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Practice forum

Identifying changes in the role of the infection preventionist through the 2014 practice analysis study conducted by the Certification Board of Infection Control and Epidemiology, Inc

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The Certification Board of Infection Control and Epidemiology, Inc (CBIC) is a voluntary autonomous multidisciplinary board that provides direction and administers the certification process for professionals who are responsible for the infection prevention and control program in a health care facility. The CBIC performs a practice analysis approximately every 4-5 years. The practice analysis is an integral part of the certification examination development process and serves as the backbone of the test content outline. In 2013, the CBIC determined that a practice analysis was required and contracted with Prometric to facilitate the process. The practice analysis was carried out in 2014 by a diverse group of subject matter experts from the United States and Canada. The practice analysis results showed a significant change in the number of tasks and associated knowledge required for the competent practice of infection prevention. As authorized by the CBIC, the test committee is currently reclassifying the bank of examination questions as required and is writing and reviewing questions based on the updated test specifications and content outline. The new content outline will be reflected in examinations that are taken beginning in July 2015. This iterative process of assessing and updating the certification examination ensures not only a valid competency tool but a true reflection of current practices.

Protecting the patient is the foundation of all health care practice. The Institute of Medicine brought to light many challenges in patient safety and systems performance in the landmark publications of *To Err is Human: Building a Safer Health System*[1] and *Crossing the Quality Chasm: A New Health System for the 21st Century*.[2] Those responsible for preventing infection have long recognized the risks associated with infection and its transmission, with the importance of organized infection prevention practice first highlighted in the Study on the Efficacy of Nosocomial Infection Control report.[3] In response to the call for demonstration of competent practice, the Association for Professionals in Infection Control (APIC) structured the APIC Certification Association and subsequently launched the first certification examination in 1982. This provided the first structured opportunity for infection control professionals to demonstrate their competence in preventing infection and its outcomes. Since that first examination, there have been many changes in the profession and therefore the certification process. Today, there are >5,600 infection preventionists (IPs) with certifications in infection control (CICs) with broad and varied responsibilities in the realm of infection prevention and control.

The Certification Board of Infection Control and Epidemiology, Inc (CBIC) is a voluntary autonomous multidisciplinary board that provides direction and administers the certification process for professionals who are responsible for the infection prevention and control program in a health care facility. The mission of the CBIC is to "protect the public through the development, administration, and promotion of an accredited certification" process that focuses on current infection prevention and control practice.[4] The CBIC

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currently works with Prometric (Baltimore, MD), a test development and delivery provider, in developing a certification examination that is psychometrically sound and able to be administered to infection prevention professionals worldwide. All elements of examination development, delivery, and assessment are performed within standards set by the National Commission for Certifying Agencies (http://www.credentialingexcellence.org/ncca).

The examination contents are driven by the practice of infection prevention in all settings where care is delivered. As the practice of infection prevention and control continues to evolve, capturing that evolution and ensuring that the certification examination recognizes current practice and enables demonstration of competence are cornerstones to the certification examination. Competence is the ability to put knowledge into action. Measurement of competence is a complex process that requires sound and consistent methods that can be replicated and defended. Measuring competence in the field of infection prevention and control requires that there be a firm understanding of the elements of the practice; therefore, metrics can be established that align with those practice elements. Although some level of competence may be achieved through structured education and clinical experience, only through a defined and standardized certification process can competence be objectively and consistently evaluated.

The association between certification and improved clinical outcomes is becoming more evident and has been demonstrated in intensive care and medical-surgical units, surgical services, and oncology.[5-7] Certification has been linked with improved ability to manage patient symptoms, improved knowledge regarding established practice standards and guidelines,[6] and lower rates of adverse outcomes, including 30-day mortality in 1 study.[5,7,8]

To date, 3 published studies support the value of CIC and its relationship to improved patient outcomes. Pogorzelska et al[9] demonstrated that certification of IPs had significant impact on infection rates involving multidrug-resistant organisms, notably methicillin-resistant *Staphylococcus aureus* bloodstream infections. Saint et al[10] showed that certified (CIC) IPs were more likely to perceive the evidence as strong for certain preventive activities than were their noncertified colleagues, the implication being that certification may lead to greater use of evidence-based practice. Finally, Carrico et al[11] found that immunization programs managed by certified (CIC) IPs were more likely to adhere to recognized best practices than those managed by noncertified colleagues. These 3 studies serve to recognize the value of IP certification and are the first to demonstrate that certification in infection control can positively impact practice and outcomes.

Approximately every 5 years, the CBIC performs a broad assessment of existing practice among certified IPs. The last practice analysis (PA) was conducted in 2009. Through the PA, IPs in all settings articulate current job responsibilities and the knowledge required for their performance. Because IPs have moved from traditional health care settings (eg, acute care hospitals) into nontraditional health care settings (eg, ambulatory surgery centers, boutique clinics) and into public health arenas (eg, health care–associated infection prevention programs), the information provided through the PA has become a rich collection of information regarding the evolution and transformation of IPs' practice. The PA is an integral part of the certification examination development process and serves as the backbone of the test content outline (Fig 1). Its purpose is to obtain information about the tasks performed for a particular role and the knowledge needed to competently perform those tasks. The specific intents of the CBIC PA are to (1) identify and re-evaluate the current role definition of the IP; (2) validate and update the list of tasks and knowledge statements related to work performed by IPs; (3) verify that the tasks and knowledge statements are consistent with the objective of certifying the IP; and (4) develop the test specifications for the CIC examination.

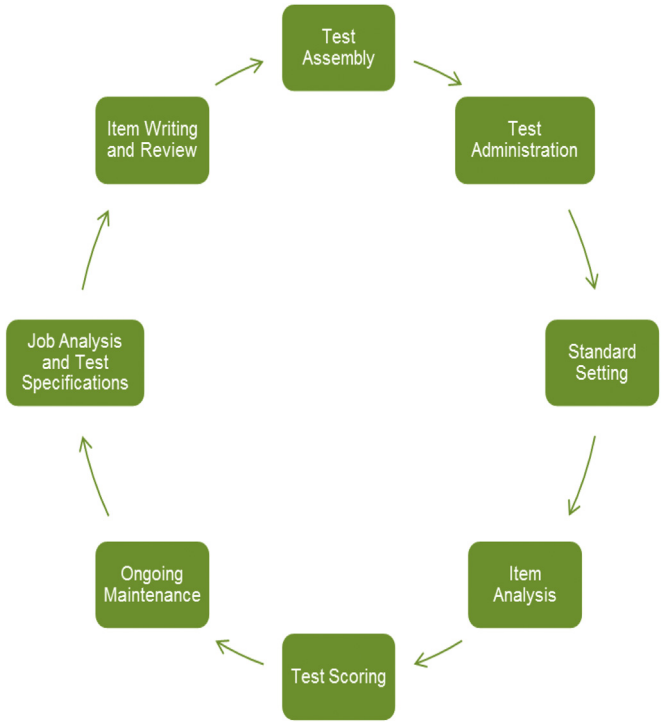

Fig 1. Examination development process. The job (practice) analysis is the first step in developing test specifications, which in turn direct the development of examination items (questions) and examination forms.

METHODS

A subcommittee of the CBIC provided oversight of the PA process along with 2 distinct subject matter expert (SME) groups. Both SME groups were strategically created to represent a range of experiences, practice settings, facility sizes, and geographic locations throughout the United States and Canada, where most certificants practice. This professional diversity provided a wide perspective that took into account the ever-changing role of the IP/infection control practitioner (ICP). SMEs were provided with an overview of test development, a purpose statement for the PA, and the 2010 content outline. Prometric provided the technical and psychometric expertise to carry out the PA in a manner consistent with the *Standards for Educational and Psychological Testing*.[12]

For the purposes of this multinational survey, the phrase IP/ICP was used to facilitate common understanding of this role. The 2014 CBIC eligibility criteria for the CIC examination were used to define the IP/ICP. An IP/ICP was defined as having primary responsibility for the infection prevention program that included accountability for (1) collection, analysis, and interpretation of infection prevention outcome data; (2) investigation and surveillance of suspected outbreaks of infection; and (3) planning, implementation, and evaluation of infection prevention and control measures.

Survey development

The PA survey development team consisted of 14 IPs/ICPs. The survey development meeting was conducted in Chicago, Illinois, on March 13-14, 2014. Brainstorming, consensus building, and the affinity process were used to list, categorize, and determine the importance of the various items deemed to be necessary to a competent IP/ICP. Facilitated group discussions and multivoting methods were used to categorize the items into either tasks or knowledge statements. The final list of 120 task and knowledge

Table 1
Five-point scale for rating importance of tasks and knowledge statements and frequency of tasks performed

Importance	Frequency
0 = Of no importance	0 = Never
1 = Of little importance	1 = Seldom
2 = Of moderate importance	2 = Occasionally
3 = Important	3 = Often
4 = Very important	4 = Very often

statements vastly differed from those used for the 2010 CBIC PA,[13] with only 15 items unchanged. The task and knowledge statements were grouped together into broad categories. Each of these categories was then reviewed to determine if it was distinct and critical to the practice of infection prevention to require a standalone classification. This resulted in the creation of 8 categories called domains. Although questions covering all 120 task and knowledge statements cannot be included in every examination, the specified number of questions from each domain creates the test specification or content outline. The survey development team developed an appropriate 5-point Likert scale for measurement of importance for tasks and knowledge statements and frequency of the tasks (Table 1).

Sixteen demographic and background questions were developed for the updated survey. These questions provided an opportunity to better understand the overall picture of the survey respondents and also allowed for subgroup analysis to determine if there were variations in response based on demographic features, background, and experience.

The survey was drafted and revised and piloted by a group of volunteers who provided comments on content and clarity. Feedback from the pilot group was incorporated into the final survey tool, which contained a total of 8 domains, including 80 tasks and 40 knowledge statements. In addition to completing background and demographic questions, respondents were asked to rate the importance and frequency of performance for each of the 80 tasks, the importance of each of the 40 knowledge statements, and how well the tasks and knowledge statements represented each of the domains (content coverage ratings), the latter using a 5-point scale that ranged from very poorly to very well. Respondents were able to include free text to indicate any areas that they felt were not covered within each of the domains. Respondents were also asked to indicate what proportion of the examination should be devoted to each domain by distributing 100 percentage points across the 8 domains. Finally, respondents were asked open-ended questions including the following: How do you expect your work role to change over the next few years? and What knowledge will be needed to meet changing job demands?

Survey dissemination

To provide the widest distribution of the survey to a comprehensive sample of health care workers responsible for the infection prevention programs in a wide variety of practice settings, 6 distribution lists were obtained and used. In addition to the CBIC (worldwide) database of all certified IPs/ICPs, an e-mail invitation was sent to the membership list of the APIC and Infection Prevention and Control Canada. A link for the survey was also posted on the Internal Federation of Infection Control Web site. Contact lists for US hospitals, long-term care facilities, and ambulatory centers were also obtained from the American Hospital Association. The lists were edited to review duplicates. To encourage participation, drawings were conducted for gift cards. A follow-up e-mail was sent out 2 weeks after the initial survey invitation to thank those who had already completed the survey and provide a reminder to those had not yet completed the survey.

Analysis of the survey data

Prometic used statistical and psychometric analytical methods to determine the mean importance ratings for tasks and knowledge statements. A criterion commonly used in similar studies is a mean importance rating that represents the midpoint between moderately important and important. Based on this, the recommendation was to use a mean importance rating of 2.50 as the threshold for inclusion of an item in the final test specifications. Any item with a mean rating between 2.40 and 2.49 would be reviewed by the survey review and test specification team. Any item with a mean rating of <2.40 would be excluded from the test specifications. The derivation of test specifications from those statements verified as important by surveyed IPs/ICPs provides a substantial evidential basis for content validity of the credentialing examination.

Data analysis by subgroups (eg, practice setting) was possible when responses from at least 30 respondents were included in the mean analysis and was performed based on several demographic and background characteristics. The index of agreement (IOA) is a measure of the extent to which subgroups of respondents agree on which tasks and knowledge are important and is more tailored to a PA than the correlation coefficient.[14] Using the mean importance ratings for tasks and knowledge, IOAs were tabulated to determine if there were any disagreements between subgroups (ie, whether 2 groups agreed that the content should [or should not] be included in an examination). IOA values of <0.80 are considered as disagreement; therefore, additional analysis would be required to determine if 1 examination would be valid for those ≥ 2 variant groups.

Quantitative results included the following:

- Means, SDs, and frequency (percentage) distributions for task statements and content coverage ratings.
- Means, SDs, and frequency (percentage) distributions for knowledge statements and content coverage ratings.
- Medians and modes for task frequency ratings.
- Means and SDs for test content recommendations.
- IOA values for designated subgroups.

Survey review and test specifications development

The survey review and test specification meeting was held June 27-28, 2014, in Baltimore, Maryland. The survey review and test specifications team, comprised of 10 IPs/ICPs, was given specific instruction regarding the test specifications process. The team reviewed the statistical analysis provided by Prometric and all comments provided by respondents in the survey and then finalized which tasks and knowledge statements should be included in the test specifications, established how many questions would be included for each domain area, and finally performed linkage between task and knowledge statements. Tasks and knowledge linking verifies that each knowledge statement included on an examination is related to the competent performance of important tasks. As such, linking documents the content validity of the tasks included in the test specifications.

Content weights for each domain were specified by each member of the test specification team and compared with those derived from survey respondents. Using facilitated group discussions and multivoting methods, a consensus was reached regarding the optimal percentages and thereby the number of questions for each domain on the CIC examination.

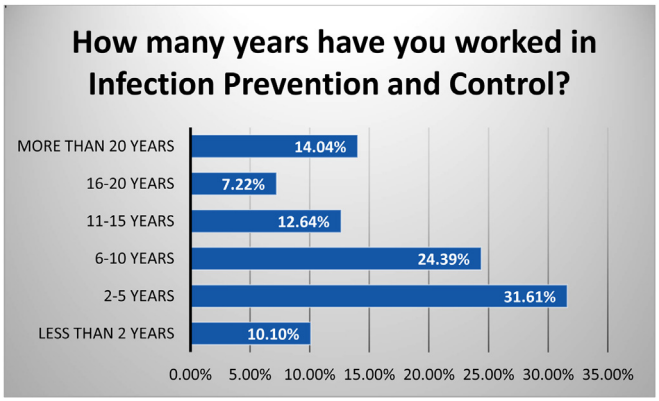

Fig 2. Years of experience in infection prevention and control among respondents who returned usable surveys.

RESULT

The survey link was distributed to a total of 17,946 medical professionals; 2,819 (15.7%) were returned. For a survey to be usable, the respondent must have answered yes to the following question: Are you an IP/ICP? They also must have completed >55% of the rating scales. There were 2,494 usable surveys received. A representative group of IPs/ICPs completed the survey in sufficient numbers to meet the requirements to conduct statistical analysis. Sufficient responses were received to allow subgroup analysis based on background or demographic responses.

Demographic characteristics of survey respondents

Durations of employment in infection prevention and control are shown in Figure 2.

Most respondents were in the 50- to 59-year old age group (40.6%), followed by the 40- to 49-year age group (21.3%). Only 3.13% of respondents were <30 years of age, whereas 19.21% were ≥60 years of age.

A total of 2,150 (87.08%) of participants practiced in the United States, 271 (10.98%) practiced in Canada, and 73 (2.92%) practiced outside of the United States or Canada. Responses were received from every US state and Canadian province and territory. Most (65.8%) respondents worked in an acute care setting, a large difference from the 86.6% of respondents who completed the 2009 CBIC PA survey.[13] Approximately 10% practiced in a variety of ambulatory and outpatient facilities, 9.42% worked in long-term care or rehabilitation settings, and 2.41% practiced in a public health capacity.

Of those who worked in an acute care facility, 46.61% practiced in a setting with <200 beds. Just less than 15% were employed in facilities with ≥500 beds. Most (51.04%) indicated they had ≤1 full-time equivalent IP/ICP in their facility, whereas 12.3% had >4 full-time equivalent IPs/ICPs in their setting. Most (62.3%) participants had other job responsibilities besides infection prevention and control, with employee health and quality functions being cited most.

About half of those surveyed were CIC certified (50.24%), with 77.14% of those not certified planning to become certified. Almost half (44.86%) had a baccalaureate degree, with an additional 31.53% holding a Master's degree or above. Nursing was the most common professional background (81.87%) with microbiology-laboratory the next largest with 10.53%. The group was predominantly women (92.76%), and nearly all (98.79%) indicated that English was their preferred language.

Table 2
Background and demographic questions used for subgroup analysis

Question
How many years have you worked in infection prevention and control?
Which practice setting do you most identify with?
What is the bed capacity of your primary practice setting?
How many IPs/ICPs (FTE) are assigned to your primary practice setting?
Over the last year, approximately how many hours per week have you spent in infection control activities?
Is your primary facility accredited (eg, DNV Healthcare, Joint Commission)?
Are you currently certified by CBIC in infection prevention and control?
In what geographic area are you employed? (split into United States, Canada, Middle East)
If in the United States, select state (split into Northeast, Midwest, South, West)
If in Canada, select province/territory (split into West, Ontario, Quebec, East/Maritimes)
Which of the following best describes your highest level of education?
Which of these describes your professional background?

CBIC, Certification Board of Infection Control and Epidemiology, Inc; *FTE*, full-time equivalent; *IP/ICP*, infection preventionist/infection control practitioner.

Table 3
Test specification content areas, certification in infection control

Category	No. of items (questions)
Identification of infectious disease processes	22
Surveillance and epidemiologic investigation	24
Preventing and controlling the transmission of infectious agents	25
Employee and occupational health	11
Management and communication	13
Education and research	11
Environment of care	14
Cleaning, sterilization, disinfection, and asepsis	15

NOTE. There are 135 questions, including cognitive levels (20%), recall (60%), and application (20%) analysis.

Content coverage ratings

The means for each content area ranged from 3.03-3.23, above the threshold of 2.5, which provided evidence that the content areas were deemed to be adequately to very well covered on the survey.

Task and knowledge ratings

All 120 of the tasks and knowledge statements achieved high means (>2.50), thereby validating their importance to competent performance for IPs/ICPs. The mean rating for tasks varied between 2.99 and 3.87, and the mean rating for knowledge statements ranged from 2.72-3.82. Because 100% of the tasks and knowledge statements were determined to be important based on respondents' high mean rating, all were included in the test specifications.

Subgroup analysis

IOAs were determined for 12 background and demographic questions (Table 2). IOAs ranged from 0.99-1.00 for tasks and 0.95-1.00 for the knowledge statements. All subgroups achieved strong agreement, with no difference in the mean importance ratings demonstrated between any of the subgroups. There was no evidence in this analysis to support the creation of a tiered certification examination based on years of experience or a separate certification examination based on practice setting.

2014 TEST SPECIFICATIONS

The culmination of the work, the 2014 content domains and test specifications, is shown in Table 3.

DISCUSSION

To achieve the mission of the CBIC, a rigorous process that adheres to nationally recognized testing standards must be followed. Completing a PA every 4-5 years is one of the requirements to meet the strict standards of the National Commission for Certifying Agencies. The commitment to providing the highest quality certification examination helps to enhance public protection through infection prevention and control certification.

The PA study for the CIC examination was conducted to identify tasks and knowledge statements that are important to the work performed by IPs/ICPs. Further, the data collected were used to guide the development of the test specifications and will be used to develop future examinations.

The tasks and knowledge statements were developed through an iterative process involving the combined efforts of the CBIC and SMEs and the expert test development guidance from Prometric staff. The results of the study support that all of the tasks and knowledge statements were verified as important through the PA process and provide the foundation of empirically derived information to develop the test specifications for the CIC examination.

Although the full details of the examination specifications must remain confidential to protect the integrity of the examination development process, an outline form of the test content will be available in the *CBIC Candidate Handbook* and online (www.cbic.org).

As authorized by the CBIC, the test committee is currently reclassifying the bank of examination questions as required and is writing and reviewing questions based on the updated test specifications. The new test specifications will be reflected in examinations that are taken beginning in July 2015. This iterative process of assessing and updating the certification examination ensures not only a valid competency tool but a true reflection of current practices.

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CBIC sincerely thanks all of those who generously gave their expertise and time to develop and review the survey tool and those who participated in the survey. The ability to provide a reliable and recognized certification examination would not be possible without their support and involvement.

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