Canadian Medical Education Journal
Revue canadienne de l'éducation médicale

The CanMEDS Competency Framework in laboratory medicine: A phenomenographic study exploring how professional roles are applied outside the clinical environment

Le référential CanMEDS en médecine de laboratoire : une étude phénoménographique explorant la manière dont les rôles professionnels sont appliqués en dehors de l'environnement clinique

Chloe Bogaty et Janneke Frambach

Volume 15, numéro 1, 2024

URI : https://id.erudit.org/iderudit/1110448ar
DOI : https://doi.org/10.36834/cmej.77140

Aller au sommaire du numéro

Éditeur(s)

Canadian Medical Education Journal

ISSN

1923-1202 (numérique)

Découvrir la revue

Citer cet article

Bogaty, C. & Frambach, J. (2024). The CanMEDS Competency Framework in laboratory medicine: A phenomenographic study exploring how professional roles are applied outside the clinical environment. *Canadian Medical Education Journal / Revue canadienne de l'éducation médicale*, *15*(1), 26–36. https://doi.org/10.36834/cmej.77140

Résumé de l'article

Contexte : Le référentiel CanMEDS est un modèle reconnu à l'échelle internationale qui décrit les compétences nécessaires d'un médecin. Cependant, il a été principalement étudié dans des environnements cliniques, mais ce ne sont pas toutes les spécialités médicales qui ont des contacts directs avec les patients. En médecine de laboratoire, le rôle du médecin est de promouvoir et d'améliorer les analyses diagnostiques des patients en supervisant les fonctions d'un laboratoire diagnostic.

Méthodes : Cette étude phénoménographique explore les expériences vécues de directeurs de programmes de résidence en biochimie, microbiologie et pathologie afin de mieux comprendre comment leurs programmes de formation utilisent les compétences CanMEDS. Huit directeurs de programme Canadiens en médecine de laboratoire ont participé à une entrevue semi-structurée individuelle et les données recueillies ont été analysées par une analyse thématique inductive.

Résultats : Les résultats démontrent que le référentiel actuel est déconnecté de la médecine de laboratoire et que certaines compétences semblent incompatibles en utilisant les définitions normalisées en vigueur. Néanmoins, les participants considèrent que le référentiel est un schéma approprié des compétences nécessaires dans leur environnement professionnel, mais une plus grande autonomie est nécessaire pour l'adapter à leurs besoins.

Conclusion : Les prochaines révisions du référentiel de compétences CanMEDS devraient mieux tenir compte des réalités des disciplines non cliniques.

Canadian Medical Education Journal

Original Research

The CanMEDS Competency Framework in laboratory medicine: a phenomenographic study exploring how professional roles are applied outside the clinical environment

Le référential CanMEDS en médecine de laboratoire : une étude phénoménographique explorant la manière dont les rôles professionnels sont appliqués en dehors de l'environnement clinique

Chloe Bogaty,[1,2] Janneke Frambach[2]

[1]Service de microbiologie et d'infectiologie, Centre hospitalier affilié universitaire Hôtel-Dieu de Lévis, Quebec, Canada; [2]School of Health Professions Education (SHE), Maastricht University, Maastricht, The Netherlands

Correspondence to: Chloe Bogaty, MDCM, Medical Microbiology and Infectious Diseases, Hôtel-dieu de Lévis, CISSS de Chaudière-Appalaches 143 rue Wolfe Lévis, QC, Canada, G6V 3Z1; email: chloe.bogaty.med@ssss.gouv.qc.ca

Published ahead of issue: Dec 11, 2023; published: Feb 29, 2024. CMEJ 2024, 15(1) Available at https://doi.org/10.36834/cmej.77140

Abstract

Background: The CanMEDS Competency Framework is an internationally recognized model used to outline the proficiencies of a physician. It has predominantly been studied in clinical environments but not all medical specialties take part in direct patient contact. In laboratory medicine, the role of the physician is to promote and enhance patient diagnostics by managing and overseeing the functions of a diagnostic laboratory.

Methods: This phenomenographic study explores the lived experiences of biochemistry, microbiology, and pathology residency program directors to better understand how they utilize the CanMEDS competencies. Eight laboratory medicine program directors from across Canada were individually interviewed using a semi-structured interview, and the data was analysed using inductive thematic analysis.

Results: The findings show that the current framework is disconnected from the unique context of laboratory medicine with some competencies appearing unrelatable using the current standardized definitions and expectations. Nevertheless, participants considered the framework to be an appropriate blueprint of the competencies necessary for their professional environment, but to make it accessible more autonomy is required to adapt the framework to their needs.

Conclusion: Newer renditions of the CanMEDS Competency Framework should better consider the realities of non-clinical disciplines.

Résumé

Contexte : Le référentiel CanMEDS est un modèle reconnu à l'échelle internationale qui décrit les compétences nécessaires d'un médecin. Cependant, il a été principalement étudié dans des environnements cliniques, mais ce ne sont pas toutes les spécialités médicales qui ont des contacts directs avec les patients. En médecine de laboratoire, le rôle du médecin est de promouvoir et d'améliorer les analyses diagnostiques des patients en supervisant les fonctions d'un laboratoire diagnostic.

Méthodes : Cette étude phénoménographique explore les expériences vécues de directeurs de programmes de résidence en biochimie, microbiologie et pathologie afin de mieux comprendre comment leurs programmes de formation utilisent les compétences CanMEDS. Huit directeurs de programme Canadiens en médecine de laboratoire ont participé à une entrevue semi-structurée individuelle et les données recueillies ont été analysées par une analyse thématique inductive.

Résultats : Les résultats démontrent que le référentiel actuel est déconnecté de la médecine de laboratoire et que certaines compétences semblent incompatibles en utilisant les définitions normalisées en vigueur. Néanmoins, les participants considèrent que le référentiel est un schéma approprié des compétences nécessaires dans leur environnement professionnel, mais une plus grande autonomie est nécessaire pour l'adapter à leurs besoins.

Conclusion : Les prochaines révisions du référentiel de compétences CanMEDS devraient mieux tenir compte des réalités des disciplines non cliniques.

For over a decade, many medical training programs globally have been transitioning towards an educational system based on the development of competencies.[1] To meet societal needs, various frameworks have been developed to outline the expectations that make the ideal physician and that are used to structure the assessment of trainees. One of the commonly used models is the CanMEDS Competency Framework. It includes seven roles that all trainees in post-graduate medical programs are expected to master: Medical Expert, Scholar, Professional, Communicator, Collaborator, Leader, and Health Advocate.[2]

The application of the CanMEDS roles, particularly the non-Medical Expert roles, has often focused on their utility in patient care.[3] It is within the context of clinical medicine that most data exist to properly integrate, teach, and assess these roles. However, not all specialties are structured around direct patient contact. Among the diagnostic laboratory specialties, including biochemistry, microbiology, and pathology, the work environment is commonly conceptualized using a "specimen-centered" approach. While diagnostic laboratory management aims to promote appropriate diagnostics, and ultimately patient outcomes, there is no direct contact between the physician and the patient to whom the specimen belongs.

While competency frameworks have the practical value of creating a consensus standard of our expectations of trainees, it has been criticized that some competencies are difficult to define in objective and measurable terms,[4] and faculty development to allow for clear and coordinated instruction is often lacking.[5,6] Even within the clinical environment, the interconnectedness of these roles can make it hard to independently teach and evaluate them and some roles are even regarded as more important than others, with Medical Expert often being considered the dominant role.[7,8] While the generic skills advocated for by the framework are aspirational, applying theory to practice is not evident: Collaborator and Communicator, while often valued as essential skills, have little formal training beyond role modeling; Health Advocate is irregularly represented and valued; the meaning of the term Leader is considered inconsistent with the regular activities of a physician; Professional is often limited to its behavioural characteristics.[9-13] Overall, many program directors across Canada are less confident that non-Medical Expert competencies are being appropriately assessed in teaching programs,[14] despite the fact that good professional performance in the workplace often correlates with aptitudes in these skills.[15]

If the integration of the CanMEDS competencies is already challenging in clinical medicine, its integration within non-clinical environments remains even more ill-defined. Minimal literature currently exists addressing the use of non-Medical Expert roles in laboratory medicine. Existing research primarily surveyed the perceived ability among trainees to perform these roles, with Communicator and Health Advocate being described as the least well mastered.[16,17] Ultimately, this may contribute to an undermining of the CanMEDS Competency Framework. In Canada, the Royal College of Physicians and Surgeons (RCPSC) provides each residency program with objectives of training. Among the laboratory specialties, some still concentrate the non-Medical Expert roles to clinical rotations where residents are expected to interface with patients without providing sufficiently inclusive learning objectives for these roles within the laboratory settings.[18] But even when a laboratory specialty has integrated laboratory-based objectives for each CanMEDS role,[19] training programs still function with minimal guidance and literature as to how to properly attain these objectives outside of the patient-centered context.

There is a need to evaluate how these competencies are manifested within the laboratory environment. This study sought to explore laboratory medicine residency program directors' lived experiences of the CanMEDS competencies, to assess how they perceive and define these roles and to gain a better understanding of the applicability of the CanMEDS Competency Framework in laboratory medicine. Their experiences could provide a blueprint of how the framework can be better designed and utilized for non-clinical environments.

Methods

This study follows a qualitative exploratory research design using a phenomenographic approach with the goal of exploring how the CanMEDS Competency Framework is experienced by Canadian residency program directors in Anatomical/General Pathology, Medical Biochemistry, and Medical Microbiology. Phenomenography stems from the tradition of phenomenological research, which seeks to investigate the human experience at a fundamental level. By combining principles of philosophy, sociology and psychology, phenomenology attempts to understand a phenomenon from the perspective of those who have directly experienced it and explore how these individuals make meaning of their lived experiences.[20] In traditional phenomenology, the objective is to uncover the *similarities* between the lived experiences. Phenomenography also

addresses the *differing* ways individuals experience the world.[21,22] Acknowledging both the similar and the dissimilar experiences between participants was necessary to develop a map of how the CanMEDS Competency Framework can be applied and integrated into laboratory medicine. Ethics approval was granted by the Comité central d'éthique de la recherche du Ministre de la Santé et des Services sociaux du Québec.

Setting and participants

The CanMEDS Competency Framework has been in use in Canada since the 1990s, and the objectives of training of each medical discipline are categorized using the framework. Each role is divided into a list of key competencies (essential abilities) and their enabling competencies (the essential components of a key competency). More recently, the RCPSC is mandating that all residency programs transition to competency-based medical education (CBME).[23] New training milestones must be representative of the CanMEDS competencies. Of the laboratory specialties, only Anatomical/General Pathology has completed their transition as of 2019. The transformation process started in 2021 for Medical Microbiology and is expected to start in 2023 for Medical Biochemistry.

Participants in this study included program directors from across Canada who were recruited using purposive sampling. Equal representation between specialties was sought to provide a complete description of differing experiences, with an attempt to recruit participants from varying medical faculties across Canada. Currently, 15 universities offer residency programs in Anatomical Pathology, five in General Pathology, eleven in Medical Microbiology, and three in Medical Biochemistry. Among other laboratory specialties, Neuropathology and Hematopathology were excluded as these fields are specialized domains of pathology with similar work environments and there was already a sufficient pool of Anatomical/General Pathologists to recruit from. Hematology was excluded as it is predominantly a clinical specialty.

Program directors' contact information is publicly available through university websites and through the national residency matching service website. Our initial goal was to recruit about 12 participants (3-4 participants/specialty), yet to terminate data collection when thematic saturation was reached, defined as the point where new data did not reveal new themes. We sent recruitment emails with the intention of recruiting participants from different universities. We progressively sent additional emails to other potential participants if there were no or negative responses, but sent reminders to potential participants from specialities that had fewer program directors.

Participants either exclusively participate in laboratory diagnostics (i.e.: pathologists) or may be involved in both laboratory and clinical work (i.e.: some biochemists and microbiologist). They all manage diagnostic services, such as designing diagnostic protocols, monitoring quality, supervising workflow, reviewing reports, etc. We chose to recruit attending physicians because they were more likely to have accumulated diverse experiences within the setting of the diagnostic laboratory. In their role as program directors, they are expected to be familiar with the CanMEDS framework and have likely had more opportunity to reflect on how to include the framework within training. Residents may not yet have had sufficient opportunity to question the relevance of the CanMEDS Competency Framework in these contexts.

Data collection and analysis

Data were collected using semi-structured interviews conducted through videoconference with the principal investigator. A third-party interviewer was deemed unnecessary as no power differential exists between the principal investigator and the participants. An interview guide (see Appendix A) was constructed using a phenomenographic lens that foregrounds lived experiences (i.e., asking about examples of daily experiences). The guide was used to ask program directors to explore their understanding of the CanMEDS framework, their personal experiences with these roles, and their opinion on whether and how the framework is applicable to their setting. One pilot interview was be conducted to ensure that the interview guide was adequately designed to help structure the discussion and prompt for detailed descriptions of lived experiences. All interviews were recorded and transcribed verbatim using an automated transcription application, and CB subsequently corrected transcription errors using the recording. The principal investigator's training program and current program affiliation were excluded due to the potential for conflicts of interest.

The data were analysed using inductive thematic analysis.[22,24] The process of phenomenographic analysis is both iterative and comparative, where data is continually reorganized to develop categories of description. Transcripts were analyzed concurrently with data collection. CB manually performed the initial inductive coding of the interviews, which generated several

consecutive versions of categorizing the data. In this process, attention was given to both similar and dissimilar experiences. The emerging categories were reviewed and discussed with JF, along with quotes from the transcripts, with the purpose of theme development. From these discussions, CB and JF jointly constructed the overarching themes.

Reflexivity

The principal investigator (CB) holds a dual license as an infectious disease specialist and microbiologist, and practices in both the clinical setting and in the diagnostic laboratory. As a result, her training in clinical medicine regularly highlighted the importance of the non-Medical Expert Roles. This framework was taught and modeled differently in the environment of diagnostic laboratory medicine, with some roles being more difficult to identify and acknowledge. These experiences led to this study and helped shape the research question. CB made a conscious effort to reflect on and be aware of personal opinions (i.e., documenting these in a reflective journal) as to refrain from influencing the interviews and the data analysis. Participants were also informed of CB's background at the start of each interview. By means of a constructivist perspective, an attempt was made to categorize the shared and diverging themes as to present an outline of the applicability of the CanMEDS Competency Framework based on both the data and CB's lived experiences. JF is a qualitative researcher in health professions education and an outsider to the clinical and laboratory medicine setting. This role enabled her to ask critical questions about CB's interpretation and presentation of the data, which promoted reflexivity throughout the research process.

Results

A total of eight interviews were completed between January and May 2022. Recruitment was ceased as thematic saturation of data was reached. Participants (four men, four women) included three pathologists, three microbiologists, and two biochemists across four provinces. The mean years of experience as program director was 5.5 (range, one to 15 years). The phenomenographic approach captured participants' dissimilar experiences with and ideas about the CanMEDS Competency Framework, which are reflected in the diversity of examples listed throughout the results. At the same time, on an overarching level, participants described similar experiences and ideas, from which three central themes were constructed.

The CanMEDS Competency Framework is disconnected from the context of laboratory medicine, such that current definitions render some competencies unrelatable

A recurrent comment among participants was the criticism that the CanMEDS Competency Framework is too clinically focused. Participants felt that its verbiage reflects direct-patient care and related clinical activities, tailoring the framework for specialties who normally interface directly with patients. While some laboratory specialties perform a mix of clinical and non-clinical work, those that have no or minimal patient contact expressed that the experience of the framework becomes only applicable to their residents during off-service rotations instead of during the routine work within the laboratory. There was an understanding among several participants that the diverse functions of laboratory specialists are often poorly understood across medicine, and that this contributes to their lack of representation and inclusion: *"It's like anything, the system is going to be centered around the majority not the minority."* (Participant (P) 7)

As it stands, some participants felt they had minimal control over the way to perform specific competencies to meet the demands of the current framework. The most staggering example was the Communicator role. The definition of Communicator used by the RCPSC relates purely to physician-patient/caregiver encounters and specifies that interprofessional communication is reserved for the roles of Collaborator and Scholar.[2] This presented complexity in how the role can be directly applied to laboratory physicians.

> *I'm not surprised that most of the Communicator role is centered around the patient and rightly so because the patient is arguably the most important part of any equation, even my equation. It's just there's more degrees of separation between me and a patient. (P7)*

With the absence of direct patient contact, the communication skills necessary for laboratory physicians are essentially interprofessional communication, but in formats that many participants expressed where not appropriately captured by other roles. The importance of informative written communication in laboratory reports was a recurring example that participants considered should be a part of the Communicator role. While competencies can overlap between some roles, there are nuances, especially between Collaborator and Communicator, that participants expressed should be dissociated.

> *Like Collaborator is working with others. You know, collaborating within health care team, but part of that is your communication so I don't see them as synonymous. (P3)*

The key competencies in the RCPSC Collaborator role include working effectively with healthcare workers, conflict resolution, and patient handovers.[2] Written communication through laboratory reports does not align easily with any of these key competencies, which are also very focused on stakeholders who interface with patients. Laboratory medicine specialists also need to collaborate with administrators, industry, and government agencies, but these stakeholders are not healthcare workers per say.

Similarly, several participants expressed that the definition of Health Advocate is also painted as too patient- and community-centric, with its definition suggesting that advocacy begins at the point of contact with a patient.[2] While laboratory physicians do serve the communities within their laboratory's catchment, there is typically no or minimal contact with the patient to whom specimens and results belong.

Additionally, the expectation that some CanMEDS roles are patient-centric appeared to negatively impact training by taking away focus from the actual skills that are necessary for these disciplines.

> *I have to include them in all my goals and objectives and it's like a 3-page laundry list […] they're still very patient-centered and I don't really know how to assess for most of them. (P7)*

The necessity for their programs to meet national standards created a need to focus examples of the CanMEDS competencies away from laboratory training. Some program directors relied on off-service rotations to ensure that all CanMEDS competencies are represented, but these rotations were not always deemed useful for the curriculum.

> *We kind of try to list all of the things that we're doing to meet all those roles even though they don't entirely speak to us, but we have to because otherwise we can't get accredited. (P4)*

Moreover, many participants acknowledged that further growth in the actual skills required for their specialty are predominantly learned in the first years of independent practice instead of during residency. A proposed explanation was that since CanMEDS competencies are not clearly pre-identified within the laboratory, role modeling is limited, the entrustment of tasks is difficult to assign, and graduated responsibility is difficult to observe.

> *I don't think that the majority of the time they have ownership or accountability or are in control in a way that makes them explore all of those petals of the framework (P7)*

Another explanation is that some skills are difficult to include within the existing framework due to the rigidity of the existing definitions (Table 1).

The clinical focus of the existing definitions, the lack of control over their interpretation, the expectations of accreditation agencies, and the sense that some skills are not easily integrated into the existing framework overall create a sense of disconnect between the current design of the CanMEDS Competency Framework and the proficiencies required of laboratory physicians.

Table 1. Enabling competencies that program directors in laboratory medicine expressed were insufficiently captured by or harder to associate to the current CanMEDS Competency Framework

Enabling competency	Examples	Selected Comments
Laboratory management	Overseeing the functioning of the laboratory Longitudinal work over months and/or years	*"I guess you could kind of link to a Leader, but it's not really that either. I know it used to be Manager, but even managing didn't really speak to kind of those types of issues that laboratory physicians need to kind of manage more frequently." (P4)*
Resource allocation	Test utilisation Budgets Purchasing merchandise	*"We still need to have a lot more awareness of costs and, you know, operations and and all that kind of stuff, maybe more so than our other colleagues." (P5)*
Quality assurance and quality improvement	Validation/verification Proficiency of staff/equipment Improving diagnostic processes	*"It is something unique to lab medicine that, you know, I think quality improvement […] and quality assurance is is so different than what our colleagues [in clinical fields] are caught up on." (P4)*
Contact with industry	Purchasing materials/equipment Dealing with shortages Modernisation/automation	*"that's a really good piece that I would say was missing. […] I had never really even seen a vendor before I started as staff." (P5)*
Media relations	Providing information	*"I can't remember if there is an actual objective related to that" (P5)*

The CanMEDS Competency Framework offers a useful blueprint of the competencies required in any specialty, including laboratory medicine

It was unanimous among participants that the framework provides a logical partition of the broad competencies required by physicians to apply their expertise effectively and appropriately, and that dividing these skills allows post-graduate training programs to incorporate them in their curriculum and assessment programs. There was a sense among participants that different elements of the framework apply to a greater or lesser degree between specialties, but that the essence of the different roles all have relevance, even within laboratory medicine. The concern was that due to the lack of direct patient contact in laboratory medicine, examples of some competencies might appear more abstract to an outside observer, but they are not absent. Table 2 provides a summary of enabling competencies suggested by participants along with which CanMEDS competency they were deemed best associated to, regardless of existing definitions.

In fact, participants generally struggled to identify skills that could not be associated to existing roles. The enabling competencies listed in Table 1 remained the hardest to integrate. As one participant pointed out, managerial skills in the laboratory, such as those listed in Table 1, were somewhat easier to conceptualize with the role of Manager found in earlier renditions of the CanMEDS Competency Framework before it was changed to Leader. While these enabling competencies are likely best related to the role of Leader, the tone still differs. Several of these activities of laboratory management are often so routine that they were often not intuitively viewed as leadership skills by participants.

More autonomy should be given to each specialty to adapt the CanMEDS Competency Framework to meet the realities of their unique environments

While all participants agreed that the framework provides a good blueprint, there was still concern on how to make the framework useful within their unique environments. For the programs that have already undergone the transition, CBME provided some improvements in training by creating more flexibility in designing curriculums, reorganising the number and order of rotations, and improving evaluations. Programs currently undergoing the transformation are hopeful they will be able to modernize by changing both the structure of rotations and the emphasis of residency. *"I think the priority, the priority now and probably should always have been, are the entrustable professional activities (EPA) for your specialty." (P6)*

Of the programs who had already undergone the transition, the CanMEDS Competency Framework had become more helpful in deconstructing why a resident might not be able to perform a particular EPA. But this still required programs to adopt their own interpretations of the framework instead of using the current and sometimes clinically inclined definitions.

> *I think that all could fall under the CanMEDS framework. It's just it's not. We don't have anyone at the Royal College who's really helping to read, to reframe it, or put it in the scope of lab medicine. (P7)*

Participants repeatedly suggested that more freedom should be allowed to every specialty to adapt the framework to their contexts to make it more relevant and useful.

Discussion

This qualitative exploratory study provides insight into how program directors in laboratory medicine across Canada perceive the applicability of the CanMEDS Competency Framework in their professional environments.

Overall, our results demonstrate that residency program directors in laboratory specialties experience substantial shortcomings with the current rendition of the framework, where the definitions of some competencies are too clinically focused and, therefore, lack flexibility outside the clinical environment. When limited to the recognized descriptions of the CanMEDS Competency Framework, the roles of Communicator, Collaborator, Health Advocate and Leader were the most difficult to implement within residency programs, but this is not for a lack of examples of these roles. When specific definitions are overlooked, participants expressed that the seven roles were still regarded as an excellent scheme of the skills and attitudes required of a laboratory physician, but to make the framework applicable for learning activities, assessments, and national accreditation, more autonomy should be allowed to adapt the content of these roles to the needs of their programs.

Table 2. Enabling competencies as identified by program directors in Anatomical/General Pathology, Medical Biochemistry and Medical Microbiology, and the CanMEDS competency they were deemed most suitably related to

	Enabling competency	Examples	Selected Comments
Communicator Role	Written communication	Laboratory reports Automated comments Patient access to test results; Email	*"To provide a clear report to be able to communicate either in a synoptic format or in a concise way, or in an efficient way the findings that will impact patient care." (P7)*
	Clarifying diagnostic uncertainty	Analytic limitations Observer variability	*"I think that as lab specialists, there is a misconception that we are perfect 100% of the time" (P7)*
	Multidisciplinary interactions	Chairing meetings Rounds Biomedical companies	*"For a lot of trainees and and for myself, starting out, you know chairing a meeting was a relatively new thing for me, right? It wasn't something that I was used to." (P3)*
	Lobbying for resources	Hospital administration Government Biomedical companies	*"We still are going to be called on to be the representatives of the lab. And communicating here, it's important for us." (P1)*
Collaborator Role	With clinicians and health-care teams	Expand and fine-tune diagnostics for individual patients	*"You really have to rely on your clinicians and collaborate […] Should you send something out? Should you pursue another investigation?" (P7)*
	Research	Expand diagnostics Epidemiologic investigations Resource allocation	*"Or we get involved in scholarly research all the time because there's interesting questions that crop up" (P4)*
	Operations of the laboratory	Laboratory personnel Support staff Industry	*"To review the manuals and procedures and, you know, respond to proficiency testing results and working together to improve the processes" (P5)*
Health Advocate Role	Post-mortem diagnostics	Autopsies Forensic pathology/coroner investigations	*"There's nobody more disempowered than somebody who's dead." (P6)*
	Innovation and technology advancement	Designing and/or implementing new technology	*"Especially now with advanced molecular testing, I really have a chance to advocate for patients, to advocate when we're able to provide additional sequencing or additional testing" (P7)*
	Obtaining external consultations	Coordinating send-out tests (locally, nationally, internationally) Second opinions	*"Applying for special permission for the use of a particular therapeutic drug would be a great example […]. That's not that dissimilar from what we do with respect to trying to, you know, send a case to get external consultations." (P6)*
	Test utilisation	Appropriateness and eligibility Turnaround-time	*"In order to improve turn-around-time, in order to make sure that we're proactive, and I feel that that comes into play" (P2)*
	Resource allocation	Prioritisation	*"Right now we're dealing with shortages, making sure that the resources are best used for the patient" (P1)*
	Public health	Notifying results of interest; Epidemiologic investigations Public health laboratories	*"I think that that's an important piece of what you know, a lot of our colleagues do, particularly in the public health lab" (P5)*
	Critical results	Reviewing critical reports Informing treating team	*"So the doctor who ordered that gets those results and acts on it quickly, so the patient gets to care in the right time" (P1)*

When originally conceptualized, the CanMEDS Competency Framework was never intended to be discipline-specific or solely patient-centered. This model was envisioned to be broadly applicable to all settings involved in health care,[2,5] and the attitudes and behaviours advocated for by the CanMEDS framework are ubiquitous in medicine.[25] Yet, trainees from laboratory-based specialties in Denmark have reported less confidence in their mastery of the Communicator and Health Advocate roles.[16] A decade later, European trainees in microbiology still continue to express a need for further training in the diverse non-Medical Expert skills.[17] The perceived inflexibility of some of the defined CanMEDS roles described in this study violates the vision of universality the model was meant to embody. If trainees are to appreciate all these roles during training, a clearer inclusion of each role needs to be recognised and modeled. Without thoughtful change, the current definitions create a paradox between advocating for excellence in training while limiting access to relevant and purposeful training.

A laboratory specialist should understand how to communicate and collaborate with laboratory personnel, hospital administrators, governmental officials, and industry. They may come across the need to show leadership in funding negotiations and when implementing new protocols that impact laboratory personnel and the healthcare workers utilizing the resources. Laboratory medicine is also intimately connected with public health

departments, to both aid in diagnostics and to map epidemiological trends. Changes to diagnostic protocols are often meant to improve patient care, which holds a theme of health advocacy at its core. Therefore, managing a diagnostic laboratory requires equal skill in communication, collaboration, health advocacy, and leadership, analogous to what is required for patient encounters.[26] In this study, a preliminary list is presented of enabling competencies required of a laboratory specialist and to which CanMEDS role participants thought them best related. While far from being exhaustive, as it was beyond the scope of this study, it does provide some groundwork on how to readdress the framework to laboratory medicine.

While several participants expressed optimism that the transition to CBME may improve the use of the CanMEDS Competency Framework by providing more liberties in the application of EPAs, this may be a superficial solution. The use of EPAs has the potential of bridging the gap between the practical performance of professional activities and the more abstract definitions within a broad framework.[27] However, a Canadian audit demonstrated that EPA milestones still show an either low prevalence or late emphasis of several CanMEDS roles across surgical and medical disciplines.[28] If the optimal distribution of these roles is already challenging for the specialties that better identify with the framework, it may be deceptive to think that CBME will solve the current disconnect with laboratory medicine. Implementing CBME is already a challenging endeavour for individual training programs but is more likely to be successful if the needs of the end users are specifically addressed and integrated.[6]

Introducing specialty-specificity has been shown to improve compatibility with competency frameworks: in the Netherlands, mapping specialty-specific needs in obstetrics and gynecology and determining their applicability to the national competency framework has led to constructive changes in competency descriptions and in curriculum alignment that better identify with learners and educators.[29,30] In Canada, introducing specialty-specificity for laboratory medicine would first require less clinically oriented definitions for some roles. This could also benefit other disciplines with significant non-clinical duties, including Radiology, Nuclear Medicine, and Public Health and Preventative Medicine. Subsequently, specialty-specificity could be accomplished by either allowing each specialty to choose which key competencies out of a master list apply to their professional context or by tailoring different versions of the framework for subgroups of disciplines (i.e.: medical, surgical, non-clinical). As an example of the latter, Radiology training programs in the Netherlands have adapted the Communicator role to include interprofessional and written communication in the list of specific competencies for their specialty, a change that would be meaningful for all non-clinical specialties.[31]

There are four central limitations to this study. First, this study was conducted in Canada using the CanMEDS Competency Framework, so the results may not be transferable to other countries or to other frameworks. Readers should carefully assess the applicability of these results to their own context. Secondly, the intent was to have participation from across the country, but due to the unequal numbers of programs and the willingness of participants, some provinces were not represented, and one specialty had one fewer participant compared to the other two. As saturation of data was reached earlier than anticipated, this is unlikely to have posed a significant impact on the analysis. Thirdly, smaller laboratory specialties or those with predominantly clinical duties were excluded, but program directors from these specialties may have additional perspectives to explore. Their input would be valuable if attempting to finalize a list of key and enabling competencies for laboratory specialities. Finally, Canadian residency programs are mandated to transition to CBME curriculums, and every specialty has a different deadline. During the timeframe of this study, only Pathology has completed the transition. As a result, not all participants have had a comparable opportunity to reflect on the impacts of using the CanMEDS framework in CBME.

Conclusion

In conclusion, it is necessary that the CanMEDS competencies be systematically integrated into all healthcare settings to allow these competencies to be appropriately taught and assessed within dissimilar environments. This study provides a first step towards understanding how the CanMEDS Competency Framework could be refined to meet the needs of laboratory medicine specialities. In Canada, the CanMEDS Competency Framework is undergoing a revision for 2025, presenting an opportunity to address the existing gaps and improve its applicability across all disciplines. Further input from key stakeholders among various non-clinical disciplines, including laboratory medicine, should be encouraged so that their perspectives can be added to the process.

Conflicts of Interest: CB and JF have no conflicts of interest to declare.
Funding: No funding was required to complete this study.
Edited by: Lawrence Grierson (section editor); Christina St. Onge (senior section editor); Marcel D'Eon (editor-in-chief)

References

1. ACGME International. *ACGME International Home*. Chicago USA; 2000 (updated 2022). Available from: https://www.acgme-i.org [Accessed on Dec 8, 2022].
2. Frank JR, Snell L, Sherbino J, editors. *CanMEDS 2015 Physician Competency Framework.* Ottawa (Canada): Royal College of Physicians and Surgeons of Canada; 2015.
3. Tromp F, Vernooij-Dassen M, Grol R, Kramer A, Bottema B. Assessment of CanMEDS roles in postgraduate training: the validation of the Compass. *Patient Educ Couns.* 2012(89):199-204. http://doi.org/10.1016/j.pec.2012.06.028
4. Norman G, Sherbino J, Dore K, et al. The etiology of diagnostic errors: a controlled trial of system 1 versus system 2 reasoning. *Acad Med*. 2014;89(2):277-284. http://doi.org/10.1097/ACM.0000000000000105
5. Kogan JR, Holmboe S. Preparing residents for practice in new systems of care by preparing their teachers. *Acad Med*. 2014;89(11):1436-1437. http://doi.org/10.1097/ACM.0000000000000480
6. Jippes E, van Luijk S, Pols J, Achterkamp M, Brand P, van Engelen J. Facilitators and barriers to a nationwide implementation of competency-based postgraduate medical curricula: a qualitative study. *Med Teach.* 2012;34(8):e589-602. http://doi.org/10.3109/0142159X.2012.670325
7. Ellaway R. CanMEDS is a theory. *Adv Health Sci Educ Theory Pract*. 2016;21(5):915-917. http://doi.org/10.1007/s10459-016-9724-3
8. Kwon H, Lee Y, Chang H, Kim A. Needs assessment of a core curriculum for residency training. *Korean J Med Educ*. 2015;27(3):201-212. http://doi.org/10.3946/kjme.2015.27.3.201
9. LaDonna K, Kahlke R, Scott I, van der Goes T, Hubinette M. Grappling with key questions about assessment of the Health Advocate role. *Can Med Educ J*. 2023;14(1):80-9. http://doi.org/10.36834/cmej.73878
10. Do V, Maniate J, Sonnenberg L. To lead or to influence? *Can Med Educ J*. 2021;12(5):59–60. http://doi.org/10.36834/cmej.72551
11. Verkerk M, de Bree M, Mourits M. Reflective professionalism: interpreting CanMEDS' "professionalism". *J Med Ethics*. 2007;33(11):663–6. http://doi.org/10.1136/jme.2006.017954
12. Roberts G, Beiko D, Touma N, Siemens D. Are we getting through? A national survey on the CanMEDS communicator role in urology residency. *Can Urol Assoc J*. 2013;7(11-12):437-41. http://doi.org/10.5489/cuaj.264
13. Berger E, Chan M, Kuper A, et al. The CanMEDS role of Collaborator: How is it taught and assessed according to faculty and residents? *Paediatr Child Health*. 2012;17(10):557-60. http://doi.org/10.1093/pch/17.10.557
14. Chou S, Cole G, McLaughlin K, Lockyer J. CanMEDS evaluation in Canadian postgraduate training programmes: tools used and programme director satisfaction. *Med Educ*. 2008;42(9):879-886. http://doi.org/10.1111/j.1365-2923.2008.03111.x
15. van der Vleuten CP, Schuwirth LW, Scheele F, Driessen EW, Hodges B. The assessment of professional competence: building blocks for theory development. *Best Pract Res Clin Obstet Gynaecol*. 2010;24(6):703-719. http://doi.org/10.1016/j.bpobgyn.2010.04.001
16. Ringsted C, Hansen TL, Davis D, Scherbier A. Are some of the challenging aspects of the CanMEDS roles valid outside Canada? *Med Educ*. 2006(40):807-815. http://doi.org/10.1111/j.1365-2929.2006.02525.x
17. Yusuf E, Ong DSY, Martin-Quiros A, et al. A large survey among European trainees in clinical microbiology and infectious disease on training systems and training adequacy: identifying the gaps and suggesting improvements. *Eur J Clin Microbiol Infect Dis*. 2017(36):233-42. http://doi.org/10.1007/s10096-016-2791-9
18. Royal College of Physicians and Surgeons of Canada. *Objectives of Training in the specialty of Medical Microbiology*. Ottawa, Canada: Royal College of Physicians and Surgeons of Canada; 2018.
19. Royal College of Physicians and Surgeons of Canada. *Objectives of Training in the specialty of Anatomical Pathology*. Ottawa, Canada: Royal College of Physicians and Surgeons of Canada; 2013.
20. Lopez KA, Willis DG. Descriptive Versus Interpretive Phenomenology: Their Contributions to Nursing Knowledge. *Qual Health Res*. 2004;14(5):726-35. http://doi.org/10.1177/1049732304263638
21. Savin-Baden M, Major C. *Chapter 14: Phenomenology. Qualitative research: the essential guide to theory and practice.* London (England): Routledge; 2013.
22. Akerlind GS. Variation and commonality in phenomenographic research methods. *High Educ Res Dev*. 2005;42(4):321-34. http://doi.org/10.1080/07294360.2011.642845
23. Royal College of Physicians and Surgeons of Canada. *Competence By Design: Canada's model for competency-based medical education*. Ottawa (Canada); updated 2023. Available from: http://www.royalcollege.ca/rcsite/cbd/competence-by-design-cbd-e. [Accessed on Dec 8, 2022].
24. Creswell JW, Creswell JD. *Research design: qualitative, quantitative, and mixed methods approaches (5th Ed)* California (USA): SAGE Publications Inc; 2018.
25. Renting N, Raat ANJ, Dornan T, et al. Integrated and implicit: how residents learn CanMEDS roles by participating in practice. *Med Educ*. 2017(51):942-52. http://doi.org/10.1111/medu.13335
26. Haller BL. Resident training in microbiology. *Clin Lab Med*. 2007(2):369-80. http://doi.org/10.1016/j.cll.2007.04.001
27. ten Cate O, Scheele F. Competency-based postgraduate training: can we bridge the gap between theory and clinical practice? *Acad Med*. 2007;82(6):542-7. http://doi.org/10.1097/ACM.0b013e31805559c7
28. LoGiudice A, Sibbald M, Monteiro S, et al. Intrinsic or Invisible? An Audit of CanMEDS Roles in Entrustable Professional Activities. *Acad Med*. 2022;97(8):1213-8. http://doi.org/10.1097/ACM.0000000000004731
29. van der Lee N, Fokkema J, Westerman M, et al. The CanMEDS framework: relevant but not quite the whole story. *Med Teach*. 2013;35(11):949-55. http://doi.org/10.3109/0142159X.2013.827329
30. van der Lee N, Westerman M, Fokkema J, van Der Vleuten C, Scherpbier A, Scheele F. The curriculum for the doctor of the

future: messages from the clinician's perspective. *Med Teach*. 2011;33(7):555–61. http://doi.org/10.3109/0142159X.2011.578176

31. Jippes E, van Engelen J, Brand P, Oudkerk M. Competency-based (CanMEDS) residency training programme in radiology: systematic design procedure, curriculum and success factors. *Eur Radiol*. 2010;20(4):967–77. http://doi.org/10.1007/s00330-009-1623-z

Appendix A. Interview Guide

Ice-breakers

For how long have you been working as a program director? How many residents are in your program?

Introduction

In this interview, I am looking to explore your perceptions of ***the CanMEDS framework*** through ***your own experiences*** as both an attending physician working in a laboratory specialty and as an educator towards your residents in your program. The focus will be on ***your own past experiences*** of the various CanMEDS roles.

Interview Questions

1. Are you familiar with the CanMEDS Competency Framework?
    - How do you define the purpose of the CanMEDS Framework?
    - Why do you think it was developed and implemented?
2. How do the roles listed in the CanMEDS framework contribute to your daily work? Do you have examples?
    - How have you experienced these roles within the laboratory environment? *(If the previous answers centered on patient-care)*
    - Are some roles more or less relevant compared to others within the unique environment of the laboratory? Why?
    - Do you think some roles only apply to particular contexts or particular specialties?
3. In what other ways do you think these roles can manifest within your speciality? *(If not sufficiently answered in Q2)*
    - Can you provide examples for the Health Advocate/Communicator/Collaborator/Leader roles?
    - How did you develop your skills in these roles?
4. How have your experiences with the CanMEDS framework influenced your mentoring of these roles with residents? Do you have examples?
    - Are there some skills that you find do not get addressed during training? Please provide an example.
    - How has the Royal College Objectives of Training provided (or not) guidance in establishing learning objectives and teaching methods for these skills?
5. How do you monitor whether residents are achieving these skills within the laboratory setting?
    - What assessment tools are used?
    - Do you think these tools properly capture these skills? Please provide an example.
6. Do you have examples of other skills that are required in your specialty that are not addressed within the CanMEDS competency framework?
    - How could the framework be better adapted to fit the needs of your specialty?

Conclusion

We are coming towards the end of the interview. I will summarise what we have discussed. Am I correct to say that:

- Your understanding of the CanMEDS competency framework is…
- You feel that this framework is applicable (*or not*) to the laboratory environment by…

Is there anything else we have not discussed that you would like to bring up?