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Original article

Staffing for infectious diseases, clinical microbiology and infection control in hospitals in 2015: results of an ESCMID member survey☆

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ABSTRACT

We aimed to assess the current status of infectious diseases (ID), clinical microbiology (CM) and infection control (IC) staffing in hospitals and to analyse modifiers of staffing levels. We conducted an Internet-based survey of European Society of Clinical Microbiology and Infectious Diseases members and affiliates, collecting data on hospital characteristics, ID management infrastructure, ID/IC-related activities and the ratio of physicians per 100 hospital beds. Regression analyses were conducted to examine factors associated with the physician–bed ratio. Five hundred sixty-seven hospital responses were collected between April and June 2015 from 61 countries, 81.2% (384/473) from Europe. A specialized inpatient ward for ID patients was reported in 58.4% (317/543) of hospitals. Rates of antibiotic stewardship programmes (ASP) and surveillance activities in survey hospitals were high, ranging from 88% to 90% for local antibiotic guidelines and 70% to 82% for programmes monitoring hospital-acquired infections. The median ID/CM/IC physician per 100 hospital beds ratio was 1.12 (interquartile range 0.56–2.13). In hospitals performing basic ASP and IC (including local antibiotic guidelines and monitoring device-related or surgical site infections), the ratio was 1.21 (interquartile range 0.57–2.14). Factors independently associated with higher ratios included compliance with European Union of Medical Specialists standards, smaller hospital size, tertiary-care institution, presence of a travel clinic, beds dedicated to ID and a CM unit. More than half of respondents estimated that additional staffing is needed for appropriate IC or ID management. No standard of physician staffing for ID/CM/IC in hospitals is available. A ratio of 1.21/100 beds will serve as an informed point of reference enabling ASP and infection surveillance.
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Introduction

Infectious disease (ID), clinical microbiology (CM) and infection control (IC) clinicians provide for patient safety in hospitals by enabling judicious antibiotic use and prevention of hospital-acquired infections in addition to providing clinical expertise on a patient-by-patient basis. Interventions such as antibiotic stewardship programmes (ASP) [1–10], decision support systems for antibiotic treatment [11–16], campaigns promoting hand hygiene [17], implementation of bundle interventions to prevent ventilator-associated pneumonia and central line–associated bloodstream infections have all been shown to improve patient outcomes, as have ID consultations [18–21].

Understandably, providing a comprehensive IC and management service in the hospital requires time, efforts and manpower. Yet there is no standard for the personnel–bed ratio of practitioners that is required for the optimal conduct of this service. The pivotal study on the efficacy of nosocomial IC (SENIC) conducted in the 1970s established a standard of 1:250 IC nurses per acute hospital beds for optimal infection prevention [22]. With increasing complexity of patients' care this figure has been recently challenged and ratios of 1:100 beds in acute care and 1:150 to 250 beds in long-term care facilities have been suggested [23,24]. For physicians no such standard exists. While recommendations are being made to increase service coverage, such as mandatory implementation of ASP [25] and surveillance and reporting of device-related infections, the manpower required to run such programmes is not defined. In a systematic review of hospital organisation, management and structure for prevention of health-care-associated infections, a recommendation was made that "staffing must be adequate to meet task requirements without leading to excessive workload," but no actual figures were proposed for physician staffing [26]. The European Centre for Disease Prevention and Control (ECDC) provides recommendations for core competencies of IC practitioners, but again without addressing staffing requirements (http://ecdc.europa.eu/en/publications/Publications/infection-control-core-competencies.pdf).

Few data are available on actual staffing rates or requirements. In a survey of representatives of infection-related academic societies in Europe conducted between 2008 and 2009 by the European Society of Clinical Microbiology and Infectious Diseases (ESCMID), the total number of ID or CM specialists per million inhabitants in different countries ranged widely [27]. In the 2011–2012 ECDC surveillance report of European hospitals, the median number of full-time equivalents (FTE) of IC doctors per 250 beds was 0.36 (interquartile range (IQR) 0–0.72) (http://ecdc.europa.eu/en/publications/Publications/healthcare-associated-infections-antimicrobial-use-PPS.pdf). In France, one of the hospital certification indicators specifies the time to be spent by the 'antibiotic expert' to run an ASP (not necessarily an ID physician) as 0.3 FTE per 400 acute care beds (http://www.sante.gouv.fr/IMG/pdf/12_286t0.pdf). However, this is not a universally accepted figure, and the French Task Force on Antibiotic Resistance recently suggested that four FTE 'antibiotic experts' along with one or two FTE pharmacists and 0.5 FTE microbiologists per 1000 acute care beds is needed to properly conduct an ASP based on a survey of staffing existence and requirement [28]. None of these reports described the personnel requirements of a complete ID/IC service per acute care hospital bed.

Standardization of the ID/CM/IC physician–bed ratio may lead to better and more uniform outcomes regarding prevention and treatment of IDs in hospitals. We aimed to provide the current status of staffing for IDs in hospitals and to analyse modifiers of the staffing-to-bed ratio.

Methods

An Internet-based survey was conducted for three months between 1 April to 30 June 2015 (Supplementary File 1). The survey was anonymous but requested hospital identity in order to enable elimination of duplicate responses. Additionally, the online survey client provided ID numbers based on IP address for the respondents which allowed for further identification of duplicate responses. In the case of multiple responses from the same institution, discordant responses were resolved by choosing the response with most answers to the survey questions. The information gathered included (a) data on hospital characteristics, (b) activities relating to antibiotic stewardship, IC and surveillance, (c) the structure of ID/CM/IC services in the hospital and (d) ID/CM/IC personnel data. The survey was developed by an expert panel (consisting of the authors) and piloted amongst these.

All ESCMID regular members, members of ESCMID affiliates, the British Society for Antimicrobial Chemotherapy (BSAC) members and attendees of the 25th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID) in Copenhagen, Denmark were invited to participate. Invitations were conveyed via emails to the ESCMID and BSAC member lists, an announcement in the ESCMID newsletter, electronic boards at the 2015 ECCMID and through the national ID societies of all coauthors (including Austria, Bulgaria, France, Israel, Italy, Slovenia, Spain, Switzerland and the United Kingdom).

Type of hospital was recorded as acute, chronic or rehabilitation and as primary/secondary or tertiary/referral. Structure of ID/CM/IC services in the hospital included presence of a specialized inpatient ID ward, presence of an organized ID consulting service, presence of an independent CM unit and presence of an independent IC unit. ID/CM/IC personnel data included the number of senior physicians (attending), junior physicians (residents/fellows), nurses and other full-time equivalents (FTE) whose person-time is dedicated to ID, CM and IC activities, respectively, the number of clinical pharmacists dedicated to ASP, the number of personnel dedicated to outpatient parenteral antibiotic therapy, the number of other personnel dedicated to ASP and the level of formal training for ID, CM and IC physicians and IC nurses (none/partial/complete/not relevant). Participants' countries were recoded by geographic region (Western Europe, Eastern Europe, Middle East, other) (Supplementary File 2). In addition we classified hospitals by European Union of Medical Specialists (UEMS) compliance (i.e. ESCMID member countries compliant with UEMS recommendations for ID and CM physician training) [27,29] and gross national income per capita (http://data.worldbank.org/indicator/NY.GNP.PCAP.CD). We defined high anticipated antibiotic consumption hospitals as those with an intensive care unit, a haematology department, bone marrow transplantation and a burn unit and high ID physician demand hospitals as institutions with a dedicated ID ward, a travel clinic and at least one other ID clinic. Hospital size was recoded to small (1–199 beds), medium (200–499 beds) and large (500+ beds).

Medians and quartiles were calculated for all continuous variables. A univariate general linear model analysis was performed utilizing the ratio between the total number of infection-related physicians per hospital (combined senior and junior ID + CM + IC) to number of beds per hospital as the outcome (dependent variable). Given that the duties of ID, CM and IC physicians are frequently complementary and the distinctions between them differ widely between countries [27], we chose to assess them together in the analysis of modifiers. As this variable was found to be highly skewed to the right (skewness 6.623, kurtosis 62.158) a $\log_{10}$ transformation was performed, resulting in a near-normal distribution (skewness 0.221, kurtosis 0.475). The exponent$_{10}$ of