

# The features of infectious diseases departments and anti-infective practices in France and Turkey: a cross-sectional study

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**Abstract** The aim of this study was to assess the infectious diseases (ID) wards of tertiary hospitals in France and Turkey for technical capacity, infection control, characteristics of patients, infections, infecting organisms, and therapeutic approaches. This cross-sectional study was carried out on a single day on one of the weekdays of June 17–21, 2013. Overall, 36 ID departments from Turkey ( $n=21$ ) and France

( $n=15$ ) were involved. On the study day, 273 patients were hospitalized in Turkish and 324 patients were followed in French ID departments. The numbers of patients and beds in the hospitals, and presence of an intensive care unit (ICU) room in the ID ward was not different in both France and Turkey. Bed occupancy in the ID ward, single rooms, and negative pressure rooms were significantly higher in France.

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The presence of a laboratory inside the ID ward was more common in Turkish ID wards. The configuration of infection control committees, and their qualifications and surveillance types were quite similar in both countries. Although differences existed based on epidemiology, the distribution of infections were uniform on both sides. In Turkey, anti-Gram-positive agents, carbapenems, and tigecycline, and in France, cephalosporins, penicillins, aminoglycosides, and metronidazole were more frequently preferred. Enteric Gram-negatives and hepatitis B and C were more frequent in Turkey, while human immunodeficiency virus (HIV) and streptococci were more common in France ( $p < 0.05$  for all significances). Various differences and similarities existed in France and Turkey in the ID wards. However, the current scene is that ID are managed with high standards in both countries.

## Introduction

France and Turkey are two large countries at the Mediterranean basin. The population of France, the largest country in the European Union, is around 66 million today ([http://en.wikipedia.org/wiki/Demographics\\_of\\_France#cite\\_note-metro-4](http://en.wikipedia.org/wiki/Demographics_of_France#cite_note-metro-4)). Turkey, located at the cross-section of three continents with close linkages to these geographical areas, has a population of 74 million according to 2010 data ([http://en.wikipedia.org/wiki/Demographics\\_of\\_Turkey#cite\\_note-1](http://en.wikipedia.org/wiki/Demographics_of_Turkey#cite_note-1)).

France is a developed country and has the world's seventh largest economy. On the other hand, Turkey is a strictly reorganizing country in the last 30 years and has the world's 15th largest economy ([http://databank.worldbank.org/data/download/GDP\\_PPP.pdf](http://databank.worldbank.org/data/download/GDP_PPP.pdf)).

The infrastructures and technical capacities of infectious diseases (ID) departments, infection control (IC) and prevention organizations, epidemiology of infections, and antibiotic consumption habits have evolved according to their own historical experiences in both countries. The current designs for these issues are quite interrelated to lots of parameters, including healthcare systems, financial concepts, postgraduate training infrastructures, the epidemiology of infections and resistant pathogens, and the traditional medical point of views. Thus, this cross-sectional study was performed in both Turkey and France to disclose the ongoing ID practices in the ID wards, to delineate the effectiveness of their anti-infective management facilities, and to provide comparisons for these two large countries located at the opposite sides of Europe.

## Methods

This cross-sectional point prevalence study was carried on a single day in June 17–21, 2013. Two questionnaires related to

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patients and ID departments were sent to participant centers. The first questionnaire evaluated the features of technical capacity of the ward and IC organization, along with characteristics of the ward personnel. The second questionnaire assessed the characteristics of patients, the quality of service provided, supportive care, characteristics of ID, infecting microorganisms, and treatment issues.

No data from military hospitals in both countries were enrolled. The cities where the participant centers were located are shown in Fig. 1. On the study day, each hospitalized patient in the ID ward was visited by an ID specialist in each center. The data were inserted into separate MS Office Excel files, one related to the ID ward and the other for patient characteristics. The overall database was produced by merging the individual Excel files.

SPSS 15.0 (SPSS Inc., Chicago, IL, USA) for Windows Evaluation Version was used for the statistical analysis. Descriptive statistics were presented as mean  $\pm$  standard deviations, and frequency and percentage. Student's *t*-test was used to compare continuous variables. Pearson's chi-squared or Fisher's exact tests were used to compare categorical variables, as appropriate. A *p*-value of  $<0.05$  was accepted as being statistically significant.

## Results

Overall, 36 ID departments from Turkey ( $n=21$ ) and France ( $n=15$ ) were involved in this study. On the study day, 273 patients were hospitalized in Turkish and 324 patients were hospitalized in French ID departments. The mean age of the patients was  $56.81 \pm 19.42$  years. The mean duration of hospitalization for the patients in the study was  $13.78 \pm 34.82$  days. The mean body temperature of the patients on the study day was  $36.80 \pm 1.71$  °C, and the means of the leukocyte count and

erythrocyte sedimentation rate (ESR) on admission were  $11,022.81 \pm 24,191.82/\text{mm}^3$  and  $49.13 \pm 40.42$  mm/h, respectively.

### Infrastructure of ID wards

The mean number of patients ( $25.6 \pm 13.7$  vs.  $13.4 \pm 6.4$ ) and the occupancy rate in the ID ward ( $25.6/25.9$  vs.  $13.4/18.0$ ) were significantly higher in favor of France ( $p < 0.05$  for all). The presence of negative pressure rooms was significantly more frequent in French ID wards compared to Turkish ID wards (8 of 15 centers vs. 3 of 21 centers), while the presence of a microbiology laboratory inside the ID wards (15 of 21 centers vs. 3 of 15 centers) was significantly more frequent in Turkey ( $p < 0.05$  for both). The features of ID departments are presented in Table 1.

### Infection control and prevention

The procedures, quality standards, and requirements related to IC and prevention infrastructures in both countries were apparently comparable. However, both invasive device-related surveillance (21 of 21 centers vs. 10 of 15 centers) and surveillance of immunization for healthcare workers (HCWs) (20 of 21 centers vs. 10 of 15 centers) were performed significantly more frequently in Turkish hospitals ( $p < 0.05$  for both). The data related to IC are presented in Table 2.

### Etiological diagnoses

There were 248 and 321 infections as the primary diagnoses in Turkey and France, respectively. Bone and joint infections [18 (7.2 %) vs. 47 (14.6 %)], pneumonia [8 (3.2 %) vs. 50 (15.6 %)], sepsis of unknown origin [11 (4.4 %) vs. 31

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**Fig. 1** The cities where the participant centers in this study are located in France and Turkey

(9.7 %)], human immunodeficiency virus (HIV) infection [10 (4 %) vs. 44 (13.7 %)], and infective endocarditis [3 (1.2 %) vs. 27 (8.4 %)] were significantly more frequent in France ( $p < 0.05$  for all). On the other hand, skin and soft tissue infections [39 (15.7 %) vs. 26 (8.1 %)], viral hepatitis [23 (9.3 %) vs. 3 (0.9 %)], brucellosis [7 (2.8 %) vs. 0 (0 %)], urinary tract infection [47 (19.0 %) vs. 31 (9.7 %)], diabetic foot infection [17 (6.9 %) vs. 3 (0.9 %)], and Crimean-Congo hemorrhagic fever (CCHF) [7 (2.8 %) vs. 0 (0 %)] were significantly more frequent in Turkish hospitals ( $p < 0.05$  for

all). The distribution of other infections was not different. The characteristics of the patients are presented in Table 3.

**Antimicrobial therapy**

On the study day, 215 (78.7 %) out of 273 patients and 251 (75.5 %) out of 324 patients were given antibiotics in Turkey and France, respectively ( $p = 0.705$ ). French ID specialists preferred to use antibiotics based on cultures and

**Table 1** The features of infectious diseases (ID) departments on the study day in Turkey and France\*

	Turkey	France	<i>p</i> -Value
Total number of participant centers	21	15	
Hospital capacity			
Mean number of hospitalized patients	763.4±351.6	710.6±408.9	0.712
Mean number of hospital beds	1,002.4±446.4	1,154.6±587.9	0.390
The ID wards			
Number of patients in the ID wards	273	324	
Mean number of patients in the ID wards	13.4±6.4	25.6±13.7	0.005
Bed occupancy rates in the ID wards	13.4/18.0	25.6/25.9	0.008
Status of the intensive care unit (ICU)			
Presence of ICU room in the ID ward	4 (19.0)	1 (6.7)	0.376
Total number of ICU rooms in the ID wards	13 (61.9)	6 (40.0)	0.194
Total bed number of ICU rooms in the ID wards	22	6	
Status of the negative pressure rooms (NPRs)			
Total number of centers with an NPR	3 (14.3)	8 (53.3)	0.025
Total number of NPRs	7	30	
Presence of room oxygenation system	20 (95.2)	14 (93.3)	1.000
Microbiology laboratory in the ID wards**	15 (71.4)	3 (20.0)	0.002

\*Data are presented as mean± standard deviation (SD) or no. or no. (%)

\*\*Pulsed-field gel electrophoresis (PFGE) 1, real-time polymerase chain reaction (RT-PCR) 4

**Table 2** Comparison of the features of infection control (IC) organization in Turkey and France

Variable	Turkey, <i>n</i> (%)	France, <i>n</i> (%)	<i>p</i> -Value
Presence of IC committee	21 (100.0)	15 (100.0)	
Presence of IC nurse	21 (100.0)	14 (93.3)	0.417
Total number of IC nurses	82	35	
Presence of a certified IC nurse	21 (100.0)	12 (80.0)	0.064
Surveillance types			
By an IC nurse	21 (100.0)	14 (93.3)	0.417
Active prospective patient-based	17 (81.0)	11 (73.3)	0.694
Active prospective laboratory-based	17 (81.0)	14 (93.3)	0.376
Target-based	18 (85.7)	13 (86.7)	1.000
Invasive device-related	21 (100.0)	10 (66.7)	0.008
Management of wastes*	20 (95.2)	15 (100.0)	1.000
Cleaning of patient rooms			
Daily	21 (100.0)	15 (100.0)	
Due to IC committee orders	21 (100.0)	14 (93.3)	0.417
Patient rooms with a sink/patient rooms	199/218	294/309	0.076
Use of liquid soap in the wards	21 (100.0)	14 (93.3)	0.417
Use of supplementary material in the wards			
Paper towels	18 (85.7)	13 (86.7)	1.000
Hand antiseptics in each room	17 (81.0)	14 (93.3)	0.376
PPE	20 (95.2)	15 (100.0)	1.000
Easy access to PPE	9 (42.9)	11 (73.3)	0.070
Mean of hand antiseptics consumed monthly (liter)	28.4	29.5	0.924
Surveillance of HCWs' vaccination	20 (95.2)	6 (40.0)	<0.001

PPE personal protective equipment, HCW healthcare worker

\*Separation of domestic, medical, and sharp wastes during disposal

susceptibility testing more frequently [91 (42.3 %) vs. 138 (55.0 %)], while Turkish clinicians used antimicrobials significantly more often on the empirical basis [121 (56.3 %) vs. 109 (43.4 %)] ( $p < 0.05$  for both). The uses of antibiotics in both countries are presented in Table 4.

#### Distribution of etiological agents

The etiological agent was confirmed microbiologically in 147 patients in Turkey and in 214 patients in France. The infecting organisms are presented in Table 5.

#### Discussion

In this study, the participant hospitals were quite similar and comparable in France and Turkey according to their patients and bed capacities. The presence of an intensive care unit (ICU) room and room oxygenation systems were apparently similar in the ID wards in both countries. Nevertheless, the presence of negative pressure rooms, which are used to prevent cross-contaminations [1], was significantly higher in France than in Turkey. On the other hand, the presence of microbiology laboratories in Turkish ID wards was more

common than in the French ID wards. The probable reason for this was that the ID specialization was established on internal medicine training followed by ID fellowship in France [2], while Turkish specialists have a training based on integrated clinical microbiology and ID [3]. Although a central microbiology laboratory existed inside the hospitals, Turkish ID physicians preferred to perform basic and rapid tests like stains, direct microscopy, and agglutination tests in their own laboratories to prevent delays.

Surveillance, prevention, and control of infections are core activities for the ID specialists [4]. The presence of IC committees, IC nurses and their qualifications, and surveillance types performed were comparable and in accordance with the current recommendations in both France and Turkey. The only difference was that invasive device-associated surveillance, which reflects the most critical changes in hospital epidemiology and provides comparisons between the institutions [5], was performed more commonly in Turkish hospitals. This could be related to the strict regulations to survey nosocomial infections compared to the yearly evaluation in French hospitals. On the other hand, parameters related to hand hygiene, the core activity for IC control [6], the availability of personal protective equipment and their easy access, daily cleaning

**Table 3** Characteristics of infections in the ID wards

Variable	Turkey ( <i>n</i> =248), <i>n</i> (%)	France ( <i>n</i> =321), <i>n</i> (%)	<i>p</i> -Value
Source of infections*			
Community	197 (79.4)	258 (80.4)	0.800
Hospital	32 (12.9)	36 (11.2)	
Healthcare-associated	19 (7.7)	27 (8.4)	
Severity of illness on the study day**			
Absence of clinical sepsis	254 (93.0)	272 (84.0)	0.001
Sepsis	18 (6.6)	49 (15.1)	0.001
Severe sepsis	0 (0.0)	2 (0.6)	0.503
Septic shock	1 (0.4)	1 (0.3)	1.000
Infections*			
Bone/joint	18 (7.2)	47 (14.6)	0.006
Skin and soft tissue	39 (15.7)	26 (8.1)	0.005
Viral hepatitis	23 (9.3)	3 (0.9)	<0.001
Central nervous system	16 (6.4)	16 (5.0)	0.451
Tuberculosis	12 (4.8)	18 (5.6)	0.684
Brucellosis	7 (2.8)	0 (0.0)	0.003
Pneumonia	8 (3.2)	50 (15.6)	<0.001
Sepsis, undetermined etiology	11 (4.4)	31 (9.7)	0.018
Human immunodeficiency virus infection	10 (4.0)	44 (13.7)	<0.001
Urinary tract infection	47 (19.0)	31 (9.7)	0.001
Upper respiratory tract infection	3 (1.2)	2 (0.6)	0.657
Diabetic foot infection	17 (6.9)	3 (0.9)	<0.001
Malaria	1 (0.4)	2 (0.6)	1.000
Gastroenteritis	2 (0.8)	1 (0.3)	0.583
Colitis	0 (0.0)	4 (1.2)	0.136
Arbovirus infection	1 (0.4)	0 (0.0)	0.436
Abscesses	8 (3.2)	12 (3.7)	0.742
Measles	3 (1.2)	0 (0.0)	0.082
Cytomegalovirus infections	3 (1.2)	2 (0.6)	0.657
Infective endocarditis	3 (1.2)	27 (8.4)	<0.001
Syphilis	2 (0.8)	0 (0.0)	0.190
Cholangitis/cholecystitis	3 (1.2)	0 (0.0)	0.082
Crimean-Congo hemorrhagic fever	7 (2.8)	0 (0.0)	0.003
Surgical site infection	4 (1.6)	2 (0.6)	0.412

\*Primary diagnoses

\*\*All patients

procedures, one of the key points in reducing hospital-acquired infections [7], and separation of wastes during disposal were quite reasonable in both France and Turkey. The surveillance of HCWs for vaccination, which safeguards the personnel and protects patients from being infected through infected workers [8], was significantly higher in Turkish hospitals. However, the poor efficacy of this strategy has long been debated in Turkey [9]. Likewise, HCWs' vaccination monitoring is reported not to be organized satisfactorily in France, except the mandatory hepatitis B virus (HBV) immunization campaign. As an example, the flu vaccination rate was reported to be less than 30 % in France in 2009 ([http://www.invs.sante.fr/Publications-et-outils/Rapports-et-](http://www.invs.sante.fr/Publications-et-outils/Rapports-et-syntheses/Maladies-infectieuses/2011/Vaccinations-chez-les-soignants-des-etablissements-de-soins-de-France-2009)

[syntheses/Maladies-infectieuses/2011/Vaccinations-chez-les-soignants-des-etablissements-de-soins-de-France-2009](http://www.invs.sante.fr/Publications-et-outils/Rapports-et-syntheses/Maladies-infectieuses/2011/Vaccinations-chez-les-soignants-des-etablissements-de-soins-de-France-2009)). Thus, HCWs are believed to be undervaccinated in both countries.

The sources of infections and the types of infections were quite similar in both countries. However, French ID specialists followed bone and joint infections, pneumonia, sepsis with unknown etiology, HIV infection, and infective endocarditis, while Turkish clinicians treated diabetic foot infections, skin and soft tissue infections, urinary tract infections, brucellosis, viral hepatitis, and CCHF more frequently. For the Turkish side, CCHF and brucellosis are endemic and problematic issues in Turkey [10]. France is officially free of endogenous

**Table 4** The antibiotics used in the ID departments on the study day in Turkey and France

	Turkey (n=215), n (%)	France (n=251), n (%)	p-Value	Overall
Use of antibiotics				
Culture/agent-based	91 (42.3)	138 (55.0)	0.006	229
Empirical	121 (56.3)	109 (43.4)	0.006	230
Prophylaxis	3 (1.4)	4 (1.6)	0.861	7
Antibiotics				
Anti-Gram-positive	31 (14.4)	21 (8.4)	0.039	52
Cephalosporins	35 (16.3)	70 (27.9)	0.003	105
Carbapenems	50 (23.3)	16 (6.4)	<0.001	66
BL/BLI	33 (15.3)	37 (14.7)	0.855	70
Ciprofloxacin	13 (6.0)	25 (10.0)	0.124	38
Penicillin/ampicillin	5 (2.3)	49 (19.5)	<0.001	54
Aminoglycoside	6 (2.8)	26 (10.4)	0.001	32
Antifungals	9 (4.2)	7 (2.8)	0.409	16
Respiratory quinolone	5 (2.3)	7 (2.8)	0.753	12
Metronidazole	2 (0.9)	18 (7.2)	0.001	20
Colistin	1 (0.5)	3 (1.2)	0.628	4
Tigecycline	9 (4.2)	2 (0.8)	0.016	11
Anti-TB	20 (9.3)	12 (4.8)	0.054	32
Antiviral	8 (3.7)	10 (4.0)	0.883	18
Doxycycline	7 (3.3)	2 (0.8)	0.088	9
Rifampicin	9 (4.2)	3 (1.2)	0.042	12
Anti-Gram-positive antibiotics: vancomycin, linezolid, daptomycin, and teicoplanin	4 (1.9)	13 (5.2)	0.057	17
Others	17 (7.9)	6 (2.4)	NA	23

brucellosis, and recent CCHF outbreaks in Turkey and the Balkans demonstrated the transmission into the European area [11]. On the other hand, HIV infection is already known to be much more prevalent in France (<http://www.avert.org/european-hiv-aids-statistics.htm>), but, surprisingly, not hepatitis B or C. In contrast, Turkish ID specialists treat chronic viral hepatitis cases according to the legal regulations for reimbursement and are quite active on this issue. However, the differences in aforementioned diagnoses were probably related to patient flow or due to the mutual concepts with other disciplines in patient sharing in both countries. Incidences of diseases, access to treatment, and cultural behaviors for hospitalizing patients may be other possible explanations.

Antibiotic use varies according to time and treatment locations [12]. In this study, the ratio of patients receiving antibiotics in the ID wards in both countries did not differ significantly. However, Turkish ID physicians prescribed a broad spectrum of antibiotics more frequently compared to French specialists. Anti-Gram-positive agents, carbapenems, and tigecycline were used significantly more often in Turkish ID wards. According to a nationwide survey, broad-spectrum antibiotic use was an issue of concern in the management of infections in ICUs in Turkey [13]. However, a relatively

narrow spectrum of drugs like cephalosporins, penicillins, aminoglycosides, and metronidazole was more frequently preferred in France. The most likely reason for this difference may be the predominance of multiple and extensively resistant pathogens like *Acinetobacter* species, extended-spectrum beta-lactamase (ESBL)-positive enteric pathogens, and *Pseudomonas aeruginosa* in Turkish hospitals [10]. The current trend in medical practice in Turkey is that, while *Staphylococcus aureus* disappears from Turkish hospitals, *Acinetobacter* replaces it [14–16]. When the infecting bacteria were taken into consideration, streptococci were more frequent in France and enteric Gram-negatives in Turkey. Although the rates of ESBL-producing Gram-negative bacteria were less than 5 % in community-acquired infections, and less than 15 % in nosocomial infections in France ([http://www.onerba.org/IMG/pdf/ONERBA\\_rap2009-10\\_CH6\\_sommaire.pdf](http://www.onerba.org/IMG/pdf/ONERBA_rap2009-10_CH6_sommaire.pdf)), the rates of ESBL-producers in the hospitals were exceedingly high in Turkey [10]. Consequently, the resistance issue may contribute to the use of carbapenems in Turkish hospitals. Our findings correlate with another French report on antibiotic use in France with less carbapenems and more cephalosporins, penicillins, and aminoglycosides [17]. However, the frequent use of anti-Gram-positive agents may not be directly related to the requirement of these antibiotics in

**Table 5** The distribution of confirmed microorganisms as an infectious agent

	Turkey, <i>n</i> (%)	France, <i>n</i> (%)	<i>p</i> -Value
Enteric Gram-negative bacilli	42 (28.6)	36 (16.8)	0.008
<i>Pseudomonas aeruginosa</i>	10 (6.8)	12 (5.6)	0.641
<i>Acinetobacter baumannii</i>	1 (0.7)	0 (0.0)	0.407
<i>Aggregatibacter actinomycetemcomitans</i>	0 (0.0)	1 (0.5)	1.000
<i>Haemophilus</i> spp.	1 (0.7)	2 (0.9)	1.000
<i>Brucella</i> spp.	7 (4.8)	0 (0.0)	0.002
<i>Neisseria</i> spp.	0 (0.0)	1 (0.5)	1.000
<i>Legionella</i> spp.	0 (0.0)	2 (0.9)	0.516
<i>Campylobacter</i> spp.	0 (0.0)	3 (1.4)	0.274
<i>Leptospira</i> spp.	0 (0.0)	(0.5)	1.000
<i>Staphylococcus aureus</i>	19 (12.9)	28 (13.1)	0.965
Coagulase-negative staphylococci	3 (2.0)	5 (2.3)	1.000
<i>Streptococcus</i> spp.	2 (1.4)	29 (13.6)	<0.001
<i>Enterococcus</i> spp.	4 (2.7)	11 (5.1)	0.258
<i>Corynebacterium</i> spp.	0 (0.0)	1 (0.5)	1.000
<i>Bacillus cereus</i>	0 (0.0)	1 (0.5)	1.000
<i>Clostridium</i> spp.	0 (0.0)	3 (1.4)	0.274
<i>Mycobacterium tuberculosis</i>	9 (6.1)	17 (7.9)	0.511
<i>Mycobacterium avium</i> complex	1 (0.7)	3 (1.4)	0.649
<i>Treponema pallidum</i>	1 (0.7)	0 (0.0)	0.407
<i>Plasmodium falciparum</i>	1 (0.7)	2 (0.9)	1.000
<i>Aspergillus</i> spp.	1 (0.7)	1 (0.5)	1.000
<i>Candida</i> spp.	2 (1.4)	3 (1.4)	1.000
<i>Cryptococcus</i> spp.	0 (0.0)	1 (0.5)	1.000
Hepatitis B and C viruses	23 (15.6)	3 (1.4)	<0.001
Human immunodeficiency virus	10 (6.8)	44 (20.6)	<0.001
Rubeola virus	3 (2.0)	0 (0.0)	0.067
Crimean-Congo hemorrhagic fever virus	7 (4.8)	0 (0.0)	0.002
Herpes simplex virus	1 (0.7)	0 (0.0)	0.407
Cytomegalovirus	0 (0.0)	2 (0.9)	0.516
Jacob-Creutzfeldt virus	0 (0.0)	1 (0.5)	1.000
Enterovirus	0 (0.0)	1 (0.5)	1.000
Total	147	214	

Turkey. One aspect of our data which supports this point of view was the rate of identifying the infecting agent by culture, and subsequent treatment due to microbiological data appears to be lower in Turkey than it is in France. Consequently, Turkish ID physicians use antibiotics on an empirical basis more frequently and, thus, this style may limit the de-escalation of a broad spectrum of antibiotics. Other than that, Turkey is a restructuring country and evolving legal procedures on malpractice issues are strictly enforcing clinicians for possible liability, which may facilitate the use of a broad spectrum of antibiotics.

The major limitation of this study was that the results were merely declarative, based on voluntary participation. In conclusion, both France and Turkey have established their ID departments according to their fundamental needs and

historical evolutions. Today, the ID departments in both countries have common and different characteristics. Although Turkish ID departments have greater access to an internal laboratory, they less frequently document the infecting pathogens and the discrepancies in antibiotic use between both countries are striking. These differences may, indeed, be related to differences in the epidemiology of resistance and the diagnostic differences. But for many other parameters related to anti-infective management in the ID wards in France and Turkey, both countries manage the routine medical work in a satisfactory and similar fashion.

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## References

- Humphreys H (2007) Control and prevention of healthcare-associated tuberculosis: the role of respiratory isolation and personal respiratory protection. *J Hosp Infect* 66(1):1–5
- Cooke FJ, Choubina P, Holmes AH (2005) Postgraduate training in infectious diseases: investigating the current status in the international community. *Lancet Infect Dis* 5(7):440–449
- Erdem H, Tekin-Koruk S, Koruk I, Tozlu-Keten D, Ulu-Kilic A, Oncul O, Guner R, Birengel S, Mert G, Nayman-Alpat S, Eren-Tulek N, Demirdal T, Elaldi N, Ataman-Hatipoglu C, Yilmaz E, Mete B, Kurtaran B, Ceran N, Karabay O, Inan D, Cengiz M, Sacar S, Yucesoy-Dede B, Yilmaz S, Agalar C, Bayindir Y, Alpay Y, Tosun S, Yilmaz H, Bodur H, Erdem HA, Dikici N, Dizbay M, Oncu S, Sezak N, Sari T, Sipahi OR, Uysal S, Yeniiz E, Kaya S, Ulcay A, Kurt H, Besirbellioglu BA, Vahaboglu H, Tasova Y, Usluer G, Arman D, Diktas H, Ulusoy S, Leblebicioglu H (2011) Assessment of the requisites of microbiology based infectious disease training under the pressure of consultation needs. *Ann Clin Microbiol Antimicrob* 10:38
- Sande MA (2006) Postgraduate training in infectious diseases. *Lancet Infect Dis* 6(2):69
- Richards MJ, Edwards JR, Culver DH, Gaynes RP (1999) Nosocomial infections in medical intensive care units in the United States. National Nosocomial Infections Surveillance System. *Crit Care Med* 27(5):887–892
- Pittet D, Dharan S, Touveneau S, Sauvan V, Perneger TV (1999) Bacterial contamination of the hands of hospital staff during routine patient care. *Arch Intern Med* 159(8):821–826
- Hughes GJ, Nickerson E, Enoch DA, Ahluwalia J, Wilkinson C, Ayers R, Brown NM (2013) Impact of cleaning and other interventions on the reduction of hospital-acquired *Clostridium difficile* infections in two hospitals in England assessed using a breakpoint model. *J Hosp Infect* 84(3):227–234
- [No authors listed] (1997) Immunization of health-care workers: recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC). *MMWR Recomm Rep* 46(RR-18):1–42
- Savas E, Tanriverdi D (2010) Knowledge, attitudes and anxiety towards influenza A/H1N1 vaccination of healthcare workers in Turkey. *BMC Infect Dis* 10:281
- Erdem H, Akova M (2012) Leading infectious diseases problems in Turkey. *Clin Microbiol Infect* 18(11):1056–1067
- Zehender G, Ebranati E, Shkjezi R, Papa A, Luzzago C, Gabanelli E, Lo Presti A, Lai A, Rezza G, Galli M, Bino S, Ciccozzi M (2013) Bayesian phylogeography of Crimean-Congo hemorrhagic fever virus in Europe. *PLoS One* 8(11):e79663
- Boyles TH, Whitelaw A, Bamford C, Moodley M, Bonorchis K, Morris V, Rawoot N, Naicker V, Lusakiewicz I, Black J, Stead D, Lesosky M, Raubenheimer P, Dlamini S, Mendelson M (2013) Antibiotic stewardship ward rounds and a dedicated prescription chart reduce antibiotic consumption and pharmacy costs without affecting inpatient mortality or re-admission rates. *PLoS One* 8(12):e79747
- Erdem H, Inan A, Altundis S, Carevic B, Askarian M, Cottle L, Beovic B, Csomos A, Metodiev K, Ahmetagic S, Harxhi A, Raka L, Grozdanovski K, Nechifor M, Alp E, Bozkurt F, Hosoglu S, Balik I, Yilmaz G, Jereb M, Moradi F, Petrov N, Kaya S, Koksali I, Aslan T, Elaldi N, Akkoyunlu Y, Moravveji SA, Csato G, Szedlak B, Akata F, Oncu S, Grgic S, Cosic G, Stefanov C, Farrokhnia M, Müller M, Luca C, Koluder N, Korten V, Platikanov V, Ivanova P, Soltanipour S, Vakili M, Farahangiz S, Afkhamzadeh A, Beeching N, Ahmed SS, Cami A, Shiraly R, Jazbec A, Mirkovic T, Leblebicioglu H, Naber K (2014) Surveillance, control and management of infections in intensive care units in Southern Europe, Turkey and Iran—a prospective multicenter point prevalence study. *J Infect* 68(2):131–140
- Erdem H, Dizbay M, Karabay S, Kaya S, Demirdal T, Koksali I, Inan A, Erayman I, Ak O, Ulu-Kilic A, Karasahin O, Akbulut A, Elaldi N, Yilmaz G, Candevir A, Gul HC, Gonen I, Oncul O, Aslan T, Azak E, Tekin R, Kocak Tufan Z, Yenilmez E, Arda B, Gungor G, Cetin B, Kose S, Turan H, Akalin H, Karabay O, Dogan-Celik A, Albayrak A, Guven T, Celebi G, Ozgunes N, Ersoy Y, Sirmatel F, Oztoprak N, Balkan II, Bayazit FN, Ucmak H, Oncu S, Ozdemir D, Ozturk-Engin D, Bitirgen M, Tabak F, Akata F, Willke A, Gorenec L, Ahmed SS, Tasova Y, Ulcay A, Dayan S, Esen S, Leblebicioglu H, Altun B, Unal S (2013) Withdrawal of *Staphylococcus aureus* from intensive care units in Turkey. *Am J Infect Control* 41(11):1053–1058
- Inan A, Ozgultekin A, Akcay SS, Engin DO, Turan G, Ceran N, Dincer E, Aksaray S, Goktas P, Erdem I (2012) Alterations in bacterial spectrum and increasing resistance rates in isolated microorganisms from device-associated infections in an intensive care unit of a teaching hospital in Istanbul (2004–2010). *Jpn J Infect Dis* 65(2):146–151
- Tunger Ö, Keleş G, Şebnem SŞ, Çetin ÇB, Gazi H, Sümeysa SÇ, Aras İ, Çivi M (2013) Risk factors for nosocomial *Acinetobacter* bacteremia: a case-control study of intensive care unit patients. *J Microbiol Infect Dis* 3(4):157–162
- Robert J, Péan Y, Varon E, Bru JP, Bedos JP, Bertrand X, Lepape A, Stahl JP, Gauzit R; Société de pathologie infectieuse de langue française (SPILF); Observatoire national de l'épidémiologie de la résistance bactérienne aux antibiotiques (ONERBA); Surveillance de la prescription des antibiotiques (SPA) Group (2012) Point prevalence survey of antibiotic use in French hospitals in 2009. *J Antimicrob Chemother* 67(4):1020–1026