Commentary

Advancing the profession: An updated future-oriented competency model for professional development in infection prevention and control

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The 2012 Association for Professionals in Infection Control and Epidemiology (APIC) Competency Model[1] for the infection preventionist (IP) was a novel tool and structure for professional development intended to be relevant for 3 to 5 years after publication. The authors' introduction of future-oriented domains to the infection prevention and control (IPC) profession was instrumental in defining a framework for professional development beyond certification.

As anticipated, IPC has progressed beyond the initial 2012 Competency Model content. A rapidly evolving health care environment has created an increasingly complex landscape for the IP to navigate, resulting in expanded functions and roles. Furthermore, composition of the IPC workforce is changing. Results of the 2015 APIC MegaSurvey demonstrated that the background of IPs is expanding from primarily nursing to other fields, such as laboratory science and public health, bringing different perspectives to the profession.[2-4] Such changes call for careful examination of the IP professional development path. In response, an updated competency model has been crafted to address innovative future-oriented competency domains and other pertinent advances.

Conceptually, the focus of IPC practice should always be patient safety; however, an additional lens that the IP uses focuses on ensuring patient safety across the continuum of care. This guarantees that patients, no matter the location of their health care encounter, experience the best possible outcomes. Key IPC elements transcend health care settings; yet, there may be unique patient safety concerns and practice approaches for IPs working in specialty settings such as acute care, long-term care, critical access, ambulatory, home health, dialysis, or ambulatory surgery.

The APIC Competency Model for the IP includes the Certification Board of Infection Control and Epidemiology, Inc (CBIC) core competencies[5] and the APIC Professional and Practice Standards (PPS).[6] Conceptually, these foundational documents and elements reside on the outermost circle of the updated model, indicating how they support IP professional development. The PPS outlines the role and scope of an IP. The CBIC core competencies are designed to prove foundational competency in the profession through the passing of CBIC's certification examination, resulting in the IP earning the CIC credential. Together, these resources, each with different functions, are designed to work in synergy to guide development of the infection prevention professional. CBIC core competencies are evidence based, reflective of current practice, and updated every 4 to 5 years through research of practice analysis surveys completed by practicing infection prevention professionals.[7] IPs renew and enhance their skills and application of the core competencies throughout their careers.

The APIC Competency Model identifies specific domains for future-oriented competency development, enabling IPs to build on the CBIC core competencies, advance their careers, and meet essential

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IPC needs that will be critical within the next 3 to 5 years. The future-oriented competency domains serve to

- Anticipate and proactively integrate advances in the field.
- Emphasize strategic areas of need and growth for the profession and the dynamic nature of the evolving IP role.
- Engage IPs to cultivate their knowledge and skills throughout their career within all interconnected domains to meet the needs of patients across the continuum of care.
- Reinforce APIC's vision of health care without infection and mission of creating a safer world through prevention of infection.

MODEL DEVELOPMENT

In January 2018, the APIC board approved the APIC Professional Development Committee's request to establish a Competency Model Revision Task Force. The task force, with assistance from the Professional Development Committee, completed 3 months of intensive research and information gathering in groups focused on the 7 strategic areas below that relate to the 2012 Competency Model, key stakeholder input, and emerging trends:

1. The Future Trends Group analyzed emerging and future trends impacting IPC practice.
2. The Authors Group interviewed the 2012 Competency Model authors to obtain historical information and updated perspectives.
3. The Committees/Survey Group surveyed members of all APIC committees, APIC chapter leaders, and APIC strategic partners on opportunities for improvement within the current model.
4. The MegaSurvey Group reviewed the APIC MegaSurvey questions and results for alignment with the 2012 Competency Model, as well as potential gaps and future insights into the IPC workforce, training, and self-assessment of competency and career stage.
5. The Health Care Skills/Competencies Group reviewed theoretical literature on skill acquisition, competency, professional growth in health care, and conceptual competency models from other professional organizations.
6. The Advisors Group interviewed experts and key contacts on next-generation perspective, technology, and performance improvement issues.
7. The Practice Settings Group interviewed diverse practitioners working in long-term care, ambulatory, and other settings to garner setting-specific perspectives.

The task force distilled the research, results, and stakeholder perspectives to identify key future-oriented competency domains and subdomains, forming a foundation for model revision. It was agreed that the competency domains and subdomains must be future oriented to meet the needs of the profession, reflective of the practice of IPC over 3 to 5 years, and applicable across all settings.

A visual model was developed from this framework and designed with interactive, easy-to-use components. The model content intentionally overlaps competency domains and subdomains to reflect the complexity of IPC practice. Although the model was developed for those with a primary focus on IPC, the future-oriented competency domains can be used by the IP in any health care setting, regardless of full-time equivalent status. Additionally, the model can be used in settings where IPs may have multiple responsibilities to help guide the IPC portion of their practice and ensure adequate IPC program development.

As previously stated, patient safety is the focus of IPC practice across the continuum of care. The task force agreed that the CBIC core competencies are foundational competencies on which new IPs begin to develop their practice and create a career path. The CBIC core competencies prepare the IP for certification and career advancement.

The future-oriented nature of the revised model encourages the development of new skills and supports professional growth and development regardless of practice setting.

2019 APIC COMPETENCY MODEL

The APIC Competency Model describes the knowledge, skills, and behaviors considered most important for successful job performance and career progression of the IP (Fig 1). The model contains future-oriented competency domains and subdomains, which should not be confused with CBIC core competencies. Although competencies are designed to prove effectiveness, the future-oriented competency subdomains guide IPs toward areas of professional development throughout all career stages. Table 1 defines the terms used in this paper to provide clarity between competencies and competency domains.

The core of the model is patient safety, because that is the center of IPC practice, with a focus on what is best for patients across the continuum of care. This patient safety core element radiates into the model, indicating its importance and connectedness to IP competency domains in various settings throughout the IP career path. Extending outward from the core are the priority areas of development for IPs, referred to as future-oriented competency domains. These domains transcend career stages and guide IP growth and development while also furthering advancement of the profession.

IP career stages are represented by 4 concentric circles depicting progression from Novice to Expert. Novice IPs are new to the rules and concepts that govern IPC and rely on them to guide their practice. New to the model is the Becoming Proficient career stage, between the Novice and Proficient stages, which represents the period when the IP is building on novice competencies and developing more involved, intricate, and independent skills.[8] Moving outward through the model, IPs are challenged to become certified in infection prevention and control (CIC), the gold standard by which an IP demonstrates core competency. The CIC credential denotes mastery of fundamental knowledge required for competent performance of current infection prevention practice and signifies movement into the Proficient stage. Although not quantified by years of practice, experience remains an important source of skill development as the IP progresses along the career path. The Expert career stage is defined by mastery of domain content, which can include role modeling or teaching, but generally signifies enhancement and expansion of the IPC profession.

The updated model has 6 future-oriented competency domains (compared to 4 in the 2012 model) identified for future-oriented IP competency development:

1. Leadership
2. Professional Stewardship
3. Quality Improvement
4. Infection Prevention and Control Operations
5. Infection Prevention and Control Informatics
6. Research

These domains represent areas of future growth for the IP and are designed to elevate the profession and the IPC professional. The future-oriented competency domains reflect the dynamic nature of the evolving IP role and are visualized in the outermost circle. Each domain is depicted as a wedge, which illustrates transcendence through each stage of the IP career path as well as radiating outward from the core, expanding as the IP develops professionally. These domains are further defined by subdomains that provide focused future-oriented competency content.

Progression through career stages of the future-oriented competency domains may not occur simultaneously; for example, an IP may be in the Expert career stage in one subdomain, such as Surveillance
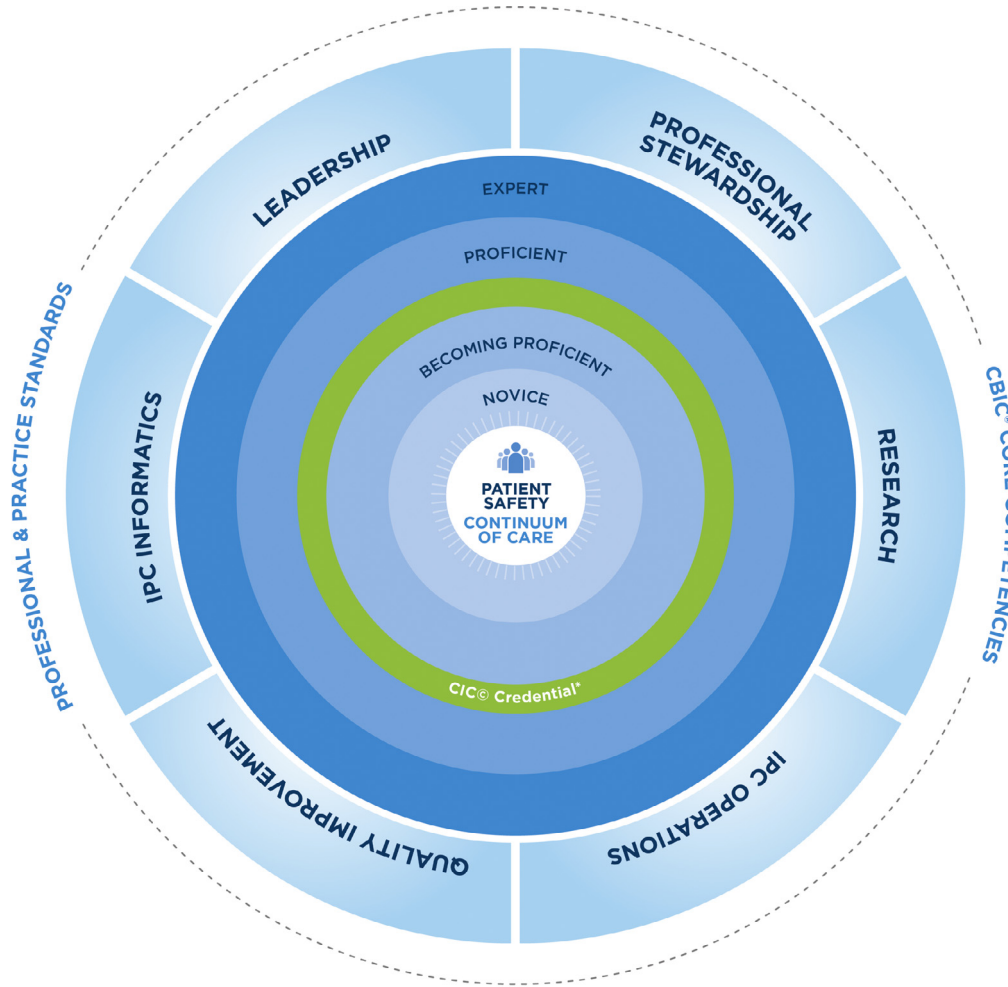
Fig 1. The updated (2019) APIC Competency Model.

Table 1

APIC future-oriented competency domains and definitions from which the concepts are derived

Concept	Definition
APIC future-oriented competency domain/subdomain	Topical area of knowledge, skills, abilities, and personal attributes that has been identified as relevant in the next 3 to 5 years for growth of the infection preventionist and the infection prevention and control profession
Competence	Ability to do something successfully with sufficient knowledge and skills[*]
Competency	Observable and measurable knowledge, skills, abilities, and personal attributes that improve performance and result in success[†]
Domain	Specified sphere of activity or knowledge[*]
Subdomain	Subdivision of a domain
Competency domains	Related sets of foundational abilities representing the required elements and outcomes that define the knowledge, skills, experience, attitudes, values, behaviors, and established professional standards[†]

[*]The Merriam-Webster dictionary, 2019.
[†]University of Nebraska, 2019.
[‡]National Board of Osteopathic Medical Examiners, 2019.

Technology, yet in the Becoming Proficient career stage in the Program Management subdomain. Furthermore, various items are intentionally depicted in more than one domain or subdomain to highlight their importance in multiple components of IPC practice and across health care settings. For example, with rapidly changing surveillance and novel diagnostic technologies, the IP needs to keep abreast of the technical aspects of surveillance systems (Surveillance Technology subdomain), as well as novel diagnostic tests (Application of Diagnostic Testing Data and Techniques subdomain) to understand how to incorporate and apply them into practice (Outbreak Detection and Management subdomain). Integration of concepts in multiple domains allows for more rapid, credible, and reliable monitoring of health care−associated infections (HAIs), quality improvement, and prevention efforts, as well as implementation science. Crossover of elements guarantees comprehensive application of knowledge and skills and highlights the fluidity between the domains.

The CBIC core competencies and PPS encircle the Competency Model. The CBIC evidence-based core competencies are grounded in patient safety and are key foundational components for the future-oriented competency domains. The PPS reflect the expectations, priorities, and values of the profession and, together with the core competencies, are key overarching elements to the model. There is some purposeful duplication of topics among the CBIC core competencies,

Table 2
Updated APIC Competency Model (2019) future-oriented competency domains and subdomains

Leadership	Professional stewardship	Quality improvement	IPC operations	IPC informatics	Research
Communication Critical thinking* Collaboration Behavioral science Program management* Mentorship	Accountability Ethics Financial acumen Population health Continuum of care Advocacy	Infection preventionist as subject matter expert Performance improvement* Patient safety Data utilization Risk assessment and risk reduction	Epidemiology and surveillance* Education* IPC rounding Cleaning, disinfection, sterilization Outbreak detection and management Emerging technologies Antimicrobial stewardship* Diagnostic stewardship	Surveillance technology* Electronic medical records and electronic data warehouse* Data management, analysis, and visualization Application of diagnostic testing data and techniques	Evaluation of research Comparative effectiveness research Implementation and dissemination science Conduct or participate in research or evidence-based practice

IPC, infection prevention and control.
*Future-oriented and updated definition of a subdomain that was also in the 2012 competency model.

PPS, and future-oriented competency domains and subdomains because some components of a topic may be novel and need further development through the future-oriented competency conceptual structure.

A new feature of the updated model is online interactivity, allowing the user to visualize expanded domain and subdomain content and to link to key documents interfacing with the model. Definitions of the 6 APIC Competency Model future-oriented competency domains and subdomains are provided in Table 2, as well as in the online interactive model on APIC's website.

Leadership competency domain

Infection preventionists use leadership skills to establish a clear vision for IPC programs throughout the continuum of care. To establish that vision, the IP must collaborate with other leaders and colleagues to align IPC program goals with the strategic goals of the organization. Subdomains identify future-oriented skill sets to guide the IP in the process of influence, implementation, and innovation to generate and enhance the commitment, capabilities, methods, and resources necessary to translate visions and plans into reality. The development of these skills throughout their career will prepare IPs for leadership opportunities that may arise in the future.

Communication subdomain

Given the complex issues and diverse stakeholders involved in infection prevention and control, effective communication is a critical, increasingly important leadership skill for IPs. Communication involves the exchange of information or ideas with individuals and groups, including the use of words, symbols, data, social media tools, listening, body language, and behavioral role modeling. Effective communication requires emotional intelligence and situational awareness. An effective communicator considers the informational needs, cultural background, and knowledge level of the audience and the real and perceived patient safety risks, using an evidence-based approach to influence others and support and facilitate desired behaviors and performance.

IPs need to anticipate potential barriers to effective communication, which may be physical, psychological, attitudinal, or hierarchical. The skill of active listening is essential, as is awareness of nonverbal cues. IPs should cultivate the art of persuading and influencing others through composed, consistent consensus building based on accurate data, analysis, and relevant rationale. The IP must evaluate the best method for communicating the message. The type of technology or social media will vary with the audience. The ultimate result of effective communication by an IP is the reduction of risk, enhanced interdisciplinary teamwork, education of key players in IPC, and improved patient outcomes.

Critical Thinking subdomain

For IPs, critical thinking means seeking and using all information at their disposal to examine a problem or situation and finding solutions through creative application of knowledge, experience, data, and evidence. It also means that the IP can apply knowledge gained from other situations and scientific evidence to a novel experience or challenge. Above all, critical thinking means the IP does not accept a process, policy, or procedure just because "that's the way we've always done it." Critical thinking is a combination of key skills or tasks:

- Recognizing that a problem exists (a problem can be an outbreak that requires immediate response or a policy that is no longer best practice)
- Identifying and analyzing options and potential solutions
- Making a decision based on the problem
- Prioritizing how to solve multiple problems at once
- Applying decision to the problem and effectively implementing the solution
- Examining what happened as a result of applying decision to improve results for the next time

Collaboration subdomain

Increasingly, and with the trend expected to continue to grow in the future, an IP's work is executed effectively and sustainably only through working with multiple departments and disciplines to carry out the IPC program's goals. Infection prevention and control touches many areas of health care and often involves sectors that are governed by their respective regulations and standards. An IP may be required to facilitate or lead interdisciplinary projects, serving as a champion for a culture of safety. Doing so requires situational awareness, emotional intelligence, and strategic vision. At other times, collaboration might mean encouraging teamwork and getting the most from others. It might also mean being able to negotiate your program needs in the larger context of the group or facility. Different types of leadership skills are required to collaborate effectively, including followership—learning to provide expertise in a supporting role while not officially being the team leader. Qualities of a good follower might include listening to and respecting others' opinions, demonstrating commitment, displaying loyalty, and working well with others to achieve consensus. It also means being willing to challenge leaders and offer constructive criticism.

Behavioral Science subdomain

Because both preventing person-to-person transmission and behavioral compliance are critical to the effectiveness and success of IPC interventions, it is important for IPs to be knowledgeable about the leadership resources offered by sciences (eg, psychology,

sociology) that seek to generalize human behavior in society using behavioral science theory. IPs benefit from the application of behavioral science theory, such as socio-adaptive strategies, when facilitating behavior change and developing education and training programs. Familiarity with socio-adaptive strategies and relationship management become valuable because prevention efforts in large part can be behaviorally focused, requiring collaboration, engagement, and communication across professional disciplines and clinical and administrative boundaries. IPs can be agents of change as they build relationships with frontline staff and leaders alike. These relationships assure sustained behavioral changes through deliberate actions and team building. With the knowledge of behavior science and change theories, IPs can better facilitate teamwork to define an agreed-upon measure of success, and they are uniquely positioned to recommend how this information is fed back to local leaders and institutional leaders for continued and actionable change.

Program Management subdomain

In addition to being subject matter experts in IPC, IPs also need to be effective and efficient managers of budgets, resources, personnel, and programs. By demonstrating sound management and leadership skills, IPs will enhance their credibility, have a stronger voice, and gain a seat at key stakeholder tables, ensuring that their IPC expertise and perspective are present during key decision making. IPs need to have a clear vision and understanding of what an effective, successful, resilient IPC program looks like, as well as the interdisciplinary program management knowledge, skills, and awareness to achieve those essential organizational and operational realities. Science, technology, health care business models, and regulatory and accreditation requirements are steadily evolving. IPs should develop and practice key skills such as forecasting, strategic planning, analyzing scenarios, and building consensus. Perseverance through adversity is required to meet targets, as well as being flexible and nimble when priorities, circumstances, roles, and responsibilities shift. The key is performance outcomes, recalibrating as needed to constantly narrow the gap between goals and results.

All IPs need team-building skills and the ability to see complex challenges from a systems perspective. IPs in solo practice may not be able to exercise a more traditional leadership role afforded through direct employee reports but do have a unique role in being a program manager. An IP director and/or manager needs additional skills to recruit, interview, onboard, mentor, and develop talent for interdisciplinary teams. Effective IP managers know how to conduct themselves with emotional intelligence, remain balanced, and align workloads for their teams. That means seeing the big picture, monitoring key details, building collaborative relationships internally and externally, fostering a culture of accountability, and managing expectations and competing priorities. At the end of the day, nothing is as motivating as the shared success that comes through excellent teamwork.

Mentorship subdomain

Effective and timely mentorship can play a critical role in the success of IPs, especially those new to the profession, because IPs come to infection prevention and control from varied backgrounds from within nursing and nonclinical fields and have not shared standardized training. In addition, the focus on implementation and dissemination of prevention strategies and interventions makes it essential for IPs to learn from each other's experiences. Effective IP mentors impart infection prevention knowledge through the lens of their personal professional experience and assist colleagues in translating textbook concepts and evidence-based guidelines to real-life clinical needs and situations. In today's fast-changing health care environment, good talent is becoming more difficult to find and even more difficult to keep. Successful mentoring improves retention by growing

and developing IPs, which in turn increases their level of professional satisfaction. Mentorship is beneficial to both the mentee and the mentor because it provides an opportunity to contribute to the professional development and competency advancement of the future IP workforce.

Professional Stewardship competency domain

The continuously changing world of health care and infection prevention requires dedicated stewards that will allow the profession to develop, adjust, and uphold a respectable and reliable reputation. IPs must be willing and ready to be held accountable for an entity larger then themselves and the organizations for which they work. IPs are responsible for and entrusted with the future of the profession and hold the potential to produce meaningful change within infection prevention practice. Professional stewardship and the subdomains it encompasses are future oriented and develop as IPs advance in their knowledge, experience, and expertise.

Accountability subdomain

As outlined in APIC's professional and practice standards, IPs must be able to demonstrate a consistent, high level of personal dependability in all aspects of their profession. IPs must also be able to work effectively throughout an organization to ensure that accountability measures are in place for the performance of evidence-based practices, especially for those that impact quality metrics scrutinized by payers and regulators and prevent harm to patients. To maintain this level of accountability, IPs must have skills in communication, education, relationship building, behavior change, and facilitation to ensure that compliance is established and that all health care workers are educated and feel accountable for preventing and controlling infections. Future competencies for the IP in this area include maintaining the confidentiality of sensitive information, investigating claims of employee violations and encouraging staff to take responsibility for those actions, implementing and sustaining new guidelines and procedures, providing information across the health system to educate staff on respective duties, emphasizing performance expectations, and revising and communicating expectations and methods for achieving health care system IPC goals and results.

Ethics subdomain

Ethics is a mindset that requires careful cultivation and stewardship, constant vigilance, and ongoing awareness and learning to provide a framework when deciding the best course of action, especially when dealing with highly complex, changing, or novel situations and systems. As stewards of the profession, IPs should demonstrate the highest standards of personal and professional conduct, accountability, behavior, and decision making, including consistent adherence to the ethical principles outlined in the APIC professional and practice standards. IPs are advocates for quality and safety in all health care settings and work to guarantee the health of the entire population for which they are responsible while respecting the rights of individuals within that population. Ethical principles should be built into policies and procedures, with justification and solid evidence provided for measures so that they are clearly understood by all individuals who are impacted. IPs should uphold the integrity of the profession through compliance with laws, regulations, and standards of best practice related to infection prevention and control. This includes conducting surveillance for health care-associated infections based on current National Healthcare Safety Network definitions and accurately reporting HAIs according to state and/or federal mandates.

Financial Acumen subdomain

As stewards of departmental budgets, IPs must project the intended and unintended impact of IPC activities across the facility. A

key component of understanding the business case for IPC is quantifying the costs and savings of IPC initiatives, such as implementation of new programs (hand hygiene observer, unit catheter-associated urinary tract infection champion), practices (adapting evidence-based guidelines), and products (reducing risk through engineering). Additionally, the IP often must justify her or his position within a facility, as well as compete for additional support (full-time equivalent). An IP who is able to make a cogent, clear, succinct business case that is customized as needed to diverse decision-makers, including the C-suite, may succeed in both implementing initiatives and supporting the role of the IP department, resulting in enhanced patient safety and reduced risk to the facility. Another key aspect of making the business case and being a good steward of resources that impact IPC is understanding reimbursement models. IPC process and outcome metric performance is being used more in reimbursement models. In addition to facility-based reimbursement models, provider quality incentive reimbursement schemes use infection prevention metrics to stimulate more focus on improved patient outcomes.

Population Health subdomain

With increased movement of patients among and between different health care settings and the community, population health concerns are becoming a progressively important aspect of an IP's work. Challenges include community-associated infections, self-prevention strategies, emerging diseases, outbreaks and epidemics, environmental hazards, and bioterrorism affecting the health outcomes of groups of individuals and the wider population. Our rapidly evolving health care system demands that IPs attend to patient safety and HAIs that go beyond an individual or hospital focus. Prevention, early detection, surveillance, and treatment modalities must be designed, implemented, and evaluated at the level of prospective preparedness. Today's health care system calls for IPs to be community and population focused, capable of recognizing and managing emerging infections, and able to deal effectively with environmental hazards and threats. Population health requires collaboration among disciplines, critical analysis of systems and outcomes, and the creation of key improvements in health care delivery. Specific skills related to population health include community health assessment, community health improvement planning and action, community engagement and cultural awareness, systems thinking, and organizational planning and management. IPs consider and address population health concerns during the annual risk assessment process, taking into account the contextual demographics as well as global implications. IPs must think outside the walls of their facility settings to keep the community healthy and safe.

Continuum of Care subdomain

Continuum of care refers to the provision of care through multiple types of health services, levels, and intensities. IPC standards encompass a broad spectrum of practice settings (including, but not limited to, acute care, behavioral health, long-term care, outpatient facilities, rehabilitation centers, community health centers, home care, and dialysis) and can be applied to every health care delivery setting. As the health care delivery system expands and patients receive care in multiple settings, it is critical that the IP develop collaborative relationships with IPs in other settings. IPs must consider IPC processes and products used in each practice setting and remain cognizant of the impact these may have on the patient, family, and health care staff as the patient moves from one setting to another. They must work to facilitate communication between facilities and may be called upon to develop plans for the safe transfer and provision of care within other practice settings.

Advocacy subdomain

To grow into greater roles of influence and decision-making, IPs must advocate at the micro (facility) and macro (national) levels for IPC and their field at large. At the national level, IPs need to (1) keep abreast of the political and regulatory health care landscape and understand its impact on the APIC Advocacy Agenda; (2) advocate for the profession and the critically important role that IPC plays across the continuum of care, especially as it impacts practice at the regional, state, and local levels; (3) inform and educate policymakers and regulatory agencies on evidence-based IPC practices that protect patients, staff, and specific populations from infection; (4) maintain vigilance for emerging issues where policymakers and the public are getting the facts wrong, which could lead to cuts to critically needed funding; and (5) practice persuasive reasoning while identifying what resonates with the audience. At the facility level, IPs need to use their position and influence to advocate for the desired future as well as realistic, incremental changes that meet the needs of patients, visitors, staff, and the IPC program itself.

Quality Improvement competency domain

Quality improvement is a fundamental framework that IPs must use to systematically improve care and reduce infections within their health care setting and throughout the continuum of care. Quality improvement requires meaningful analysis and use of data; a clear comprehension of how to assess risk, apply risk reduction strategies, and incorporate performance improvement methodology; and the ability to maintain a focus on patient safety. Progression in the future-oriented quality improvement subdomains will allow IPs to implement stable processes, reduce variation, and improve outcomes to establish a culture of safe and quality care within their health care organizations and promote this culture throughout the profession.

Infection Preventionist As Subject Matter Expert subdomain

IPs are critically important leaders and subject matter experts (SMEs) in any health care setting, with a unique interdisciplinary skill set and the ability to see the big picture. As SMEs, IPs are definitive sources of IPC knowledge, technique, and expertise. They also have the experience, awareness, and systems perspective to understand how changes in the environment could potentially impact patient safety, such as during construction or renovation or when a new technology or technique is introduced at the bedside. The IP's complex, critical role includes knowing when to manage or lead a project or support others as a SME consultant. To maintain a position of leadership as SMEs in IPC, IPs must expand their knowledge to include disciplines beyond infection prevention and control. IPs must also demonstrate enhanced skills to communicate and work effectively with a wide range of experts, from doctors and nurses to laboratory scientists and environmental services staff. Such varied knowledge and skills are invaluable not only during a crisis but also in preventing outbreaks of infectious diseases. By establishing their expertise in IPC grounded in the latest, evidence-based knowledge, IPs will be more likely to secure a seat at the decision-making table.

Performance Improvement subdomain

IPs will continue to collaborate with other health care professionals on performance improvement (PI) processes to create transformational change leading to better clinical outcomes and sustained PI at the system level. Several methodologies with concomitant tools are available for PI. Regardless of the method chosen, the key elements of PI are assessing performance in a given area, setting achievable goals, using data to initiate changes, incorporating human factors engineering, and developing measures that will ensure sustainability of the improvement. Employee involvement and empowerment are vital to the success of PI. PI is a continuous, not static,

process. Because of increasing demands for no harm to patients and for high-reliability care, the IP must be proficient in participating in PI. The advancing IP must have the knowledge and ability to recognize when to lead or facilitate the PI team and when to be part of the team to achieve the goals of the project.

Patient Safety subdomain

Patient safety is at the core of IPC programs, and IPs must be actively involved in the facility's overall patient safety program. That involvement can be demonstrated through participation on a patient safety committee or leading teams to reduce HAIs, among other patient safety initiatives. Concepts central to patient safety that IPs must take into account include systems thinking, high reliability, and sustainability.

Systems thinking requires IPs to consider connections inside and outside the health care setting and how they are interrelated in the provision of care. Rarely does the implementation of a new process or a defect in a process affect only one team or individual. These are often system issues, which must be addressed before change can occur. It is crucial for IPs to be able to see beyond the walls of the unit or organization involved in order to have an impact. IPs must be able to recognize potential system issues and be prepared to address them as they are identified.

High-reliability organizations are organizations that maintain a high level of safety with the goal of no failures (errors) over a long period. High-reliability organizations are continuously looking for ways to improve system processes and reduce harm. The 5 attributes of high reliability are

1. Preoccupation with failure
2. Sensitivity to operations
3. Reluctance to simplify
4. Commitment to resilience
5. Deference to expertise

Given their knowledge and skills, IPs must remain highly competent in predicting possible failures in processes and practices and act to preempt or prevent them. An example is compliance with isolation precautions. IPs must develop a system for monitoring compliance, identifying failures, and working with stakeholders to improve practice.

Sustainability is the ability of an organization to maintain implemented processes over time. IPs coordinate and participate in surveillance activities related to processes implemented to reduce the risk of HAIs. Examples include hand hygiene audits, compliance with isolation precautions, and compliance with HAI bundle activities. IPs then use the data collected to improve processes and implement strategies to hardwire the changes.

Data Utilization subdomain

To sustain and grow their influence, IPs must be viewed as super users of data. The purpose of data utilization is to aid in decision-making and goal setting, developing annual IPC plans and determining priority improvement opportunities, seeking collaboration with frontline staff, and presenting information to leadership. Productive data utilization demonstrates the value of the information that is available to the practitioner or the facility. In health care settings, information is derived from both individuals and groups. IPs possess these skills to successfully use data:

- Select appropriate indicators to measure.
- Determine types and sources of data.
- Perform statistical analyses of the data (coordinate with others with this skill).

- Analyze and interpret the results so they can be applied to future actions.
- Discuss results and provide visualization of the results to interested parties.

Larger datasets, increasing integration of health care records across the care continuum, and enhanced data mining capabilities will present opportunities and challenges for the IP.

Risk Assessment and Risk Reduction subdomain

With the goal of assessing current risks, minimizing unprotected exposure to pathogens, and eliminating or reducing the transmission of pathogens, risk assessment is by its very function a future-oriented competency. It is and will remain a cornerstone of an effective IPC program. A risk assessment examines risk factors and vulnerabilities relative to persons, places, and things. The severity of the potential harm, the likelihood of occurrence, and existing control measures are considered when developing a risk assessment. This allows risks to be prioritized to determine the focus of the infection prevention plan and activities. In addition to using the annual risk assessment for program planning, this process can address other, more advanced situations, such as managing outbreaks of novel or emerging pathogens, environment of care considerations such as special locations, water management plans addressing water contamination, construction-related concerns, food handling safety, and equipment management.

Risk reduction occurs via implementation of evidence-based prevention strategies. These strategies will be directed by surveillance data, the annual risk assessment, and services provided by the organization. Risk reduction strategies should target high-risk, high-volume, high-cost events as determined by the IP and the infection prevention committee. Strategies should contribute to patient and staff safety. New technology for diagnosis, care, and treatment; advances in scientific research; and managing with limited resources must be considered for future risk reduction efforts. Future-oriented risk reduction strategies for special locations can be addressed by becoming familiar with and using United States Pharmacopeia standards, *Legionella* mitigation interventions, Facility Guidelines Institute guidelines, food handling safety standards, and manufacturers' instructions for use to reduce risks identified.

Infection Prevention and Control Operations competency domain

Although all model domains address IPC content, this domain highlights specific future-oriented competency content that crosses clinical, technical, and leadership subdomains. The broad scope of functions contained in the Infection Prevention and Control Operations domain use proactive and reactive approaches to conduct surveillance, identify infection risks, implement infection interventions, and mitigate risks.

Epidemiology and Surveillance subdomain

Epidemiology is the study of the frequency, distribution, cause, and control of disease in populations, and surveillance is a comprehensive method of measuring outcomes and related processes of care, analyzing the data, and providing information to members of the health care team to assist in improving those outcomes. Together, they form the basis of infection prevention analysis and workflow. IPs bring a solid understanding of epidemiology to surveillance in order to be proactive and predictive in setting infection reduction targets and establish thresholds for action and response. To do this successfully, IPs must be able to apply and expand surveillance principles; use complex data display tools (control charts, affinity diagrams, scatterplots); conduct basic cluster or epidemic investigations; interpret results using statistics, rates, and ratios; and know what benchmarks to use for their programs. The IP's surveillance skills can be

augmented by familiarity with analytical computer programs or through productive collaboration with colleagues with this talent. This is a core area of IPC knowledge and skills, where IPs need to constantly refresh and deepen their knowledge so that they are able to speak with authority and clarity to public health officials and diverse professionals in their facility and other facilities that may be impacted when dealing with novel or ambiguous outbreak situations or high-stakes emergencies.

Education subdomain

Learning is often referred to as the most important 21st-century skill. Nowhere is that truer than in fast-paced health care settings today. A critical, ongoing IP role is to assess the IPC educational needs of staff, patients, students, and visitors; identify the right goals and objectives; and develop and deliver engaging education sessions and/or materials. Examples of educational delivery methodologies include oral presentations (formal or informal), one-on-one, handouts, posters, teach back, train the trainer, simulation labs, positive deviance dialogs, online, and videos. However, proficient IPs also have to deliver impromptu specific education (including microlearning) that addresses needs and gaps just in time, as new circumstances arise.

Effective education programs result in improved behavior, habits, mindsets, and performance outcomes. IPs need to be familiar with the core principles of adult learning and to stay abreast of innovations in teaching and learning design with the end in mind. IPs take into consideration what they want their learners to know, remember, feel, or be able to do. Increasingly, limited time is available for education and training, and most learning takes place outside of formal training contexts. Therefore, every effort is made to ensure that learning opportunities are memorable, meaningful, and motivating, in addition to increasing the level of participation, impact, and engagement. IPs keep in mind that the one who does the work does the learning, and content covered is not content learned. IPs should always follow up a training to gauge its impact on the job and success in achieving desired outcomes. IPs understand that learners will be more likely to apply what they have learned if there is an expectation of accountability and they are intrinsically motivated.

IPC Rounding subdomain

IPC rounding requires experience and expertise, along with mentoring, training, and supervision, so that Novice or Becoming Proficient IPs learn to see complex, constantly changing health care settings through the eyes of a highly experienced IP. Based on annual and periodic risk assessments, IPs conduct rounds, which may be either interdisciplinary or individual, to ensure compliance with IPC standards while maintaining a sanitary and safe environment for patients, staff, and visitors. Enhanced skills require that observational rounding elements in each area or clinical practice are relevant and appropriate for that setting. Operating room environmental rounds will be different from observation of appropriate care and maintenance of indwelling catheters and also different from rounds ensuring that patients are on appropriate isolation.

Beyond the infection control risk assessment for construction or renovation activities, the IP must round on these ongoing projects and audit the area for breaches in requirements. This requires a keen eye and knowledge of the details of the project, as well as knowing what to look for when rounding, whether working with renovation of existing facilities or the construction of new buildings. IPs must have knowledge of the requirements for the specific areas and practices being observed. Findings of rounds must be communicated and appropriate action plans implemented and sustained. Beyond the lens of traditional IP rounding, IPs participate in interdisciplinary, clinical-centered rounding as programs are developed at their facility. This allows real-time assessment of device utilization as well as opportunities for antibiotic stewardship discussions with clinicians.

IPs may also round on patients with devices, in transmission-based precautions, or with infectious diseases to provide patient safety education.

Cleaning, Disinfection, and Sterilization subdomain

Cleaning, disinfection, and sterilization are essential elements of IPC programs in all health care settings. Surgical and nonsurgical procedures, as well as contamination and bioburden within the health care environment, carry a risk of infection for patients. IPs play a crucial role by being knowledgeable about disinfection and sterilization practices used in all settings across their organization and closely collaborating with health care personnel and sterile processing teams in their respective settings to minimize contamination risks and ensure that medical instruments and equipment are properly cleaned and reprocessed.

A key IP function is understanding and ensuring implementation of manufacturers' instructions for use for equipment or products used for cleaning, disinfection, and sterilization. IPs must become and remain familiar with expert organizations' sterilization and disinfection recommendations to facilitate compliance within their organizations. Should breaches in performance or noncompliance with guidelines occur, IPs must collaborate with key stakeholders to identify the level of risk to patients and provide necessary follow-up.

The IPs' ability to critically evaluate technological advancements in cleaning, disinfection, and sterilization and to determine appropriate use in their setting is an important one. IPs offer assistance to determine if "new and improved" equipment and instruments can be appropriately cleaned, disinfected, and sterilized to ensure safe patient care. Knowledge of how to apply the Spaulding classification system is fundamental when dealing not only with current instrumentation and equipment but also with new and improved technology in the future.

Outbreak Detection and Management subdomain

The identification of adverse events, such as infections, when they occur above the background rate or when there is an unusual pathogen or adverse event is a fundamental component of an IP's work that demands ongoing vigilance. The key components to outbreak detection and management include confirmation of an outbreak; notification of key partners about the investigation; conducting a literature review; establishing and refining a case definition and case finding methodology; preparing a line list and epidemic curve; observing and previewing of implicated care activities; sampling of environment and device, if indicated; implementing and ongoing review of control measures and performance; and implementing an analytic study, if needed. The future challenges for IPs will be detecting emerging or novel pathogens through the use of (but not limited to)

- Application of diagnostic testing data and techniques; see subdomain under Infection Prevention and Control Informatics (includes predictive analytics, data mining, artificial intelligence, and application of big data sources)
- Natural language processing, which allows for a quick compilation of the data into terms obviously related to a research topic and other relations that may be unexpected; capitalizing on the uncommon terms could give the researcher the ability to identify flags that may aid in investigation of or prediction of outbreaks
- Using data and data feeds to identify risks to the health care continuum from threats related to domestic and international travel

Advances in and application of all of the above aid the IP in the detection, prediction, management, and investigation of outbreaks.

Emerging Technologies subdomain

Technological change is taking place at an unprecedented, exponential rate, well beyond the capability of any one individual, group, profession, or society to fully understand or assimilate. In this environment, being receptive to learning new things, cultivating curiosity to want to know more, learning how to learn, and knowing what you know and do not know are important skills. Given the wide scope of IPC work, IPs should play to their natural strengths: interdisciplinary thinking, seeing the big picture, and knowing how to connect the dots across the complex landscape of health care facilities in the continuum of care. IPs may know a lot about a particular technology; however, it is important to monitor the possible IPC impacts of a broad range of current and emerging technologies. Key areas to pay attention to may include information systems and patient care technology, diagnostic testing, telemedicine, and new environmental technologies.

Antimicrobial Stewardship subdomain

IPs are involved with the facility's antimicrobial stewardship initiatives by providing consultative expertise and by being a leader and advocate in this very important area that increasingly impacts the health and safety of patients worldwide. The magnitude of these adverse outcomes will be more pronounced as disease severity, strain virulence, or host vulnerability increases. Failure to combat the continued evolution of antimicrobial resistance in the hospital and across the continuum of care threatens to significantly compromise the ability not only to prevent but also to treat serious infections. IPs proactively contribute to antimicrobial stewardship efforts by identifying and detecting multidrug-resistant organisms among the population served, reporting surveillance trends over time, using surveillance data (eg, treating asymptomatic bacteriuria, collecting contaminated specimens), and analyzing antibiograms and antibiotic use. These processes are critical elements of annual and targeted risk assessments to determine the role of epidemiologically significant organisms. IPs further support antimicrobial stewardship initiatives by assisting with early organism and infected patient identification; promoting compliance with standard and transmission-based precautions and other infection prevention strategies, such as care bundle practices and hand hygiene; and developing and providing educational programs for staff, patients, and visitors.

Diagnostic Stewardship subdomain

Recent advances in rapid-precision microbial technologies and radiographic imaging or interventions are transforming patient diagnostics in health care. Diagnostic stewardship means selecting the right test for the right patient at the right time in the right way to optimize clinical care. IPs play an essential role in the collaborative effort that involves decisions about which new diagnostics are needed, how they will be used and interpreted, and the cost implications and trade-offs. It requires a seamless partnership among providers, infectious disease specialists, laboratories, radiologists, pharmacists, IPs, nurses, and other clinical team members so that tests are ordered appropriately and information is translated and used accurately in treatment decisions. IPs work with frontline staff to develop protocols for testing, including proper specimen collection techniques to optimize results. Development of auditing systems and use of data compliance monitoring to drive improvements in diagnostic stewardship are key roles for IPs. IPs monitor the impact of diagnostic stewardship via HAI data analysis and incorporate financial value in the evaluation process.

Infection Prevention and Control Informatics competency domain

Information and diagnostic technologies and their applications are rapidly evolving and highly dynamic. IPs must keep abreast of and stay proficient in using and leveraging systems to input, analyze, extract, and manage data to support and drive data integrity, streamlining of processes, innovative IPC practices, and positive patient outcomes. Future-oriented concepts such as rapid identification mechanisms for data and diagnostic laboratory tests, real-time decision making, data dissemination, machine learning, and artificial intelligence are all important for IPs.

Surveillance Technology subdomain

A primary function of surveillance technology is leveraging data inputs to help identify HAIs and other reportable infection prevention data and managing reportable data, including communicating results through automated reporting. Applications may be homegrown or designed by vendors, and they may encompass all aspects of IPC work (beyond HAI surveillance), including mining staff illness, risk management, antibiotic stewardship, and microbiology surveillance. Surveillance technology has changed the workflow of the IP from manual processes to electronic solutions. Harnessed effectively, surveillance technology can be applied to proactively identify trends. The IP must perform due diligence in implementation and ongoing validation of surveillance technology, as errors in this process can lead to data quality issues. As surveillance technology improves, the IP must keep pace with these improvements and anticipate ways to harness the program across the continuum of care and for historical relevant data within a system.

Electronic Medical Records and Electronic Data Warehouse subdomain

Although some facilities may still use paper-based medical records, the national trend, with support of meaningful use initiatives, is toward electronic medical records (EMRs). The EMR is the legal record created by hospitals and ambulatory environments that populates the broader electronic health record (EHR). An aggregation of discrete EHR data that can be queried and analyzed comprises the electronic data warehouse (EDW). An EDW differs from a data repository, such as the National Healthcare Safety Network, in that the data are pulled directly from the EHR to the EDW with minimal manual data entry. An IPC electronic surveillance program may function as an EDW specific to IPC issues. As a data repository, the EDW may be harnessed to identify the impact of certain infections on resource utilization (eg, length of stay), to determine the effectiveness of infection prevention and therapeutic interventions, and to allow algorithmic detection of possible HAIs, as well as for syndromic surveillance for public health or national security reasons, data validation, and identification of possible surgical site infections coded in claims data systems. With a comprehensive understanding of the informatics needed for IPC, the IP is able to guide information technology solutions for everyday IP issues such as simplifying and streamlining surveillance processes and building rules for clinical alerts and real-time decision making. IPs need to be involved in the evaluation and selection of an EMR vendor, should be trained in its use and actively tailor the system to enhance data accuracy and IP productivity, and should be involved in changes made to the system that impact IPC. Use of an EMR can include chart review, automated collection of device-days and procedures, alerts to clinicians of continued presence of devices such as urinary catheters, real-time management of patients in isolation precautions, and names of personnel needing post-exposure follow-up from possible occupational exposure to infectious disease.

Data Management, Analysis, and Visualization subdomain

Using the surveillance plan, the IP creates a data management process for the IPC program. Keeping abreast of the current technologies available to streamline the surveillance process is crucial as IPs incorporate the correct data streams to ensure relevant and accurate reporting of data in a resource-efficient manner. Advances in machine learning can help expedite identification of trends and assist IPs in the

identification and early prevention of HAIs, outbreaks, and areas of focus for improvement activities. Understanding the gaps in the interpretation and use of data is vital to ensuring meaningfulness and accuracy. Infection-related data must be validated, stored, protected, and processed correctly to ensure accessibility, reliability, and timeliness for all end users and identification of issues and reporting needs. Techniques to transform raw data into usable information are essential in addressing infection prevention concerns. IPs should adopt visualization methods to help enhance identification of patterns, trends, and correlations that otherwise might go undetected, in addition to incorporating and tailoring data visualization methods when disseminating IPC data to end users.

Application of Diagnostic Testing Data and Techniques subdomain

Advancements in diagnostic testing methods related to health care will continue to occur at a rapid pace. IPs need to collaborate with the laboratory and radiology to ensure ongoing self-education of novel diagnostic technologies being used at their facilities. IPs also need to interpret and judiciously apply the findings from new diagnostic testing methods into their IPC programs, such as determining the initiation or removal of a patient from isolation precautions and assessing the potential impact on surveillance plans, as well as National Healthcare Safety Network HAI definitions in various patient populations. These diagnostic advances are important considerations for IPC and antimicrobial stewardship programs as they help identify infections and HAIs sooner, improve timeliness of proper antimicrobial use, expedite identification of clusters/outbreaks, and even identify markers/risk factors that can be used to prevent infections before they occur. Utilization of machine learning and artificial intelligence in diagnostic technology and data mining arenas will be important concepts for IPs to understand so that they are able to articulate data needs from electronic systems. Furthermore, predictive analytics will connect our diagnostic technology with clinical documentation to facilitate more rapid intervention in patient care and improve clinical outcomes. IPs will need to ensure that these new diagnostic methodologies and results are incorporated into surveillance systems to ensure reliable monitoring of HAIs. IPs also can play an important role in educating frontline staff, in an easy to understand manner, about new diagnostic test results and their relevance to IPC practices and data analysis and dissemination.

Research Competency domain

Research is an essential skill set that supports and advances the IPC field. The content in this domain highlights the importance of applied research and implementation science for the IP. Incorporating research constructs into the role equips the IP with the opportunity to synthesize, apply, and evaluate research information to develop and demonstrate IPC and epidemiological expertise.

Evaluation of Research subdomain

Even if IPs are not conducting research, they should understand whether or not the basic design of a study is strong and know whether they should implement the results. IPs implement the very best research into their facility's practices and conduct analyses of how it is working in their settings. Doing so requires the skills to review and assess the strengths, limitations, and application of research and to critically assess content, validity, and reliability.

Comparative Effectiveness Research subdomain

According to the Agency for Healthcare Research and Quality, "Comparative effectiveness research (CER) is designed to inform health care decisions by providing evidence on effectiveness, benefits, and harms of different treatment options. The evidence is generated from research studies that compare drugs, medical devices, tests, surgeries, or ways to deliver health care." With this focus on the application of clinical research, CER supplements and strengthens implementation science efforts. An understanding of CER better equips the IP to ground IPC practice in evidence and informed decisions. The ability to compare the relative value of a treatment option, based on evidence, allows the IP to make informed decisions when recommending products, devices, and supplies to use and implement. IPs should become familiar with CER methodology so they can apply this knowledge to compare one active intervention to another to assess benefits and harms to patients (eg, rate of patient infection, not just microbial contamination).

Implementation and Dissemination Science subdomain

Implementation and dissemination science may be defined as research that creates new knowledge about how best to design, implement, and evaluate quality improvement initiatives. A critical element of IPs as consultants and influencers is the ability to promote the uptake of evidence-based practice and research findings into routine practice. Applying evidence to the practice of IPC is not always an easy task, and presenting people with evidence does not necessarily translate to a change in practice or behavior. Competency in the methods and working of implementation science provides the IP with the means of identifying what and how guidelines and standards should inform daily clinical practice, how the evidence should be adopted as accepted practice and implemented at the patient bedside, and how to apply research that appears in scientific, peer-reviewed journal to policies and practices. Standardized frameworks for the successful implementation of evidence into practice should be familiar to and used by IPs in all settings. These frameworks should be considered when evaluating an implementation or designing an implementation study or activity. The Promoting Action on Research Implementation in Health Services framework and Consolidated Framework for Implementation Research are examples of frameworks that can be used. Dissemination science refers to the targeted distribution of information and intervention materials to a specific audience. Knowledge of dissemination science principles directly strengthens key elements of the IP's role as educator and communicator. Implementation implies that the goal of the communication is, however, to do more than increase awareness; it is the use of strategies to adopt and integrate evidence-based health interventions and change practice patterns within specific settings.

Conduct or Participate in Research or Evidence-Based Practice subdomain

It is important to note that quality improvement and research can look similar, but there are differences. Research will be conducted with the idea of developing generalized knowledge for others; whereas, a quality improvement initiative within a facility seeks to understand what works in that setting but does not try to inform the entire practice. Although not all IPs will design a study to conduct research, IPs do have a responsibility to add to the evidence through publications about work being done in their facility. IPs not conducting their own research may participate in research studies by identifying gaps in knowledge and setting research priorities for their facilities. Such experience and knowledge serve IPs well in being successful and effective in leading and participating in local quality improvement initiatives.

APPLICATION OF THE MODEL

The APIC Competency Model is not a stand-alone document and should be used in conjunction with and when referencing the APIC PPS[6] and CBIC core competencies.[5] The model can be used to enhance orientation and ongoing competency assessment, for professional development of IPs, to clarify roles and responsibilities of IPs, and to

Table 3
Examples of competency statements, adapted from the updated (2019) APIC Competency Model, which may be used to measure IP performance at each career stage within the future-oriented competency subdomains

Novice	Becoming Proficient	Proficient	Expert

Leadership domain: Collaboration subdomain

Novice	Becoming Proficient	Proficient	Expert
The IP demonstrates effective emotional intelligence, listening, and learning skills and is acquiring baseline knowledge about each department and team in which she or he interacts. The IP is beginning to understand the diverse areas of responsibility in her or his new role and is developing relationships with department staff outside of Infection Prevention.	The IP collaborates well with peer groups and can work well with diverse groups. The IP is developing collaboration skills by assuming a role in a focused group project. With ongoing guidance, the IP is becoming more independent in collaborating with key stakeholders.	The IP actively suggests and seeks ideas to improve quality, efficiency, and effectiveness. The IP is able to prepare for group meetings by identifying key issues and expectations and is able to identify resources most likely to guide project tasks. The IP is able to engage all members in the discussion with respect and professionalism.	The IP actively pursues collaboration and discussion by facilitating and leading diverse groups, welcoming opinions, respectfully challenging perspectives, and modeling effective listening skills. The IP encourages ownership of the process by group members, highlights group successes, builds a sense of shared accomplishment, and reinforces success by becoming an advocate for the group's decisions.

Professional Stewardship domain: Financial Acumen subdomain

Novice	Becoming Proficient	Proficient	Expert
The IP demonstrates effective basic knowledge regarding the importance of cost versus quality. The IP seeks ways to understand the processes involved in cost and value analysis.	The IP collaborates with peers to identify the cost of a product/service. The IP is more independent in pursuing the information, in collaboration with an experienced IP. The IP is becoming comfortable with speaking to product/equipment representatives and obtaining costs for a product/service.	The IP is comfortable with performing a cost-quality analysis for a given product/service. The IP describes, compares, and contrasts how various product/service options align with IPC best practices. The IP conducts and presents a cost-quality analysis to senior leaders for approval.	The IP confidently performs a cost-quality analysis, performs negotiations, and presents to senior leadership for approval and implementation. The IP responsibly allocates and accounts for the use of fiscal resources, weighing alternatives and their benefits, and seeks ways to reduce cost. The IP applies return-on-investment principles to establish the value of a product.

Quality Improvement domain: Risk Assessment and Risk Reduction subdomain

Novice	Becoming Proficient	Proficient	Expert
The IP has a basic knowledge of the risk assessment concept and its importance to the IPC program. The IP is participating in projects and beginning to understand risk reduction strategies of the infection prevention program. The IP is becoming familiar with the infection prevention annual plan and understands the link between the IP risk assessment and reduction strategies selected.	The IP identifies the information necessary to conduct a basic risk assessment. The IP participates in a basic risk assessment and provides input into developing risk reduction strategies based on the risk. The IP conducts and organizes a basic literature search to review and analyze ideas to include in the risk reduction strategies.	The IP knows where and how to access the appropriate data and information necessary to conduct a risk assessment. The IP recognizes the need for additional information to move forward with risk assessment and reduction measures. The IP conducts and develops a comprehensive risk assessment and prioritizes findings; develops an overall prevention plan using nationally recognized guidelines, including goals and objectives; proactively identifies key potential risks; and makes adjustments to prevention measures.	The IP shows insight into the root causes of potential risks and generates a range of solutions and courses of action based on research. The IP is proficient in researching evidenced-based resources for risk reduction strategies and is able to think "outside the box" for appropriate actions, including the use of ideas from others, to help develop solutions, seeking out those who have had similar risks. The IP is confident in developing a risk assessment for unique situations (eg, water management plan) and generates a collaborative team-based atmosphere to reduce risk and improve patient safety outcomes.

Operations domain: Epidemiology and Surveillance subdomain

Novice	Becoming Proficient	Proficient	Expert
The IP conducts routine surveillance activities. The IP is beginning to identify nationally recognized surveillance and/or outbreak definitions relevant to the practice setting and report appropriately to regulatory agencies.	The IP is becoming confident in conducting surveillance and identifies and associates nationally recognized surveillance and/or outbreak definitions relevant to the practice setting and IPC program. The IP performs basic statistical techniques and formulas to analyze data.	The IP appropriately categorizes and examines data using basic descriptive statistics. The IP uses basic data display formats such as charts, graphs, and tables. The IP may begin to expand statistical skills by incorporating inferential statistics to detect unusual findings or clusters/outbreaks. The IP creates action plans based on the findings.	The IP is confident in their knowledge and skills to implement advanced epidemiology principles and statistics, data analysis, and the use of complex data communication and display and is comfortable using benchmarks to set up infection rate thresholds. The IP understands, selects, and uses advanced statistical and quantitative techniques and principles to achieve desired data or solutions.

Research domain: Evaluation of Research subdomain

Novice	Becoming Proficient	Proficient	Expert
The IP is familiar with publications within the field of IPC. The IP is actively reading IPC research studies and is able to understand broad themes and summary-level findings. The IP is learning about the differences and associated hierarchy of each type of research method/design. The IP has a limited understanding of how research and implementation science applies to their professional work.	The IP identifies research findings and has a more developed understanding of how the findings apply to IPC programs. The IP is beginning to understand that research findings must be evaluated and interpreted appropriately to identify their significance and validity to practice. The IP is working toward the ability to identify evidence-based practices and conduct a gap analysis.	The IP independently reviews journal articles and identifies strengths and weaknesses of research design. The IP draws conclusions from the research, detects bias, separates facts from opinion, and discerns the author's purpose and tone. The IP evaluates evidence to determine its validity and implements change based on that evidence.	The IP analyzes and interprets research, replicates research studies, and develops plans to implement and evaluate patient outcomes. The IP screens out irrelevant and vague information, keeping the high-quality findings in focus; questions the limits, quality, and accuracy of data; perseveres for additional details; and confirms suspect data. The IP may seek out opportunities to collaborate with other experienced IPs to develop multisite studies and publications.

(continued)

Table 3 (*Continued*)

Novice	Becoming Proficient	Proficient	Expert
	Infection Prevention and Control Informatics domain: Surveillance Technology subdomain		
The IP uses facility-based surveillance technology to monitor microbiology reports and patients with symptoms suggestive of infection. The IP is learning the functions, purposes, and limitations of the technology and is practicing using it.	The IP uses surveillance technology appropriately to identify trends of disease or illness. The IP is beginning to develop confidence and recognize the need for data management and simple report generation that apply to assigned tasks.	The IP designs novel technological workflows to make surveillance more efficient and effective. The IP recognizes when data have exceeded established thresholds, potentially signifying a pattern or unusual cluster of epidemiologically important organisms. The IP knows how to identify and leverage specific expertise and skill sets on teams, prioritize issues, and identify efficient ways to use the technology.	The IP conducts surveillance by whole and stratified patient populations. The IP uses surveillance technology to develop and report data findings to guide facility strategy discussions with key stakeholders. The IP teaches and mentors others about the use of novel surveillance technology. The IP sees opportunities for creative uses of the technology to generate unique and useful solutions to maximize the use of the technology.

IP, infection preventionist.

advance the IPC profession. The updated competency model lays the foundation for several associated APIC tools noted below that enable IPs to design their career paths while allowing managers to select, develop, evaluate, retain, and promote a competent IPC workforce for the future of health care.

Orientation and ongoing competency

Orientation

The APIC Competency Model can be used when onboarding new IPs to ensure standardization and alignment with the profession by developing consistent training and education tools.[9] APIC has developed the Novice Roadmap,[10] which is a tool and guidepost for the novice IP, leading them from their first day in their new professional role through sitting for the CIC exam. The Novice Roadmap is aligned with the APIC Competency Model, helps IPs become familiar with the CBIC core competencies, and guides their orientation to ensure that all basic aspects of the role are covered. Incorporating concepts from the model into orientation programs will ensure that IPs begin their career journey in a consistent and standardized way.

Ongoing competency

Competency moves the individual beyond basic tasks and includes the application of knowledge, interpersonal decision-making, and psychomotor skills.[11] The APIC Proficient Practitioner Bridge[10] is an online interactive self-assessment tool that helps proficient IPs identify opportunities for growth and development through the future-oriented competency domains. IPC leaders can also use this information to help IPs ensure that ongoing competencies are targeted to the need of the individual and aligned with the IPC profession and organizational goals. The future-oriented competency domains within the model should be incorporated into performance evaluations to allow IPs to develop personalized goals for moving to the next career stage. Including competency content outlined in the model that fits within the organization or department goals can allow for a standard definition of competency and assessment of each employee's level of competence or career state.[11] Competency statements can be developed using the domain and subdomain definitions as a guide, allowing for ongoing competency assessment of technical, critical thinking, and interpersonal skills. Competency can be verified by multiple methods, including exemplars, case studies, presentations, evidence of daily work, return demonstration, mock events, surveys, peer reviews, self-assessments, tests, quality improvement, discussion, and reflection.[11,12] Using the model to develop internal tools allows for a consistent methodology when evaluating IP competency assessment.[11]

Professional development

Individual growth

The model can be used by the individual IP to guide professional development and identification of career paths. Future-oriented competency domains begin in the Novice career stage and grow in importance and in depth of knowledge as one moves through the model. Self-assessment is a powerful tool and can be used by IPs to assess their needs and align knowledge gaps to professional job responsibilities or experiences while developing goals for learning and advancing to the next career stage.[13] By using the APIC Competency Model as a professional development guide, IPs can avoid becoming stagnant and promote dynamic professional growth. It shows a pathway for advancement within the role and allows for planning ongoing maintenance of competency and professional advancement.

Given the increasing diversity of backgrounds for those entering the profession, the "readiness on day 1" status of the IPs' knowledge base will vary depending on the individual and specific skill set, training, clinical or technical background, and experience. Some new recruits will already be in the Becoming Proficient career stage in certain areas but still in the Novice stage in other areas. Table 3 provides generic examples of competency statements across the future-oriented domains and the 4 different career stages. Different levels of competency can be used to adapt orientation of new employees, assist leaders in developing a clinical IP ladder, and validate more concrete ongoing professional development goals while guiding career advancement.

Clinical ladder

The model can be used by organizations interested in developing a clinical ladder for IPs. Clinical ladders provide a framework for professional growth and development and have been shown to improve job satisfaction, retention, recruitment, motivation to advance practice, use of evidence-based practice, and movement toward continuous professional development.[14] Job descriptions and performance evaluations can be customized by career stage, integrating the future-oriented competency domains and subdomains, and can allow for the development of personalized annual professional goals that meet the level of competence in each stage.[15,16] In general, the Novice IP and Becoming Proficient IP are essentially learning the core competencies of IPC practice and becoming more independent in certain aspects of their role. The Proficient IP is applying the basics and learning more advanced concepts outlined within the domains, and the Expert is learning, applying, and role modeling more advanced concepts. Competency statements at each level should be aligned with the IP's current career stage.

Clarification of roles and responsibilities

Authors of the original model suggested that organizations compare existing professional development tools (ie, job description, orientation tools, performance evaluation, and self-assessments) to the competency content outlined in the model.[1] Ensuring that tools are aligned with the APIC Competency Model career stages promotes professional development, enhances workforce excellence, and provides value to IPC departments. The PPS is the ideal resource when developing IP job descriptions.[6] Using the elements within this document sets the stage for ensuring that IPs are practicing within the dynamic scope of the profession. The job description can then be modified to meet each career stage and align with organizational goals. It is more important than ever for IPs to practice using CBIC core competencies, the PPS, and the APIC Competency Model. Updating organizational tools to reflect accurate roles and responsibilities as outlined by the profession can be accomplished by using these resources. The model can be used to delineate the IP role within the multidisciplinary team while fostering collaboration, communication, and consultation with other health care disciplines.[16] Using the model as a guide during leadership communication will assist in translating the values and priorities of competency in relation to IPC. Some facilities have IP specialists serving as content matter experts and specialists responsible for a specific portion of the IPC program (eg, construction and renovation, performance improvement, data management, HAI surveillance). The model domain and subdomain definitions can assist in outlining job descriptions to include these specialty areas in a consistent fashion.

Advancing the profession

Several competency models have been used to develop advanced practice education programs.[17] The APIC Competency Model has the potential to be threaded through educational curriculums or used to develop IPC courses in existing health care programs.[16] The model can be used as a recruitment tool to help promote awareness of the specialty practice.[16] A key benchmark of the IP professional career path is the Fellow of the Association for Professionals in Infection Control and Epidemiology (FAPIC) status, a distinction of honor for IPs who are not only advanced expert practitioners of IPC practice but also leaders within the field. The FAPIC program was built to recognize exemplary APIC members.[18] The FAPIC designation is based on demonstration of commitment to the IPC field and achievement in future-oriented competency domains.

The 2019 APIC Competency Model is meant to guide IPC practice and define needed skill sets over the next 3 to 5 years. IPs should use the future-oriented competency domains as a guide when developing a plan to progress through career stages or pursue leadership roles. The updated competency model reflects the exciting, dynamic, specialized, yet interdisciplinary, nature of the IPC field. The IP has ever-evolving ways to learn and grow throughout the career as a subject matter expert and leader, playing an indispensable role in reducing risk for patients across the continuum of care.

Acknowledgments

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