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Competency assessment tools for infection preventionists: A scoping review

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Abstract

Background: Infection prevention competencies are critical for successful job performance, career progression and robust performance of infection prevention and control programs.

Aim/objective: Identify competency assessment tools available to infection preventionists and describe their characteristics, validation processes and reliability.

Methods: A scoping review was conducted on five databases and grey literature from 1999 to 2022. A descriptive synthesis approach was undertaken to analyse the data.

Finding/results: Seven tools that meet the inclusion criteria were identified. Of those, one tool was reviewed twice. All tools were developed in the United Kingdom, Canada, China and the United States, and were published between 2009 and 2022. All tools use a rating scale; and the most used method to assess competencies was self-assessment. Levels of competency were cited by five tools. Two tools provided information on validation methods and reliability tests for internal consistency.

Discussion: Few competency assessment tools are available in the literature, and there is a lack of information on their development process. A global effort to develop an assessment tool that allows comparison across countries and cultures can be a step forward to propel infection preventionists' careers and enhance the efficacy of Infection Prevention and Control Programs.

Keywords

competency, infection preventionist, scoping review, assessment tools

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Background

Healthcare-associated infections (HAI) are regarded as a global public health problem and one of the biggest challenges involving patient safety and healthcare provision. Therefore, infection preventionists (IPs) should be provided with professional knowledge, skills and behaviours to manage HAI prevention more efficiently and effectively (Landers et al., 2017).

Establishing an advanced level of IP competency is critical for successful HAI prevention, containment of antimicrobial resistance (AMR) and management of outbreaks (World Health Organization, 2020). Relevant organizations such as the European Centre for Disease Prevention and Control (ECDC), the Association of Professionals in Infection Control and Epidemiology (APIC), the Infection Prevention Society (IPS), and the World Health Organization (WHO) have already defined what core competencies IPs should pursue.

In order to support the achievement of the best level of IP competency, an assessment tool is required for either self-assessment or external assessment by a supervisor or mentor. Additionally, by escalating IP's individual competencies, we would leverage infection prevention and control (IPC) as a

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discipline as well as a practice. However, there is a gap in systematic information of currently existing tools for IP competency assessment, and also their development process and availability.

Therefore, this study is aimed at identifying the competency assessment tools available to IPs and describes their characteristics, validation processes and reliability.

Methods

Study design

This is a scoping literature review, and the PRISMA-ScR recommendations were used for reporting purposes (Tricco et al., 2018). A study protocol was registered on Open Science Framework, a prospective international register for systematic scoping review (https://osf.io/wvhb6/). To guide this study, the following question was posed according to the PCC [(P) – Population; (C) – Concept (C); (C) – Context (C)] strategy: 'What tools are available in the literature to assess IP competency'?

Data sources and search strategy

A search strategy was developed in collaboration with a research librarian. We searched five electronic publication databases with no restriction on the type of studies: PubMed, Scopus, CINAHL, EMBASE and PsycINFO (Table 1). In addition, we explored eight grey literature websites: Google Academics, CAPES theses, NDLTD, World Cat, Open Grey, DART-Europe, eTHOS and Trove (Table 2).

Study inclusion and exclusion criteria

Searches included all literature related to IP competency tools published in English, Spanish and Portuguese between January 1st, 1999 and April 30th, 2022, with no restriction of the type of publication. Publications would be included if they provided measurement tools regarding any aspects of IP competency (Table 3).

Data extraction

Two authors performed a systematic search using pre-defined terms according to the database, and duplicates were removed. Thereafter, two reviewers independently screened the titles and abstracts for potentially relevant full texts using the inclusion criteria. At any stage, disagreements were solved by means of discussion until a consensus would be achieved. We used a standard form created by the authors to collect the information with a focus on the author, year of publication, aim of publication, competency domains, number of items, competency levels and key findings (type of instrument, number of items and psychometric characteristics).

Data synthesis

A descriptive analysis of data was performed using relative and absolute frequencies. Due to the nature of the scoping review method, there was no need to formally assess the methodological quality of the studies included. The PRISMA – ScR (Tricco et al., 2018) flow diagram was used to summarize the studies' selection processes.

Ethical approval and patient consent was not required for this work.

Results

Studies included

The initial search protocol identified 287 citations from databases, while 300 additional publications were identified by using other source strategies. After duplicates were removed, a total of 63 publications were screened to read the titles and abstracts, of which another 43 were subsequently excluded because of inadequacy in terms of the inclusion criteria based on IP competency. Twenty studies were read, and 13 were excluded because they failed to address the research questions. Thus, seven publications were considered eligible for this review and were included in the synthesis. Figure 1 shows a summary of the publications gathered and included in descriptive syntheses approach.

Characteristics of IP competency assessment tools

All tools were published between 2009 and 2022. The study's characteristics and a summary of key findings are shown in Table 4. The United States developed one tool that would be reviewed from time to time (APIC, 2015, 2017, 2019). China developed two tools (Chan et al., 2016; Cui et al., 2022), and the United Kingdom and Canada developed one tool each (IPS, 2019; CHICA, 2009).

The most common method to assess IP competency was self-assessment. All included studies provide for a wide variety of domains. Frequently measured domains related to 'infection prevention practices', 'program administration and management', 'education' and 'research'. 'Professional skills' and 'professional development' were mentioned by two studies. The number of items to be assessed in the tools ranged from 30 to 116. Overall, all tools are rating scale instruments. Levels of IP competency were cited by five tools.

Validation and reliability of IP competency assessment tools

The content validation of the tool using the Delphi technique was mentioned in one paper. Regarding reliability, the Rasch model was mentioned in one paper, while the Cronbach's α-coefficient was mentioned in another. Almost half of the

Table 1. Database and search strategy.

PCC strategy	Database and search strategy				
	PubMed®	SCOPUS	CINAHL	EMBASE	PsycINFO
P- population	("Infection Control Practitioners" [MeSH Terms] OR "Infection Control Practitioner" [All Fields] OR "infection preventionist" [All Fields])	(TITLE-ABS-KEY ({*infection control practitioner*} OR {*infection preventionist*} OR {*infection control practitioners*})	Infection control practitioner OR infection preventionist OR infection control practitioners	('infection control practitioner'/exp OR 'infection preventionist' OR 'infection control practitioners')	Infection control practitioner OR infection preventionist OR infection control practitioner
C - concept	("self assessment" [MeSH Terms] OR ("self assessment" [MeSH Terms] OR "self assessment" [All Fields] OR ("self" [All Fields] AND "assessments" [All Fields]) OR "Self Assessments" [All Fields]) OR "self assessment" [All Fields] OR "Self Assessments" [All Fields] OR ("self assessment" [MeSH Terms] OR "self assessment" [All Fields] OR ("self" [All Fields] AND "criticism" [All Fields]) OR "Self Criticism" [All Fields]) OR "Self Criticism" [All Fields] OR ("self assessment" [MeSH Terms] OR "self assessment" [All Fields] OR ("self" [All Fields] AND "criticisms" [All Fields]) OR "self criticisms" [All Fields]) OR "self assessment psychology" [All Fields] OR ("surveys and questionnaires" [All Fields] OR "assessment tools" [All Fields] OR "self evaluation" [All Fields]))	(TITLE-ABS-KEY (*self-assessments* OR {*Self Assessment*} OR {*Self Assessments*} OR *self-criticism* OR {*Self Criticism*} OR *self-criticisms* OR {*Self Assessment (Psychology)*} OR {*Self Assessments (Psychology)*} OR *self-evaluation* OR {*self evaluation*} OR {*surveys and questionnaires*} OR {*assessment tools*} OR {*self evaluation*}))	-	('Self assessment' OR 'self assessments' OR 'self criticism' OR 'self criticisms' OR 'self assessment (psychology)' OR 'self assessments (psychology)' OR 'self evaluation'/exp) AND [embase]/lim	-
C - context	-	-	Competency	-	-
Total *	**119**	**56**	**90**	**9**	**13**

*in 04/30/22.

Table 2. Grey literature search strategy.

#	Searches**	Results
1	"Infection control practitioner" AND (self-assessment OR self-evaluation) AND (Competence OR competency OR competencies)	265
2	"Controladores de infecção" OR "Controladores de infecções" OR "controlador de infecção" OR "Controlador de infecções"	5
3	"Infection control practitioner"	10
4	"Infection control practitioner" AND (Competence OR competency OR competencies)	8
5	"Infection control" AND (Competence OR competency OR competencies)	1
6	"Infection control" AND (Competence OR competency OR competencies)	1
7	"Infection control" AND (Competence OR competency OR competencies)	1
8	"Infection control practitioner" AND (Competence OR competency OR competencies)	9
Total *		**300**

*in 04/30/22.
**Google Academics, CAPES theses, NDLTD, World Cat, Open Grey, DART-Europe, eTHOS and Trove.

Table 3. Eligibility criteria for the scoping review.

Review question	Inclusion criteria	Exclusion criteria
Population	Infection control practitioners, infection control preventionists	Undergraduate students, general healthcare professionals
Concept	Self-assessment, assessment tools, questionnaires, surveys	Studies published in languages other than English, Spanish and Portuguese
Context	Competence, competency	Studies for which the full text was not available, and whose archive request was not answered by the author; publications in conferences were excluded

tools are public and freely available. Two publications provided a framework and a competency assessment tool in association.

Discussion

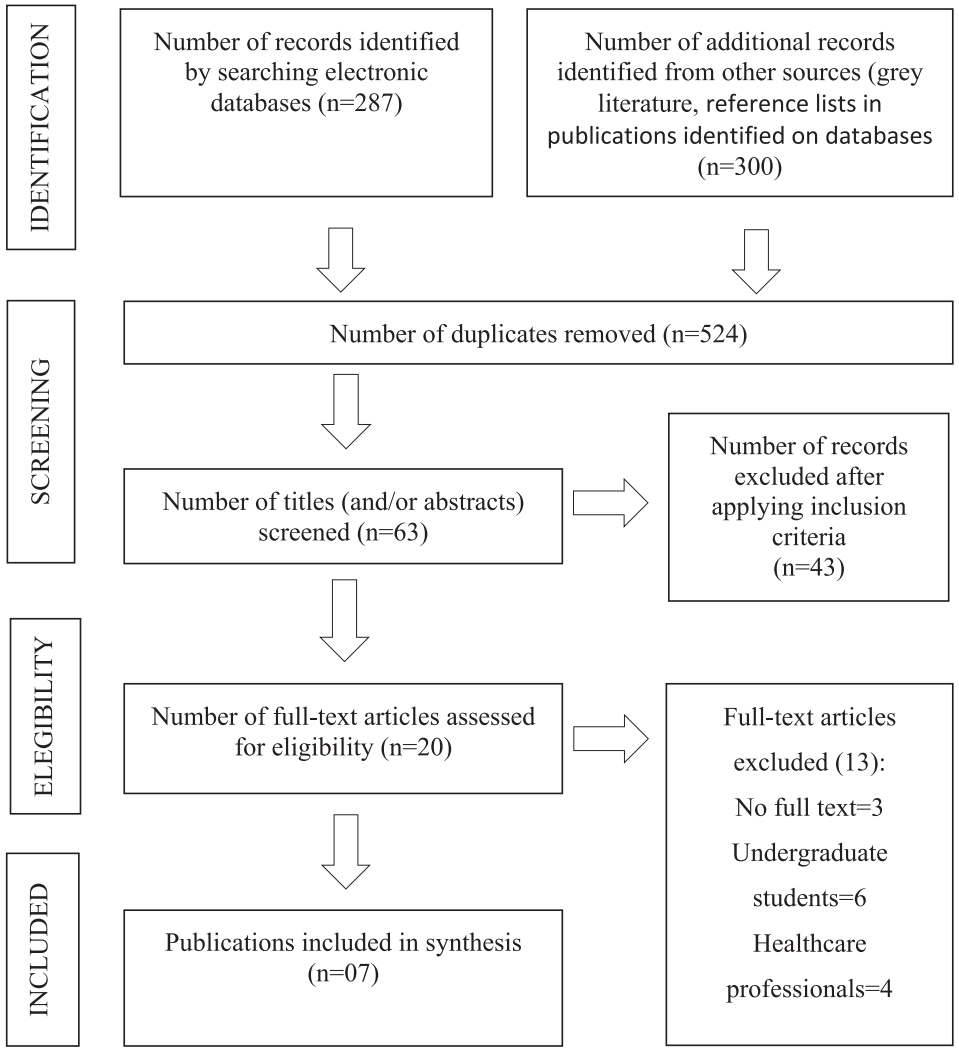
This scoping review demonstrated scarcity of valid, reliable tools to assess IP competencies, which thus reveals a large gap to be filled by future research. Competency is a prerequisite for an effective implementation of core components of IPC programs. According to WHO, it is critical that all individuals responsible for and working in IPC programs be competent. This includes knowledge, skills and attitudes that would allow them to perform as an IP in a safe and ethical manner (WHO, 2020).

The key reasons to conduct a competency assessment include identifying the key skills required to complete a task, evaluate the IPs on these skills and make sure that they are qualified and capable of performing their roles. In addition, the care quality needs to be improved through effective IPC programs. Another benefit of competency assessment is to provide information on the gap existing between the IP competencies assessed and the job requirements, which can be filled with training and development.

It is imperative to increase IPs competency worldwide, and it can be a game changer particularly in low and middle-income countries (LMIC), where HAI rates are higher than other countries (Landers, 2017), and IPC programs still have low scores according to the WHO global report (Tomczyk et al., 2022). Furthermore, investments in training programs can be better evaluated if improvements in IPs competency can be tracked down along the education process.

Infection prevention responsibilities include implementing and monitoring infection prevention measures, and also education, research, leadership and management activities (Landers, 2017). In this review, all tools reflected the complexity of the roles of IPs, assessing not only

Figure 1. Preferred reporting items for systematic reviews and meta-analysis flow diagram for the scoping review (PRISMA-ScR).



foundational knowledge and skills, but also soft skills, such as collaboration, communication and accountability.

Characteristics of IP competency assessment tools

Competency can be assessed using different methods. Across the identified tools, we found two types of methods: self or external assessment. Self-assessment is a process according to which IPs evaluate their own knowledge, skills and attitudes, while external assessment is a process where an experienced professional (i.e. managers and senior IPs) evaluates IPs competencies (IPS, 2019). One negative point regarding self-assessment is the fact that individuals tend to produce socially acceptable answers. Since competency is a multidimensional concept, it is highly recommended to use a combination of both methods, and thus improve the accuracy of the assessment. Irrespective of the method, it is important to assess competencies on a regular basis to monitor the progress in standards of practice, guide professional development plans and promote feedback on the performance of IPs (WHO, 2020).

Our findings show that assessment tools consisted of various domains that are critical to determine the ability and readiness for IPs to provide quality services. We detected recurrent domains of competency among the tools that may reflect consistency in the role of IPs over the years. However, it is important that countries and/or professional associations regularly update their standards of practice and assessment tools for IPs to make sure that they are in line with the current knowledge unfolding. It should be noted that the APIC regularly reviews its tool based on results of surveys with IPs who are members of the association (Pogorzelska-Maziarz et al., 2023).

Another relevant characteristic refers to the levels of competency of the tools described. The tools from Canada, the United States and the United Kingdom outlined at least

Table 4. Characteristics of the seven publications included in the scoping review.

Author (year of publication)	Country	Aim of tool (self or external assessment)	Competency domains	Number of items	Levels of competencies	Psychometric characteristics	Free public domain
CHICA (2009)	Canada	Self and external assessment	Qualifications, education, ethics and accountability; professional development; leadership; infection prevention and control practice; microbiology and infection disease; surveillance; epidemiology; education; consultation and communication; occupational health; program administration and evaluation; fiscal responsibility; performance improvement; research	116	Developing[a], refining[b], proficient[c], expert[d]	Not mentioned	No
APIC (2015)	USA	Self-assessment	Identification of infectious disease processes; surveillance and epidemiologic investigation; preventing/controlling the transmission of infectious agents; management and communication (leadership); education and research; employee/occupational health	35	Novice[e]	Not mentioned	Yes
Chan FW, Bond TG, Adamson B, Chow M (2016)	China	Not mentioned	Surveillance, data management, program management, program evaluation, evidence-based practice, education, team and service management, use of link person systems, collaboration and partnership, outbreak investigation and control, research and development, expert knowledge, continued education and professional development, financial management, patient and public involvement	76	Not mentioned	Validity: Delphi method Reliability (Rasch Model): Ranged between 0.90 and 0.91	No

(continued)

Table 4. (continued)

Author (year of publication)	Country	Aim of tool (self or external assessment)	Competency domains	Number of items	Levels of competencies	Psychometric characteristics	Free public domain
APIC (2017)	USA	Self-assessment	Identification of infectious disease processes; surveillance and epidemiologic investigation; preventing/controlling the transmission of infectious agents; management and communication; education and research; employee/occupational health; environment of care; cleaning, sterilization, disinfection, asepsis	44	Proficient[f]; advanced (expert)[g]	Not mentioned	Yes
APIC (2019)	USA	Self-assessment	Identification of infectious disease processes; surveillance and epidemiologic investigation; preventing/controlling the transmission of infectious agents; management and communication; education and research; employee/occupational health; environment of care; cleaning, sterilization, disinfection, asepsis	44	Novice[h]; becoming proficient[i]	Not mentioned	Yes
IPS (2019)	United Kingdom	Self and external assessment	Clinical practice; quality improvement and research; education; leadership and management	51	Assisted[j]; independent[k]	Not mentioned	Yes
Cui et al. (2022)	China	Not mentioned	Professional skills, professional development capability, organizational collaboration ability, personal trait	30	Not mentioned	Validity: Delphi method. Reliability: Cronbach's α-coefficient was 0.964	No

Note: IPC: infection prevention and control; IP: infection preventionist; ICN: infection control nurse.
Developing: [a]a skill or practice IPs do not currently use, but which should be included in their roles. [e]IPs who have 2–3 years' experience and gain basic skills focused on patient safety. [h]IPs who have recently become acquainted with the rules and concepts that govern IPC and rely on them to guide their practice.
Refining: [b]a skill or practice IPs feel could be improved. [i]represents the period when IPs are building on novice-stage competencies and developing more involved, intricate, independent skills. [j]those who perform the skill, task or responsibility only under direct or indirect supervision.
Proficient: [c]a skill or practice IPs feel they are good at. [f]IPs work to demonstrate how the skills gained during the novice stage are used to improve patient outcomes; they hold a certification in infection.
Expert: [d]a skill or practice IPs feel they excel in. [g]IPs regarded as role models and content experts in the field. [k]Independent: those who perform the skill, task or responsibility as an independent practitioner.

two competency levels: one for entry-level professionals and another for more experienced professionals, which is in line with current recommendations (WHO, 2020). Levels of competency may be identified and strengthened so that ambitious standards of practice are established and maintained. Moreover, it may be useful to encourage IPs in their career development (WHO, 2020). WHO´s document and learning theory, from Novice to Expert, may be used to guide future studies (WHO, 2020; Benner, 2004).

Our findings identified tools in free public domain that can be accessed without formal user fees. Despite this advantage, they may not be adopted automatically because of differences in healthcare settings, cultural and educational backgrounds and other potentially relevant factors. On the other hand, free accessible tools can help compare areas and domains with the currently core IP competencies proposed by WHO (WHO, 2020).

Validation and reliability of IP competency assessment tools

Developing assessment tools involve complex, systematic procedures, such as an appropriate number of items, and also validity and reliability. Our synthesis shows that the number of items varied among tools. However, there is evidence that an adequate number of items is important to reduce the cognitive burden on participants and make sure they remain interested in answering the tool through the end (DeVellis, 2017).

Content validity is considered the most important measurement property to consider when selecting an assessment tool. The most common technique used to perform content validity is the Delphi method, which is a technique used for structuring group consensus. The content validity index (CVI) is an example of statistical procedure used to analyse Delphi consensus. To verify the validity of new tools, some authors suggest a minimum conformity of 0.80 with the CVI (DeVellis, 2017). In our review, Delphi's method of seeking expert opinions was reported in only one study, and the findings showed that the tool reached the minimum conformity; however, additional details on the content validity process were reported in a previous study (Chan et al., 2011).

With regard to reliability, one study found Cronbach's alpha coefficient of 0.964, and another study found the Rash model between 0.90 and 0.91. According to the literature, an alpha coefficient of 0.70 is often considered as an acceptable limit for reliability; however, 0.80 and 0.95 are preferred for the psychometric quality of the scales. A Rash measurement between 0.91 and 0.94 is considered as very good, but excellent if greater than 0.94 (DeVellis, 2017).

The clarification of the entire development and testing process is critical to determine the most reliable, fit-for-purpose IP competency assessment tool. In addition, this information increases the quality of research, which may support stakeholders when deciding whether to implement the tool in their clinical practice.

Finally, it is also important to acknowledge that most tools were available separately from the core competency framework that originated them, which can hinder the full understanding of the purpose, process and definitions of the assessment. Therefore, we suggest that future research provides both documents together.

Future studies should seek to gather evidence for the validity and reliability of the IP competency assessment tool when it is used in different countries and cultures.

Limitations

This scoping review has limitations. Although efforts have been used to develop a comprehensive search strategy, it is possible that some relevant publications were missed. By deciding to summarize and report the overall findings without the scrutiny of a formal evaluation process, we recognize that some aspects of the publications presented in this review may have been overlooked.

Conclusions

Few IP competency assessment tools are available in the literature, and there is a lack of information on their development, validation process and reliability. Therefore, we consider that a global effort to harmonize IP competency standards and the development of a global assessment tool that allows comparison across countries and cultures could be a step forward to propel the careers of IPs and improve IPC programs. Additionally, the COVID-19 pandemic and the recent release of WHO's document may encourage other researchers to develop and improve the assessment tools for IPs.

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