Surveillance Network has been operational since 2008 (11), while a similar network in the USA (the National Nosocomial Infections Surveillance System [NNIS]), has been active since the 1970s in the USA, where it has led to a 30–40% decrease in HCAI rates (4,12). Therefore, the delayed awareness regarding infection control and prevention as well as the late adoption of HCAI surveillance may have contributed to the high HCAI rates in Turkey.

In this study, the median length of the PICU stay was 10 days (range, 1–1,825; mean, 54). In comparison, in a similar study conducted in the USA, the median stay was 6 days (range, 1–358). It should be noted that although similar studies have been conducted in Italy and Hong Kong, they have been conducted in pediatric wards other than PICUs, making the USA study the most relevant comparison. The length of PICU stay in Turkey was longer than that reported n the USA study, however, length of stay was not a statistically significant risk factor for HCAI in the present study. Furthermore, most patients with a prolonged intensive care stay experienced neuromuscular problems and chronic respiratory failure. In Turkey, there are no intermediate/palliative health care centers or hospices, nor is there a ''do not resuscitate'' or ''withdrawal of care'' policy. When the families do not consent for tracheostomy and/or home ventilation (due to lack of capacity at home), the duration of the stay can be considerably long, which may account for the increased length of stay in this study.

Causative microorganisms were isolated in 71 of 122 HCAIs (58%). A previous study of adult ICU-acquired HCAIs in Turkey reported an isolation rate of 91% for all HCAIs (13). In the USA study, an isolation rate of

Table 3. Causative microorganisms and isolation sites in patients with PICU-acquired health-care associated infections

Causative microorganism[2)]	Isolation site (n = no. of patients) [infection type][1),2)]				
	Respiratory specimen (broncho-alveolary lavage fluid or endotracheal aspirate)	Blood	Cerebrospinal fluid	Urine	Conjunctiva swab/ wound swab
Pseudomonas spp.	3 [PNEU] 13 [VAP] 2 [LRTI]	1 [PNEU] 2 [VAP] 4 [LCBSI] 1 [CLABSI]	1 [CNS]	1 [CR-UTI] 2 [SUTI] 1 [ABU]	
Acinetobacter spp.	9 [VAP]	3 [PNEU] 1 [VAP] 5 [LCBSI]		1 [CR-UTI] 1 [ABU]	
Serratia spp.		1 [PNEU]		1 [CR-UTI]	
E. coli		1 [PNEU] 2 [LCBSI]		1 [ABU]	
Stenotrophomonas maltophilia	2 [PNEU] 1 [VAP]	1 [PNEU] 2 [CLABSI] 1 [LCBSI]	1 [CNS]		
Klebsiella spp.	2 [VAP]	2 [PNEU] 1 [VAP] 4 [LCBSI]			1 [EI]
Enterococcus spp.		1 [PNEU] 1 [LCBSI]		2 [CR-UTI]	
Proteus vulgaris				1 [CR-UTI]	
Pantoea spp.		1 [PNEU]			
Enterobacter spp.	1 [VAP]				
Burkholderia spp.	1 [VAP] 1 [LRTI]				
Methicilline-resistant coagulase-negative *Staphylococcus* (bilaterally)		1 [VAP] 1 [CLABSI] 5 [LCBSI]			1 [EI] 1 [SSI]
Candida spp.		6 [LCBSI]	2 [CNS]	1 [CR-UTI]	

[1)]: Infection types are given in paranthesis; PNEU, pneumonia; VAP, ventilator-associated pneumonia; LRTI, lower respiratory tractiInfection excluding pneumonia; LCBSI, laboratory confirmed blood stream infections; CLABSI, central-line associated blood stream infection; CNS, central nervous system infection; EI, eye infection; CR-UTI, catheter-related urinary tract infection; SUTI, symptomatic urinary tract infection; ABU, asymptomatic bacteriuria; SSI, surgical site infection.
[2)]: There were more than one type of infection in 17 patients, and the infections were polymicrobial in 19 patients.

96% was reported for all HCAIs (2). However, in our study, the causative microorganism isolation rate was lower than in other studies. This may be because of insufficiently equipped laboratories in participant hospitals as well as reluctance to obtain culture samples. Failure to identify causative microorganism may prolong the use of empiric antibiotics and thus increase the risk of downstream resistance.

Pseudomonas aeruginosa is a common cause of severe infections (e.g., pneumonia, sepsis, and wound infections) in ICUs and has been consistently reported as the most frequent cause of pneumonia in Canadian and European studies (5,10). In this study, *P. aeruginosa* was the most frequently isolated microorganism in all HCAIs, including cases of pneumonia and VAP. Furthermore, antimicrobial resistance among *Pseudomonas* species is increasing. Surprisingly, carbapenem susceptibility rates among *P. aeruginosa* isolates in this study were higher than those in previous national studies (71% versus 48–64%, respectively) (13,14). However, these findings may vary according to ICU and patient profiles. *Acinetobacter* infection rates in ICUs are also increasing due to resistance to commonly used antibiotics (15). *Acinetobacter* species isolated from pneumonia patients represented the second most common causative agent in this study. Ten of 12 *Acinetobacter* isolates tested were susceptible to colistin, and 2 were intermediately susceptible. However, the uncontrolled use of colistin may limit its effectiveness against *Acinetobacter* infections in the future.

The widespread use of antibiotics is associated with the development of resistance to antimicrobial agents (16). In our study, 247 of the 327 patients (75%) received antibiotics, and 146 patients (44%) were treated with more than 1 agent. These rates were similar to antibiotic use ratios reported in other contries (38–79%) (2,6,8,17,18). In addition, third-generation cephalo-

Table 4. Risk factors for PICU-acquired healthcare-associated infections

Risk factor	OR[1]	95% CI[2]	*P* value[3]
	Univariate analysis		
Hospital type (university or training/ research hospital versus state hospital)	3.4	1.9–6.2	0.0001[3]
Sex (male)	1.4	0.9–2.3	0.14
Age (≤12 months)	1.1	0.7–1.7	0.6
PICU stay (>7 days)	4.9	2.9–8.4	<0.00001[3]
Central venous catheter	3.3	1.9–5.5	0.00001[3]
Central venous catheter duration (>7 days)	3.3	1.4–7.7	0.004[3]
Urinary catheter	2.2	1.3–3.6	0.001[3]
Urinary catheter duration (>7 days)	4.4	1.9–10.1	<0.00001[3]
Endotracheal tube	4.4	2.6–7.2	0.00001[3]
Endotracheal tube duration (>7 days)	1.4	0.6–3.1	0.3
Mechanical ventilation	4.4	2.7–7.3	0.00001[3]
Mechanical ventilation duration (>7 days)	1.1	0.5–2.2	0.6
Total parenteral nutrition (TPN)	2.5	1.4–4.5	0.0005[3]
TPN duration (>7 days)	6.2	2.2–17.1	<0.00001[3]
Nasogastric feeding tube	3.4	2.0–6.0	0.00001[3]
Nasogastric feeding tube duration (>7 days)	2.5	1.4–4.6	0.001[3]
	Multivariate analysis		
Hospital type (university or training/ research hospital versus state hospital)	2.7	1.3–5.5	0.005[3]
Sex (male)	2.2	1.1–4.2	0.015[3]
PICU stay (>7 days)	5.0	2.6–9.6	<0.00001[3]
Mechanical ventilation	3.9	2.0–7.4	<0.00001[3]

[1]: Odds ratio. [2]: Confidence interval. [3]: $P \leq 0.05$.

Table 5. Risk factors for PICU-acquired healthcare-associated infections related mortality

Risk factor	OR[1]	95% CI[2]	*P* value[3]
	Univariate analysis		
Hospital type (university or training/ research hospital versus state hospital)	1.6	0.7–3.8	0.22
Sex (male)	0.5	0.2–1.0	0.04[3]
Age (≤12 months)	1.6	0.8–3.1	0.14
PICU stay (>7 days)	2.1	1.1–4.5	0.03[3]
Central venous catheter	2.0	1.0–4.0	0.03[3]
Central venous catheter duration (>7 days)	0.9	0.3–2.5	0.89
Urinary catheter	3.0	1.5–6.0	0.0007[3]
Urinary catheter duration (>7 days)	2.6	0.9–6.8	0.05[3]
Endotracheal intubation	4.8	2.3–10.4	0.00001[3]
Endotracheal intubation duration (>7 days)	0.9	0.3–2.1	0.82
Mechanical ventilation	4.9	2.2–11.9	0.00001[3]
Mechanical ventilation duration (>7 days)	0.6	0.3–1.5	0.35
TPN	2.1	1.0–4.3	0.03[3]
TPN duration (>7 days)	1.1	0.3–3.7	0.77
Nasogastric feeding tube	10.0	3.1–51.0	0.00001[3]
Nasogastric feeding tube duration (>7 days)	0.9	0.4–1.9	0.9
Hepatic insufficiency	4.4	1.5–12.2	0.0008[3]
Presence of HCAI	3.4	1.6–7.0	0.0002[3]
	Multivariate analysis		
Presence of HCAI	3.9	1.5–10.0	0.005[3]
Sex (male)	0.3	0.2–0.9	0.021[3]
Endotracheal intubation	2.6	1.1–6.4	0.038[3]
Urinary catheter	3.0	1.2–7.1	0.013[3]

[1]: Odds ratio. [2]: Confidence interval. [3]: $P \leq 0.05$.

sporins were the most frequently administered antibiotics (19%) in this study. This is consistent with the European Prevalence of Infection in Intensive Care (EPIC) study results which also reported cephalosporins as the most commonly used antibiotics (17). However, a study among Turkish adults found that the most commonly used antibiotics were aminoglycosides, while amoxicillin-clavulanate was the most common in a Hong Kong study, and penicillin was the most common in Canadian and Italian studies (6,7,10,13). Thus, the excessive use of antibiotics in PICUs in Turkey should be examined given that it is related to increased healthcare costs, the risk of drug interactions, adverse side effects, and the predominance of resistant microorganisms in ICU floras. The characterization of antibiotic communities and mandatory consultations with an infectious disease specialist may help to reduce the excessive use of antimicrobials.

Hospital type (university or training and research hospital versus state hospital), male , PICU stay (>7 days) and mechanical ventilation were identified as independent risk factors for PICU acquired-HCAIs in our study. In addition, surgical procedures, medical devices, antibiotic therapy, tracheostomy, diabetes, length of hospital or PICU stay, and placement in isolation were reported as risk factors for HCAI in many other studies (2,5,6,8,13,19).

Forty-three (13%) patients had died by the 1-month follow-up. Patients with HCAI were more likely to die within this time interval than their uninfected counterparts, and 65% (n = 28) of these deaths were directly related to HCAIs. In addition, the PICU mortality rate in our study was markedly higher than rates reported in American and European studies (5–10%) (2,5). Given that this study reported a high rate of HCAIs in participating PICUs, and that HCAI was found to be an independent risk factor for mortality, the HCAI related mortality rate could be reduced if effective prevention measures were implemented.

PICU nursing personnel and doctor staffing ratio data were not available in our study. However, reduced nursing personnel levels have been associated with an increased risk of PICU-acquired infections in the previous studies (2,20). The recommended ratio of patients to bedside nurses is typically 2:1. This allows the critical care nursing staff to spend several hours per patient per shift collecting information and incorporating it into meaningful patient care (21). Unfortunately, observation of infection-control compliance in 50 PICUs was not possible during this study. There are few studies evaluating hand hygiene compliance in Turkey. For example, Karabey et al. reported that the frequency of hand washing among medical personnel in a Turkish intensive care unit was 12.9% (22). In addition, Sacar et al. observed that hands were washed both before and after venipuncture procedures in 45% of cases (23). In reaction to these low rates, the Turkish Ministry of Health began a national hand hygiene campaign in

2009. Named ''Danger In Your Hands'', the campaign aims to increase hand hygiene compliance.

In conclusion, this study represents the first national, multicenter, and point-prevalence survey of PICU-acquired HCAIs in Turkey. The results of this study revealed a high prevalence of HCAI in Turkey and identified both *P. aeruginosa* and *Acinetobacter* species in participating PICUs. Given these results, awareness of infection control and prevention methods should become a major part of intensive care procedures. However, the high rate of antibiotic use underscores the need to review current antibiotic therapy policies. In light of the 'primum non nocere' principle, the prevention of PICU-acquired HCAI should be a priority for public health policy.

Conflıct of ınterest None to declare.

Appendix The members of Turkish PICU-HCAI Study Group are as follows: Hasan Agin, Rana Isguder, Demet Demirkol, Suleyman Bayraktar, Cevdet Yildirim, Sultan Karagoz, Melek Hamidanoglu, Gunhur Basibuyuk, Ozden Ozgur Horoz, Dincer Yildizdas, Solmaz Celebi, Benhur Sirvan Cetin, Esra Sevketoglu, Bulent Karapinar, Pinar Yazici, Muhterem Duyu, Servet Yel, Ener Cagri Dinleyici, Aziz Polat, Basak Nur Akyildiz, Sonay Aslan, Benan Bayrakci, Selman Kesici, Mehmet Turgut, Fatma Levent Istifli, Muhammed Sukru Paksu, Nazik Asilioglu Yener, Mehmet Davutoglu, Halit Cam, Zeynep Seda Uyan, Agop Citak, Guntulu Sik, Emine Polat, Yasemin Duzceker, Tanil Kendirli, Bilge Aldemir-Kocabas, Caglar Odek, Embiya Dilber, Mehmet Bosnak, Leyla Telhan, Etem Piskin, Nilay Bas, Zahide Yalaki, Yildiz Bilge Daglar, Okan Tugral, Fatih Turna, Yasar Bildirici, Gokhan Kalkan, Oguz Dursun, Tolga Koroglu, Mehmet Burhan Oflaz, Ali Ertug Arslankoylu, Mehmet Cengiz Yakinci, Fesih Aktar, Tugrul Karakus, Metehan Ozen, Tamer Kuyucu, Kadir Serafettin Tekgunduz, Dost Zeyrek, Melike Keser, and Canan Kuzdan.

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