SURVEY OF SHEA MEMBERSHIP

Expanding Roles of Healthcare Epidemiology and Infection Control in Spite of Limited Resources and Compensation

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OBJECTIVE. Data on the resources and staff compensation of hospital epidemiology and infection control (HEIC) departments are limited and do not reflect current roles and responsibilities, including the public reporting of healthcare-associated infections. This study aimed to obtain information to assist HEIC professionals in negotiating resources.

METHODS. A 28-question electronic survey was sent via e-mail to all Society for Healthcare Epidemiology of America (SHEA) members in October 2006 with the use of enterprise feedback management solution software. The survey responses were analyzed using Microsoft Excel.

RESULTS. Responses were received from 526 (42%) of 1,255 SHEA members. Of the respondents, 84% were doctors of medicine (MDs) or doctors of osteopathy (DOs), 6% were registered nurses, and 21% had a master of public health or master of science degree. Sixty-two percent were male (median age range, 50–59 years). Their practice locations varied across the United States and internationally. Two-thirds of respondents practiced in a hospital setting, and 63% were the primary or associate hospital epidemiologist. Although 91% provided HEIC services, only 65% were specifically compensated. In cases of antimicrobial management, patient safety, employee health, and emergency preparedness, 75%–80% of respondents provided expertise but were compensated in less than 25% of cases. Of the US-based MD and DO respondents, the median range of earnings was $151,000–$200,000, regardless of their region (respondents selected salary ranges instead of specifying their exact salaries). Staffing levels varied: the median number of physician full-time equivalents (FTEs) was 1.0 (range, 1–5); only about 25% of respondents had 3 or more infection control practitioner FTEs.

CONCLUSIONS. Most professionals working in HEIC have had additional training and provide a wide, growing range of services. In general, only traditional HEIC work is compensated and at levels much less than the time dedicated to those services. Most HEIC departments are understaffed. These data are essential to advocate for needed funding and resources as the roles of HEIC departments expand.

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Healthcare epidemiology and infection control practitioners and departments are facing increasing scrutiny and pressure to protect patients and healthcare workers. Mandated public reporting of healthcare-associated infections, performance standards associated with the Joint Commission patient-safety goals, government accountability, and headlines in the lay press are increasing the visibility of our field. With the public scrutiny, we are being asked to increase efforts to monitor adverse events associated with health care, to intervene and prevent transmission of infections, to change healthcare worker behaviors, and to promote best practices. Yet current data on the responsibilities, resources, and compensation for Society for Healthcare Epidemiology of America (SHEA) members and their hospital epidemiology and infection control (HEIC) departments are limited. Such information is often requested by SHEA members in order to negotiate for additional resources to appropriately staff infection control programs. Data cited often include the 1975 Study on the Efficacy of Nosocomial Infection Control (SENIC), which listed optimal staffing as 1 infection control practitioner (ICP) for every 250 occupied beds.[1]

In the intervening 34 years, the field of infection prevention and control has broadened to encompass additional facilities (eg, ambulatory sites and long-term care facilities) and roles (eg, occupational health, emergency preparedness, antimicrobial management, and healthcare quality), as well as a more complex patient population (eg, solid organ and bone marrow transplantation units, burn units, and neonatal intensive care units). Transmissible infections such as severe acute respiratory syndrome and H1N1 influenza have dem-

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onstrated the vulnerability of healthcare facilities and have forced some governments to rethink how to best develop a cohort of professionals with the skills needed to perform the complex tasks of infection control. Additionally, leadership is needed to create priorities within and to advocate for healthcare epidemiology. There is a growing need to develop a cadre of valued professionals who can provide guidance to institutions in the complicated and changing world of healthcare regulations and reporting.

Recent studies suggest that staffing should be at least twice that recommended in the SENIC.[2-7] However, most institutions have not increased the resources for HEIC to that level. In addition, appropriate financial compensation and administrative support have not recently been evaluated. Some international experts have started the conversation regarding the need for the appropriate background and formal training of healthcare epidemiologists, including integration with other microbiology and infectious diseases specialty training.[8] Additionally, recent publications have emphasized the unmeasured and perhaps underappreciated economic impact of hospital infection prevention and control activities.[9,10]

An attempt to gain current information from the SHEA membership on the responsibilities, resources, and compensation of HEIC departments was initially undertaken at the April 2005 SHEA Annual Scientific Meeting in the form of a printed survey. This survey received a response rate of less than 20%. The survey was shortened and refocused. A modified survey, described here, was launched in October 2006.

OBJECTIVE

Our primary objective was to better understand the responsibilities, resources, and staff compensation of HEIC departments. Our secondary objective was to assist in negotiation for additional resources.

METHODS

Study Population

The eligible study population included all SHEA members as of October 2006, identified through the SHEA member list. Society members include physicians, nurses, microbiologists, and other ICPs.

Subject Recruitment

With the use of enterprise feedback management (EFM) software (Vovici, formerly WebSurveyor), a 28-question electronic survey was sent via e-mail to all subjects in October 2006. Surveys were sent by US mail (for faxed return) for those with returned e-mails. E-mail reminders were sent at 2, 4, 10, 13, and 17 weeks after the survey launch.

Data Collection

Survey questions focused on respondent demographics (eg, age, sex, professional degree, and board certification), training in HEIC, and practice demographics (eg, location, setting, type, size, and specialty units). A printed version of the survey is available in the Appendix, which appears only in the online version of the journal. Location regions were based on modifications to the region classifications used by the Centers for Disease Control and Prevention (CDC) *Morbidity and Mortality Weekly Report*.[11] Data were also collected on professional responsibilities (eg, patient care, HEIC, occupational or employee health, antimicrobial management, emergency preparedness, patient safety, research, administration, and teaching). One subgroup analysis was performed on financial compensation for US-based hospital epidemiologists. This included the total salary and the proportion specifically designated to HEIC activities. Additionally, hospital epidemiologists and lead ICPs completed questions on HEIC resources (eg, physician and ICP full-time equivalents [FTEs], call coverage, and ancillary support). FTEs were defined as categorical variables. Total FTEs represent a combination of full-time and part-time positions. For example, 1.0 physician FTE may represent partial salary support for several physicians performing HEIC functions.

Data Analysis

Basic descriptive analyses were run using EFM software for responses received by April 1, 2007. Analyses of ICP and physician FTEs were performed using Microsoft Excel 2003. For the number of beds, the ICP analysis assumes a lower limit of 50 and an upper limit of 1,000. The ICP-to-bed ratio was calculated by dividing the midpoint of the bed size range by the median number of ICPs for each category.

RESULTS

Respondent and Facility Demographics

Responses were received from 526 (42%) of 1,255 SHEA members. Demographics of respondents are summarized in Table 1. Eighty-four percent of respondents were physicians; more than 70% were trained in infectious diseases. In addition, 59% of respondents had taken the SHEA/CDC training course, 26% had at least 1 year of additional training in HEIC (beyond infectious disease fellowship for physicians), and the mean number of years' experience in HEIC was 16 years (range, 1–38 years). The majority of respondents were hospital or associate hospital epidemiologists.

Most respondents worked in urban medical centers, including academic institutions, although more than 10% were in private practice. The median average daily census for a respondent's primary facility was 400–600 patients. Most respondents were from the midwestern and northeastern United States. Respondents indicated the following additional specialty services or departments at their facilities: bone marrow transplantation (41%), solid organ transplantation (43%), neonatal intensive care units (59%), and other adult intensive care units (86%).

TABLE 1. Respondent and Facility Characteristics for Society for Healthcare Epidemiology of America Members Participating in the Healthcare Epidemiology Resource and Compensation Survey

Characteristic	No. (%) of respondents (n = 526)
Degree (may be >100%)	
MD, DO, or MBBS	440 (84)
MPH or MS in epidemiology	110 (21)
PhD	52 (10)
RN or BSN	29 (6)
MA, MSN, or master's in other field	47 (9)
Other	23 (4)
Board certification	
Infectious diseases	384 (73)
Internal medicine	297 (57)
Pediatrics	48 (9)
Other	91 (17)
Not indicated or not applicable	41 (8)
Academic position	321 (61)
Male sex	326 (62)
Age group	
<40 years	71 (14)
40–49 years	167 (32)
50–59 years	198 (38)
⩾60 years	89 (17)
Work location	
United States	
Northeast	105 (20)
Mid-Atlantic	34 (7)
Southeast	83 (16)
Midwest	119 (23)
Northwest	21 (4)
Southwest	42 (8)
West	32 (6)
Other (eg, Hawaii, Puerto Rico, or Guam)	3 (1)
Canada	23 (4)
Outside United States and Canada	63 (12)
Role at institution (may be >100%)	
Hospital epidemiologist	286 (54)
Associate hospital epidemiologist	44 (8)
ICP	35 (7)
Infection control manager (lead ICP)	48 (9)
Director of antimicrobial management	65 (12)
Pharmacist	0 (0)
Microbiologist	32 (6)
Other	110 (21)
Facility type (location of primary role)	
Hospital or medical center (including academic medical centers)	325 (62)
Healthcare network or health system	28 (5)
Long-term care facility or rehabilitation center	4 (1)
Private practice	57 (11)
State or local government (department of public health)	16 (3)
Federal government	26 (5)
University or medical school (nonclinical)	19 (4)
Pharmaceutical or biotechnical industry	5 (1)
Retired	4 (1)
Other	20 (4)
Facility setting	
Urban	337 (64)
Suburban	116 (22)
Rural	27 (5)
Not indicated or not applicable	46 (9)
Average daily census at primary facility	
<200 beds	77 (15)
200–399 patients	135 (26)
400–600 patients	125 (26)
>600 patients	135 (26)
Not indicated or not applicable	54 (11)

NOTE. The number of respondents varies for individual questions; missing data are indicated for those variables to which large numbers of participants did not respond. BSN, bachelor of science in nursing; DO, doctor of osteopathy; ICP, infection control practitioner; MA, master of arts; MBBS, bachelor of medicine, bachelor of surgery; MD, doctor of medicine; MPH, master of public health; MS, master of science; MSN, master of science in nursing; PhD, doctor of philosophy; RN, registered nurse.

Professional Responsibilities and Compensation

Professional responsibilities for all respondents varied; almost 80% reported some clinical responsibilities. For the proportion of their time spent performing clinical work, physicians reported a mean percentage of 39%. Of all respondents, 91% provide some HEIC services, and 63% have a written agreement explicitly describing the HEIC services provided. However, of all those surveyed, only 65% are specifically compensated for these services, and 48% negotiated this compensation before beginning their position. In addition, 75%–80% of all respondents also provide expertise in antimicrobial management, patient safety, employee health, and emergency preparedness. Less than 25% of all respondents are specifically compensated for these additional activities. Of all respondents with any written contract, 38% state that this document describes compensation for specific activities provided.

For the subset of US-based physicians who were willing to provide financial data (285 [78%] of 365), the median range of earnings was $151,000–$200,000, regardless of their region (respondents selected salary ranges instead of specifying their exact salaries). The median contribution percentage of HEIC compensation to total earnings was less than 25%. For the 102 respondents who reported receiving hourly compensation for these activities, the median range was $101–$150/hour.

Resources and Infrastructure

Of the 335 hospital epidemiologists and lead ICPs who responded to the entire survey, 334 provided answers to at least

some of the questions on resources. ICP staffing and, to a lesser extent, physician staffing varied by the average daily occupancy of the institution. Physician staffing dedicated to HEIC by facility bed size is summarized in Table 2. Most facilities had some physician-level support. The range was 0–10 FTEs, with a mean value ranging from 0.85 FTEs for the smallest institutions to 1.79 FTEs for the medical centers with more than 600 beds. No obvious trends were noted for physician FTEs by US region.

Respondent reports of ICP FTEs are summarized in Table 3. The ICP FTEs had a mean range from 1.2 for institutions with fewer than 200 beds to 3.9 for institutions with more than 600 beds. Estimated ICP-to-bed ratios ranged from 1 : 139 for the smallest institution size to 1 : 205 for the largest institutions. The analysis of ICP FTE by US region had too small a sample size to achieve significance. However, for those facilities with more than 600 beds, less ICP support was noted in the northeastern United States (mean, 3.5 ICP FTE; $n = 18$), compared with the overall mean (3.9 ICP FTE; $n = 81$). By comparison, several regions had staffing above the mean, such as facilities in the mid-Atlantic (4.8 ICP FTE; $n = 6$) and southeastern United States (4.7 ICP FTE; $n = 12$).

Seventy-eight percent of the hospital epidemiologists and ICPs who responded described providing 24-hour on-call coverage for infection prevention and control issues, regardless of the setting. Additionally, 55% have an administrative assistant dedicated to infection control.

TABLE 2. Physician Full-Time Equivalents (FTEs) for Healthcare Epidemiology and Infection Control, by Facility Bed Size

Variable	No. of beds			
	<200	200–399	400–600	>600
No. of facilities or hospitals[a]	61	97	78	83
Physician FTEs				
Mean	0.85	0.98	1.07	1.79
Median	1.00	1.00	1.00	1.00
Range	0–4	0–5	0–5	0–10

[a] Data are available for 319 of the subset of 335 healthcare epidemiologist and infection control manager respondents.

DISCUSSION

Given the changing roles of HEIC, this survey sought to provide more-recent data on the current state of responsibilities, resources, and staffing in infection control and prevention programs. Respondents were predominantly physicians practicing as the primary or associate hospital epidemiologist at large urban medical centers in the United States. Most of this group had acquired additional training in HEIC despite having training in infectious diseases; 3 of 5 respondents participated in the SHEA/CDC training course, and 1 of 4 had at least 1 year of HEIC-specific training. Additionally, it was an experienced group; the mean number of years' experience was 16 years. Despite this experience and training, only 65% of respondents were specifically compensated for providing HEIC services. Additional responsibilities in related areas, such as antimicrobial management, patient safety, employee health, and emergency preparedness, were compensated less than 25% of the time.

The increased responsibilities and scope of HEIC departments were not always reflected by increased resources. The median physician FTE for an HEIC department was 1.0, regardless of facility size. For ICP staffing, the median ICP-to-bed ratio was within the recommendations of the 1976 SENIC[1] but did not conform to more recent recommendations for all institution sizes.[2-7] Only slightly more than half of respondents reported having an administrative assistant dedicated to infection control.

Prior SHEA membership surveys that concern professional HEIC responsibilities and compensation have been published.[12-14] Survey questions were not uniform and were not analyzed in the same manner, and results were not shared with the professional community in a formal fashion. The 1998 survey[14] did contain some questions regarding similar issues, although the respondent demographics differed (72% male in 1998 vs 62% male currently, 91% physicians in 1998 vs 84% physicians currently, and more respondents working at smaller institutions in 1998). These differences likely reflect overall changing trends in SHEA membership. Despite the change in demographics, there was no difference in the proportion of respondents providing infection prevention and control services. Services included under the umbrella of HEIC have evolved in the intervening 9 years; therefore, contributions of specific activities, such as antimicrobial management and patient safety, cannot be evaluated. Interestingly, the compensation reported in the present survey has changed minimally from that reported in the 1998 survey.

The current study has a number of limitations. Surveys of healthcare workers traditionally have low response rates, as has been evidenced by prior surveys of the SHEA membership. We attempted to increase the number of respondents by switching from a written to an electronic format. However, the hesitancy of respondents to share information on financial reimbursement also may have contributed to the lower response rate. Furthermore, the survey on resources for HEIC was combined with a SHEA strategic survey in order to limit the number of survey requests sent to the membership. Ultimately, this limited the number of questions that could be included. For example, information on ICP FTEs was obtained in ranges only; therefore, exact calculations of ICP-to-bed ratios could not be performed. Similarly, only limited analysis of compensation was possible since responses were provided as salary ranges because of the sensitive nature of the data and low response rates to these questions on prior surveys. No control for the patient case mix of institutions is included, which may affect the interpretation of physician and ICP FTE data.

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TABLE 3. Infection Control Practitioner (ICP) Full-Time Equivalents (FTEs) for Healthcare Epidemiology and Infection Control

Variable	No. of beds			
	<200	200–399	400–600	>600
No. of hospitals	55	91	74	81
ICP FTEs				
Mean	1.2	1.7	2.6	3.9
Median	0.9	1.8	2.7	3.9
Range	0.13–3.5	0.13–5.6	0.13–6.1	0.13–6.1
ICP-to-bed ratio[a]	1 : 139	1 : 167	1 : 185	1 : 205
Literature standards for ICPs per bed (per bed category)				
SENIC[1]	1 : 250	1 : 250	1 : 250	1 : 250
Delphi[2]	1 : 100	1 : 120	1 : 125	1 : 125
Health Canada[3]	1 : 167	1 : 167	1 : 167	1 : 167
Dutch Society[4]	1 : 178	1 : 178	1 : 178	1 : 178
Richards et al[5] (NNIS)	1 : 115[b]	1 : 115[b]	1 : 115[b]	1 : 115[b]
Stevenson et al[6] (rural hospitals)	1 : 160	1 : 160	1 : 160	1 : 160
Massachusetts panel[7]	1 : 67–100[c]	1 : 67–100[c]	1 : 67–100[c]	1 : 67–100[c]

NOTE. SENIC, Study on the Efficacy of Nosocomial Infection Control; NNIS, National Nosocomial Infections Surveillance.

[a] Assumes a low bed size of 50 and a high bed size of 1,000. See the "Data Analysis" section for details.

[b] NNIS excludes hospitals with <100 beds.

[c] Range determined by the complexity of the patient mix and the care provided.

Epidemiology (APIC) surveyed their membership in February 2006 and included questions on resources and staffing for HEIC.[15] The 3,091 respondents (31% of APIC membership) were mainly ICPs from acute care facilities, although there may be some overlap with our current SHEA membership. Their survey found several themes in common with our results. Approximately half of the respondents were the only staff dedicated to infection control at their institutions. Half of the respondents also indicated that resources were "only somewhat adequate," and 1 of 5 indicated that resources were "barely adequate." Three-quarters of respondents indicated that the number of infection control FTEs were stable in the 12 months before the survey, even in the setting of increasing expectations. Salaries focused on ICPs and were thus not comparable to our results.[15]

The Delphi project, published in 2002, used data obtained from a group of ICPs through a series of 10 surveys conducted in a variety of healthcare settings from September 1999 through July 2001. The 32 Delphi panel members were from 20 states and represented acute care, long-term care, and community care settings, and they performed traditional HEIC tasks and also had expanded responsibilities. Competing responsibilities and a lack of adequate resources were the most frequently cited reasons for nonperformance of essential infection control tasks. The Delphi panel suggested that 0.8–1.0 ICP FTEs for every 100 occupied acute care beds was adequate staffing. The authors suggested that recommendations for staffing must consider not only the number of occupied beds but also the scope of the program, the complexity of the healthcare facility, the characteristics of the patient population, and the unique or urgent needs of the facility and community.[2]

Studies outside the United States have also attempted to describe the needed resources for HEIC. Health Canada hosted meetings of Canadian infection control experts in November 1997 and in March 1998 to develop a model on which the resources required to support an integrated infection control and prevention program across the healthcare continuum could be based. The final models projected 3 ICP FTEs per 500 beds in acute care hospitals. Of note, the staffing for this inpatient population did not include infection control coverage for transplantation, neurosurgery, cardiac surgery, or burn units.[3] Similarly, a group of ICPs and medical microbiologists were convened in the Netherlands in 2007 to determine how much time was needed for specific infection control activities in acute care hospitals. This group estimated that 1 ICP FTE was needed per 178 hospital beds or 1 per 5,000 admissions.[4]

The recommendations for resources may also need to take into account different facility types. In 2000, a survey assessed HEIC staffing needs and infrastructure support in 77 small rural hospitals in Idaho, Nevada, Utah, and eastern Washington. Almost all hospitals (97%) had an ICP, and nearly half reported a designated physician for HEIC oversight. Most ICPs also had other responsibilities outside of HEIC. The authors concluded that most rural hospitals surveyed have expended reasonable resources to develop infection control programs that are patterned after those seen in larger hospitals and that conform to recommendations of consensus expert panels.[6]

Larger facilities may also have specific needs with respect to HEIC. In 1999, a survey was performed of participating National Nosocomial Infections Surveillance (NNIS) hospitals, and their HEIC programs were compared with those of other US hospitals with at least 100 beds. Overall, NNIS hospitals had more hospital beds than did other US hospitals.

The majority of NNIS hospitals had affiliations with academic medical centers, and most had substantial numbers of intensive care beds. The authors reported that 96% of NNIS hospitals maintained at least 1 ICP per 250 occupied beds, with a median of 1 ICP per 115 beds. Furthermore, the results suggested that although ICPs in NNIS hospitals spent most of their time in inpatient settings, 40% of their time was spent in a variety of other areas, including home health, outpatient surgery or clinics, extended care facilities, employee health, and quality management, as well as other clinical or administrative activities.[5]

With the advent of mandatory reporting of healthcare-associated infections in 29 states in the United States, HEIC programs have faced additional work and regulatory requirements. Although several states have been on the forefront in the development and implementation of these state laws, few have made specific recommendations on the additional resources and staffing needed for these activities (M.B. Edmond, MD; G.A. Noskin, MD; R.A. Weinstein, MD; and N. Fishman, MD, written communications, May 2008.) The state of Massachusetts created a Healthcare-Associated Infection Prevention Expert Panel that met consistently from July 2007 through January 2008 to develop a comprehensive set of recommendations encompassing healthcare-associated infection reporting and "best practices" for prevention. Relevant recommendations included staffing at 1.0–1.5 ICP FTEs per 100 occupied beds, with institutions with a more complex mix of cases and clinical services maintaining staffing at the higher end of the range. In addition, information technology and ICP extenders, such as surveillance technicians and data analysts, were recommended to improve the ability of ICPs to accomplish necessary tasks.[7]

The data from our survey suggest that, in many cases, resources for HEIC were below that recommended in both older and newer studies, surveys, and expert panels reported in the peer-reviewed literature. The quickly evolving external mandates that have arisen since our survey have placed additional strain and expectations on our already resource-scarce departments. By comparing the data in this survey with the above-noted recommendations, we hope that the deficiencies revealed will be addressed by advocating for resources and compensation at both the local facility and professional societal level. Some facilities have anecdotally reported the creative use of less highly skilled staff for those activities appropriate to supplement functions of more formally trained ICP staff (eg, using non-ICP clerical or master's-level staff to collect less complicated data for surveillance). With these constraints on HEIC programs, the recruitment, support, and formal training of ICPs and hospital epidemiologists should be a priority to adequately address the ever-evolving challenges of HEIC.

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