

The current practice of infection prevention as demonstrated by the practice analysis survey of the Certification Board of Infection Control and Epidemiology, Inc

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Background: The Certification Board of Infection Control and Epidemiology, Inc., (CBIC) provides direction and administers the certification process for infection prevention professionals. CBIC performs a practice analysis (PA) survey every 5 years to assess the current practice of infection prevention. The last PA survey was conducted in 2005. The CBIC conducted the 2009 survey to ensure its certification examination focuses on current infection prevention practice.

Methods: CBIC appointed a Task Force to develop the survey, approve the sampling plan and oversee the distribution and analysis of the responses. After pilot testing, the final survey was distributed electronically to infection preventionists in multiple health care settings throughout the world.

Results: A total of 3,771 eligible surveys were received representing a 27.5% response rate. The typical respondent was a female, approximately 50 years old, who is experienced in infection prevention, has worked in health care for 25 years, and is a registered nurse.

Conclusion: Of importance to a multi-national certification examination is that the specifications for the examinations appropriately reflect the responsibilities of all individuals who will participate in the certification examination process. The respondents agreed that the survey listed the critical tasks currently performed by an infection prevention professional.

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The Certification Board of Infection Control and Epidemiology, Inc (CBIC) is a voluntary, autonomous board that provides direction for and administers the certification process for infection prevention professionals (IPs). The CBIC performs a practice analysis (PA) survey approximately every 5 years to assess the current practice of infection prevention and ensure that the certification examination focuses on current IP practice. A PA is the process of systematically collecting information that describes activities performed by individuals working at a specific job. Each CBIC PA survey builds on previous CBIC PA surveys to identify the

current responsibilities of IPs. The results are used to develop the test specifications for the certification examination. The PA is a key component of an ongoing examination development process, as depicted in Fig 1.

Significant changes in IP practice have occurred since the last PA survey was conducted in 2005.¹ To ensure that the certification examination reflects current IP practice, the CBIC made the decision to conduct the PA survey in 2009 instead of 2010.

To facilitate the PA process, the CBIC appointed a Practice Analysis Task Force to serve as the Advisory Committee. The responsibilities of the Task Force included (1) developing the PA survey, (2) identifying the sample to survey, (3) reviewing and analyzing responses, (4) determining test specifications for the certification examination, and (5) reviewing and revising the certification examination content outline.

The Task Force members included the following IPs with varying tenure in the IP profession, both members of the CBIC and other certified IPs, and from geographical locations throughout the United States and Canada:

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0196-6553/\$36.00

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doi:10.1016/j.ajic.2010.05.020

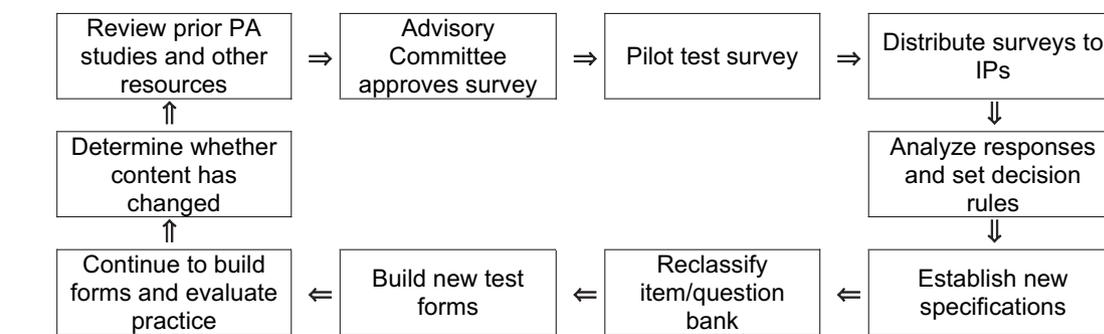


Fig 1. Cycle for CBIC PA and examination development.

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METHODS

The CBIC requested the services of Applied Measurement Professionals, Inc (AMP), Psychometrics Division, to provide technical assistance in developing and administering the survey and analyzing the findings. Lawrence J. Fabrey, PhD, AMP Senior Vice President, served as lead for the AMP team.

The PA process involved 2 phases. The first phase focused on developing the survey instrument, piloting the survey among IPs with varied tenure (ranging from 2.5 years to more than 25 years), and then distributing the survey to a sample of IPs working in multiple health-care settings in the United States, Canada, and other countries. For the purpose of the survey, the term “infection prevention and control professional” (ICP) was used instead of IP. An ICP was defined as one responsible for the (1) planning, implementation, and evaluation of infection prevention and control measures;

(2) collection, analysis, and interpretation of epidemiologic data relative to infections; and (3) investigation and surveillance of suspected infection outbreaks.

The second phase of the PA process focused on analyzing the results, developing the test specifications, and reviewing and revising the detailed content outline to reflect the results of the PA survey. Both phases of the PA process were successfully implemented with members of the Task Force working collaboratively with the AMP team.

Survey development

Task Force members reviewed background information regarding the PA process and its relationship to the examination development process, the role of the CBIC in the development of a certification examination for IPs, and materials used by the CBIC in the previous PA. During a Task Force meeting on January 24, 2009, the existing task list was reviewed, and tasks representing individual job responsibilities were modified, added, and removed, resulting in a list of tasks that was dramatically different from the previous survey. The list was organized within 7 content domains, under which 76 tasks were categorized into subcategories. The Task Force approved a rating scale that allowed survey respondents to indicate that the task either was or was not necessary for the job and to rate each necessary task on a 4-point scale, ranging from minimally significant to extremely significant. In addition, 23 relevant demographic questions were approved. Some questions addressed characteristics of the respondent, such as years in infection prevention and control, years in any health care setting, sex, race, and age. Other demographic questions addressed the respondent’s practice, such as geographic region of employment, primary employment setting, the facility’s bed capacity, number of annual outpatient visits, and number of full-time ICPs in the facility. Demographic questions were included in the survey

both to provide descriptive information about the respondents and, for some demographic questions, to help ensure that individuals from different subgroups view that the tasks required of the ICP exceed a level of importance sufficient to warrant inclusion on an examination used in the United States and Canada.

After the Task Force meeting, the survey was distributed as a pilot test to the Task Force, the entire CBIC Board, and other individual content experts. An effort was made to solicit input on the pilot test from novice IPs (ie, those with 5 years or less experience), as well as those with broad knowledge and experience in infection prevention. Following a review of the comments from the pilot test, the survey was finalized for distribution to the sample.

Sampling plan and survey distribution

The Task Force considered various methods of identifying IPs for the sampling plan. Ultimately, an attempt was made to reach the entire population of IPs by taking a 100% sample from the membership of 3 major infection prevention organizations. Invitational e-mails containing a link to the online PA survey were distributed to IPs listed in the CBIC database, as well as to the 2 professional organizations for IPs in North America: the Association for Professionals in Infection Control and Epidemiology (APIC) and the Community and Hospital Infection Control Association of Canada (CHICA-Canada). Currently certified individuals in the CBIC database were deemed the most critical group to be sampled, but the Task Force wanted to ensure valuable input from noncertified IPs as well. Lists that included 4346 names from the CBIC, 11,107 names from the APIC, and 1727 names from CHICA-Canada were merged, and duplicate entries were purged. A total of 17,180 e-mail addresses were initially available; after duplications were deleted, the sample comprised 15,058 addresses.

A link to the final survey was distributed to the sample via e-mail on April 15, 2009, along with a message emphasizing the survey's purpose and the importance of receiving responses from actively practicing IPs. In addition, potential respondents were informed that those who completed the survey before the May 11 deadline would be eligible for a random drawing for a gift card. A follow-up message was sent to the sample on April 30, thanking those individuals who had already completed the survey and reminding those who had not completed the survey about the importance of their participation.

RESULTS

Of the 15,058 survey invitations distributed, 1346 were returned undeliverable, and 15 individuals opted

Table 1. Years in IP, years in health care, and respondent age

Variable	n	Mean	SD	Median	Mode
Years in infection prevention and control	3743	10.05	8.80	6.50	2
Years in any health care setting	3738	25.78	10.27	27.00	30
Respondent age, years	3637	50.67	9.13	51.41	54

out of the study. Thus, the potential number of respondents was 13,697. A total of 4147 responses were received, but 376 were removed from the data set due to insufficient responses or duplicate surveys. Thus, a total of 3771 completed surveys were available for analysis, for a corrected response rate of 27.5%.

Demographic information

A review of the demographic characteristics of the respondents who were removed from the data set revealed no obvious differences from those of the 3771 valid respondents. The Task Force concluded that the respondent group demographic characteristics were as expected and judged these characteristics to be representative of the IP population. In addition, the Task Force concluded that the respondent group included a sufficient number of responses in relevant subgroups for subsequent analysis.

Table 1 provides summary statistics on respondents' age, years of experience in any health care setting, and years of experience as an IP. As can be deduced from the table, all distributions are negatively skewed, especially those for years as an IP.

A total of 3332 responses were received from IPs practicing in the United States, 374 from those practicing in Canada, and 54 from those practicing in other countries. Responses were received from every US state and Canadian province. Overall, the majority of respondents (86.6%) reported working in an acute care environment. More than one-third of the survey respondents (37.6%) were from facilities that had >10,000 visits/procedures per year. Respondents varied in terms of bed capacity of their facility, with most (20.4%) having 101-200 beds.

Almost half of the respondents (48.0%) were certified in infection control (CIC), and the majority of respondents (44.2%) reported that CIC is not required but preferred at their facility. The professional background of the majority of respondents (81.2%) was as a Registered Nurse. Nearly half of the respondents (45.5%) held a baccalaureate degree as their highest level of education, and 27% held a masters degree. The respondent group was primarily female (93.5%). The majority of respondents (84.4%) classified

themselves as white non-Hispanic, using the groupings suggested by the US Census Bureau and modified by the Task Force.

Adequacy of the instrument

In response to the question following the task list, "How well did this section cover the critical tasks for the role of the Infection Prevention and Control Professional?" 55.5% of the respondents indicated "completely" and 43.9% indicated "adequately" (for a total of 99.4%). Only 22 respondents indicated the task list on the survey was "inadequate." Another aspect of the instrument's adequacy relates to its reliability. Two aspects of reliability were estimated. Task reliability estimates indicate the extent to which each scale "hangs together." The alpha coefficient reliability among tasks for each of the 7 domains ranged from 0.82 for the first domain (with 7 tasks) to 0.94 for the second domain (with 30 tasks). The relatively high level of task reliability indicates that each domain represents a consistent collection of tasks. Rater reliability estimates are more important in survey research, because they indicate the degree to which respondents agree on the importance of each task. Again calculated within the domains, intraclass correlation coefficients for each domain were at least 0.99 based on all respondents with complete ratings within a domain.

Task ratings

Descriptive data for each of the 76 tasks were calculated and then evaluated by the Task Force. First, the number of ratings representing "not necessary for the job" was tallied. Second, a mean rating was calculated using a 4-point scale ranging from minimally significant to extremely significant. The mean level of significance judged by the respondents who believe that the task is necessary to practice ranged from 2.22 for task 25 ("Use advanced statistical techniques to describe data [eg, z score, χ^2 , odds ratio]") to 3.86 for task 40 ("Identify and implement infection prevention and control strategies related to hand hygiene"). Means, standard errors, and the number of respondents in each subgroup for the 76 tasks were calculated and then evaluated by the Task Force.

Various decision rules were considered and discussed. A total of 12 decision rules were established by the Task Force to determine tasks that should be eliminated from the examination specifications. The first decision rules helped ensure that only those tasks that were clearly a component of practice were included. Three tasks for which 13% or more of the respondent group indicated that the task was not necessary for the job were eliminated. Next, two tasks with a mean rating of importance were eliminated

Table 2. Tasks removed from the examination specifications

Number	Task
14	Determine methods for monitoring and evaluating antimicrobial use
25	Use advanced statistical techniques to describe data (eg, z score, χ^2 , odds ratio)
58	Prepare and manage the infection prevention and control program budget
75	Participate in research activities (eg, product evaluation, prevalence surveys)
76	Conduct research in infection prevention and control either independently or collaboratively

because the Task Force determined that the tasks were not sufficiently significant to practice. Then a total of 10 decision rules related to subgroup analyses were established to ensure that the remaining tasks were significant to practice regardless of geographic region (comparing responses from the United States, Canada, and other countries, as well as regions within the United States and Canada), experience as an ICP, bed capacity of the facility, number of ICPs within the facility, CIC status, educational preparation, professional background, and sex.

Application of the decision rules resulted in the elimination of 5 tasks (Table 2), leaving a total of 71 tasks on the final task list. Approximately 6.6% of the tasks were eliminated by the decision rules adopted by the Task Force. The Task Force determined that the remaining tasks could be assessed appropriately through a total of 135 multiple-choice examination items to ensure appropriate content coverage.

The Task Force considered the input of the survey respondents, as well as the breadth and depth of the tasks within each content domain, and used an iterative process to determine the number of items that would be appropriate to reasonably sample candidates' knowledge of the domain. Then the Task Force evaluated each task and agreed on the cognitive level requirement for a candidate with 2 years experience to perform the task. An overview of the examination specifications approved by the Task Force, and subsequently by the CBIC Board, is shown in Table 3.

All items (questions) on future examinations will be directly related to a task listed in the new specifications, and all items will be categorized at an appropriate level of cognitive performance (recall, application, or analysis) expected from the candidate.

DISCUSSION

The purpose of the CBIC certification process is to protect the public by providing standardized measurement of the current knowledge needed for individuals

Table 3. Overview of examination specifications

Content domain	Item	RE-AP-AN*
Identification of infectious disease processes	18	5-10-3
Surveillance and epidemiologic investigation	38	9-23-6
Preventing/controlling the transmission of infectious agents	39	9-24-6
Employee/occupational health	10	2-6-2
Management and communication (leadership)	16	4-9-3
Education and research	14	4-9-1
Total	135	33-81-21

*The number of items requiring recall, application, and analysis, respectively.

practicing infection prevention. The CBIC certification process validates a working knowledge of infection prevention. The CIC credential indicates a certain level of competency.

The certification process encourages individual growth and study, and it formally recognizes IPs who meet the requirements for certification and recertification.² Because the examination assesses the IP's competency in infection prevention principles and practice, it must reflect current practice. Therefore, CBIC performs a PA at least every 5 years to ensure the certification exam remains valid. The results of the PA provide the evidence-based framework for the certification exam.

The CBIC completed the 2009 Practice Analysis Survey described herein as a part of an ongoing process to assess the practice of infection prevention. The response rate for the survey was 27.5%, compared with 21% for the 2005 PA survey. The results of the survey were used to develop the test specifications for the certification examination. Examination specifications

incorporate the detailed content outline as well as other information needed to ensure the development of comparable examination forms. The examination specifications remain confidential and are used only for examination development purposes.

The detailed content outline was revised to reflect the results of the PA survey. For the CIC examination, the detailed content outline is a list of examination subject matter in outline form for candidates and item writers. The revised detailed content outline will be published in the *CBIC Candidate Handbook* and will be available at www.cbic.org.

Working under the authority of the CBIC Board, the CBIC Test Committee has reclassified items in the bank according to the new test specifications and the revised content outline. The CBIC Test Committee began using the new specifications to prepare updated examinations for administration starting in July 2010. Based on this PA, the revised certification examination should more accurately reflect the current practice of infection prevention.

The CBIC Board thanks all of the respondents to the 2009 PA survey for their valuable contributions to help ensure that the CBIC certification examination process reflects current infection prevention practice.

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