Implementing a Competency-Based Medical Education Curriculum for the Ontario Undergraduate Medical Education Programs

Tharshika Thangarasa[1], Mina Boshra[1], Cole Clifford[1], Gabrielle Haidar[1], Tayler Bailey[1], Alexander Pearson[1], Sara Trincao-Batra[1], Francesco Fazzari[1], Victoria Renée Lanoe[1], Sarah Wei Ping Chan[1], Tul-Zahra Rida[1], Kathryne DesAutels[1], Brittany Paul[1], Imane Foudil-Bey[1], Ioana Stochitoiu[1], Robert Bell[1]

[1] University of Ottawa Faculty of Medicine
Approved: May 11, 2020
Editors: Kelly Dong, Hassaan Khalik, Victoria McKinnon, Austin Yan, Ryan Gotesman

INTRODUCTION

The Competency-based Medical Education (CBME) curriculum is a new curricular structure implemented by residency programs across Canada.[1,2] It ensures trainees progress through residency based on adequate performance of clinically relevant competencies, ideally measured by objective evaluation.[2] This is in contrast to purely chronology-based progression, where residents move forward in residency based on time spent in training.[2] CBME strives for improvement to resident education, trainee evaluation, and patient safety.[3] As such, the Association of Faculties of Medicine of Canada (AFMC) has published guidelines towards incorporating CBME into Undergraduate Medical Education (UGME).[4]

CBME has been incorporated into specialist Canadian postgraduate medical education (PGME) programs under the title Competence by Design (CBD)[*.1,2,5] Using the CBME approach, a trainee progresses in PGME through completion of Entrustable Professional Activities (EPAs). These are sets of clinical practices and physician responsibilities which integrate competencies from numerous CANMEDS roles (see Table 1).[1] A supervising physician evaluates a student's performance for progression through numerous milestones within each EPA. Milestones are markers of progression towards EPA completion. Once these milestones are completed and the learner is deemed proficient to independently perform the EPA, they are considered entrustable and the EPA is complete. Once a resident is entrustable for all EPAs for their program, they are considered fully trained.[5]

CBME improves medical education in several ways. Firstly, it ensures learners progress through training in an appropriate timeline based on evaluated clinical skills, rather than basing progression on time spent in training.[6] The addition of CBME principles may address some problems in strictly chronology-based curriculums, including discrepancies between expected and realized performance in learners and feelings of ill-preparedness for independent practice.[7,8] Furthermore, EPAs contextualize broader CANMEDS competencies into daily clinical duties, emphasizing the evaluation of patient-care skills and making standardized trainee assessment more practical in a clinical setting by focusing on the specific, discrete competencies required within the CANMEDS framework rather than an all-encompassing role.[9,10] Lastly, CBME provides a framework for using valid and reliable tools to assess students' clinical competence, allowing supervisors to appropriately determine learners' clinical autonomy.[11]

The advantages of CBME have been demonstrated through numerous initiatives at the PGME level. One study showed that the use of EPAs allowed staff physicians to appropriately determine resident autonomy

---

* CBD is a brand of the Royal College of Physicians and Surgeons. Although it uses the same principles as CBME, this paper will be using CBME for the purpose of inclusivity of both RCPS and CFPC specialities.

and decision-making abilities.[12] EPAs have been shown to be useful tools in the reliable evaluation of clinical skills in multiple residency training programs.[13] That being said, there is limited evidence examining differences in resident training outcomes, likely due to its recent implementation and insufficient time for data collection. One study out of the United States demonstrated improved Obstetrics patient outcomes in centers providing competence-based resident training compared to traditional training programs.[14] Some residents have identified increased resident-staff interactions, improved clinical learning, and increased autonomy as benefits of the CBME model.[15]

After reviewing the advantages of CBME curriculums in PGME, the AFMC endeavoured to provide similar benefits to UGME students and their longitudinal medical learning experience by publishing twelve EPAs defining levels of UGME student competency based on the Reporter-Interpreter-Manager-Educator (RIME) progression of professional growth of medical students.[16] RIME progression states that as clerkship students gain further knowledge and experience, they progress from being only able to collect and report clinical information (reporter) to being able to independently interpret clinical data (interpreter), create treatment plans (manager) and, finally, seek evidence-based information and educate the rest of the team (educator). Dividing the competencies in such a manner allows medical students to understand their current level of competency as well as the future milestones they need to aim for (e.g. if they are currently only able to collect patient history, they understand that the next step is to interpret this information and create a list of differential diagnoses). This will also aid preceptors in providing the right level of autonomy to students based on their current level of competency. This can help to ensure patient safety, as students will not be performing tasks far beyond their competence level. [8,9,17]

As with PGME, CBME may improve standardized and objective evaluation of clinical performance in UGME programs, supported by recent studies demonstrating the effectiveness of EPA-guided evaluation at the pre-clerkship and clerkship level.[18,19] Finally, if students are familiar with the use of EPAs, they may also choose to integrate required EPAs from their desired residency program into their medical training. This may improve their preparedness and provide opportunities to display interest in their chosen specialty.[20]

In Canadian UGME, CBME is currently used at Queen's University and Memorial University of Newfoundland (MUN).[21,22] In 2017, Queen's implemented 13 curriculum EPAs to be completed prior to graduation.[21] These EPAs include modified versions of the 12 from the AFMC and one additional EPA, titled, "Design a research project".[21] Through communication with the Queen's student Vice President of Academics, consensus is that, despite minor frustrations, CBME is well-received.[21] Challenges include logistical issues around evaluation completion, differing expectations regarding entrustability, inability for residents to complete evaluations, and preceptor evaluation burden. In comparison, MUN has implemented 13 EPAs, including, "Collaborate as a member of an interprofessional team". EPAs are assessed weekly during clerkship, and student progression is evaluated at the 6, 9, and 12-month marks.[23] Through direct communication with the student Vice President of Academics at MUN, feelings are divided on CBME. Students see the benefit of CBME for residency preparation but acknowledge a sense of anxiety regarding their ability to attain entrustability, notably for procedure-oriented EPAs for which preceptors have higher standards regarding entrustability. The successes and challenges of CBME implementation at Queen's and MUN can be used as lessons to smooth the transition to CBME in UGMEs across Ontario.

Overall, medical education has shifted towards the use of CBME and outcomes-based curricula. These initiatives have been successfully implemented in PGME, and implementation in UGME has proven effective in preliminary studies. This report will describe the guiding principles of implementing CBME curricula in UGME and recommendations towards smooth and effective transitions.

Table 1: CANMEDS Seven Physician Roles[28]

The Seven Roles	Description
Medical Experts	Applying medical knowledge, clinical skills, and professional attitudes in the provision of patient-centered care

Communicators	Facilitating effective doctor-patient relationships
Collaborators	Achieves optimal patient care by effective work within a healthcare team
Managers	Participating in healthcare organizations and contributing to the effectiveness of the healthcare system
Health Advocates	Influencing advancement of health and well-being of individual patients, communities, and populations
Scholars	Demonstrating a lifelong commitment to reflective learning as well as the creation, dissemination, application and translation of medical knowledge
Professional	Applying ethical practice, profession-led regulation, and high personal standards of behavior.

Table 2: AFMC EPAs

EPA 1	Obtain a history and perform a physical examination adapted to the patient's clinical situation
EPA 2	Formulate and justify a prioritized differential diagnosis
EPA 3	Formulate an initial plan of investigation based on the diagnostic hypotheses
EPA 4	Interpret and communicate results of common diagnostic and screening tests
EPA 5	Formulate, communicate and implement management plans
EPA 6	Present oral and written reports that document a clinical encounter
EPA 7	Provide and receive the handover in transitions of care
EPA 8	Recognize a patient requiring urgent or emergent care, provide initial management and seek help
EPA 9	Communicate in difficult situations
EPA 10	Participate in health quality improvement initiatives
EPA 11	Perform general procedures of a physician
EPA 12	Educate patients on disease management, health promotion and preventive medicine

PRINCIPLES

The Ontario Medical Students Association makes its recommendations using the following guiding principles:

1. High quality undergraduate medical education should be based on students' attainment of practical knowledge and skills, which will allow them to be effective residents.
2. Students and preceptors should have a mutual understanding of an individual learner's competence, which can be used to encourage safe progression in clinical responsibility.
3. Changes in medical curricula should be rooted in student and faculty feedback and based upon evidence from the successes of other medical education programs.
4. Innovations in medical education, as well as the purpose behind them, should be made transparent to learners and preceptors, to ensure mutual understanding and eventual successful transition.

RECOMMENDATIONS

The Ontario Medical Students Association recommends the following:

A. Curriculum Transition

1. UGME programs should ensure their curricular structure is able to fulfill all mandated EPAs and evaluate whether additional EPAs should be included to align with a specific program's mission and values.

To achieve a smooth transition to a CBME curriculum, the UGME program of each school needs to compare their current curriculum with the EPAs provided by the AFMC to identify which ones will they be able to readily adhere to. The use of the AFMC EPAs stems from the fact that most schools took part in the production of such objectives to ensure compatibility with educational goals and long-term adherence. Thus, this process becomes more manageable for most schools as it can be tailored to the individual UGME program. Moreover, by using the same base EPAs, a provincially unified, robust medical competence framework can be created. Mastering these EPAs is invaluable for all clerks transitioning into residency.

To preserve the unique identity and values of each UGME, extra EPAs could be created by individual UGME programs. This has been achieved by Queen's University and MUN with their 13th EPAs. For reference, Queen's University chose "Design a research project" as their 13th EPA, while MUN chose to add the requirement of "Collaborate as a member of an interprofessional team".[21,23] Thus, the medical students of the province are able to attain the same basic competencies while concurrently experiencing the unique curricular values of their respective schools. This helps target one of the main issues raised with CBME curricula; having fixed competencies may lessen the diversity of UGME programs across Canada and lead to a group of clinicians with a homogeneous approach to clinical practice.[21] With the addition of specialized EPAs, the UGME can develop residents with both a strong unified foundation and a diverse skillset, thus maintaining appropriate heterogeneity among graduating medical students.[21]

2. UGME programs should match program learning objectives to the newly formed EPAs.

To successfully integrate CBME into UGME curricula, the learning objectives and program examinations within each program should align with the competencies outlined by the EPAs formed in Recommendation 1. Taking care to ensure coherence between the learning objectives of the EPAs and the curriculum will allow students to gain the knowledge and experience necessary for transitioning from pre-entrustable to entrustable.

Mapping learning objectives to newly formed EPAs is achievable. Since the newly formed EPAs mirror both CANMEDS and the values of Ontario medical programs, there should be significant overlap already between the two curricula. This has been demonstrated by Queen's University and MUN UGME curricula.

Table 3: Queen's University EPAs tagged with corresponding CANMEDS roles

EPA	Medical Expert	Communicator	Collaborator	Leader	Advocate	Scholar	Professional
EPA 1: Obtain a history and perform a physical examination adapted to the patient's clinical situation	X	X			X		X
EPA 2: Formulate and justify a prioritized differential diagnosis	X				X	X	
EPA 3: Formulate an initial plan of investigation based on the diagnostic hypotheses	X					X	

EPA 4: Interpret and communicate results of common diagnostic and screening tests	*X*	*X*				*X*	
EPA 5: Formulate, communicate and implement management plans	*X*	*X*	*X*			*X*	
EPA 6: Present oral and written reports that document a clinical encounter	*X*	*X*					*X*
EPA 7: Provide and receive the handover in transitions of care	*X*		*X*	*X*			
EPA 8: Recognize a patient requiring urgent or emergent care, provide initial management and seek help	*X*	*X*	*X*				
EPA 9: Communicate in difficult situations	*X*	*X*			*X*		*X*
EPA 10: Contribute to safety and quality in patient care	*X*		*X*	*X*		*X*	
EPA 11: Perform general procedures of a physician	*X*	*X*					*X*
EPA 12: Educate patients on disease management, health promotion and preventive medicine	*X*	*X*			*X*	*X*	
EPA 13: Design a research project			*X*	*X*		*X*	*X*

Queen's University UGME curriculum is based on the following three frameworks: EPAs, Clinical Presentations of the Medical Council of Canada, and the CANMEDS roles of the Royal College of Physicians and Surgeons, including Medical Expert (ME), Communicator (CM), Collaborator (CL), Leader (LD), Health Advocate (HA), Scholar (SC), and Professional (PR).[21] These frameworks ensure that each medical graduate will be able to demonstrate medical expertise and master the other roles of CANMEDS in a given clinical scenarios.[21] EPAs permit medical graduates to be entrustable with indirect supervision for each designated activity.[21] The 13 EPAs incorporated into Queen's UGME curriculum include the abilities and expectations of all medical graduates that are widely accepted by Canadian medical schools. [21] These include the 12 EPAs developed by the AFMC (Table 2), as well as one additional EPA concerning student involvement in research[21] unique to Queen's University (Table 3). Queen's University integrated EPAs 1-6 in the learning objectives and assessment of all clerkship rotations, while EPAs 7-13 are assessed in curricular courses and specific clerkship rotations.[21]

MUN has also implemented EPAs into their UGME curriculum as a framework for learning and assessment in clerkship.[23] The UGME curriculum at MUN is divided into 4 phases: Phases 1-3 comprise years 1 and 2 of pre-clerkship, while Phase 4 is comprised of years 3 and 4 of clerkship. Phase 4 is structured around the 13 EPAs, which are each linked to a CANMEDS competence to ensure effective representation of all CANMEDS roles.[23] The number of EPAs assessed during each core rotation varies (Table 4), however each EPA is assessed during a minimum of four core rotations. Students are expected to achieve entrustability in each EPA by the end of the 8 core rotations.[23] Based on both their model and that of Queen's University, creating an EPA achievement outline to share with students before the implementation of CBME will help decrease anxiety by creating a clear plan prior to students experiencing the curriculum change for the first time.

Table 4: MUN EPAs with their corresponding rotations

	EPA 1	EPA 2	EPA 3	EPA 4	EPA 5	EPA 6	EPA 7	EPA 8	EPA 9	EPA 10	EPA 11	EPA 12	EPA 13	number of EPAs covered
Anesthesia		X				X	X			X	X		X	6
Emergency Medicine	X	X	X	X	X	X	X	X	X	X	X	X	X	13
Internal Medicine	X	X	X	X	X	X	X	X	X	X	X	X	X	13
Obstetrics and Gynecology	X	X	X	X		X	X	X		X	X		X	10
Pediatrics	X	X	X	X	X	X	X	X		X			X	10
Psychiatry	X	X	X	X	X	X	X	X	X	X		X	X	12
Rural Family Medicine	X	X	X	X	X	X		X	X	X	X	X	X	12
Surgery	X	X		X	X	X		X		X	X		X	9
Number of assessments per EPA	7	8	6	7	6	8	6	7	4	8	6	4	8	

3. The UGME program should create a set of milestones for each EPA to allow for discreet, stepwise goals.

Creating a milestone framework for each EPA allows competency achievement to be a discreet, stepwise process. This process can provide many benefits for skill development. First, it challenges the binary view of skills being "mastered" or "not mastered" by providing skill sets with levels of mastery embedded within the EPA. Thus, this provides a more appropriate view of achieving proficiency, as students are able to gauge what level of mastery they have attained and how to attain a higher level. Second, it provides medical students with specific goals that they can aim to achieve. This can be helpful since one of the main concerns by students in CBME curricula is the vagueness of the competencies, leading to anxiety due to uncertainness regarding achievement of entrustability.[24] Furthermore, this system can also help tutors by providing them with a structure for assessment. Having steps to achieve within each EPA provides clarity for evaluation. Finally, outlining milestones can help the UGME program identify which students require further assistance by comparing the progress of students.

Creating milestones is manageable since each EPA competency is based on a specific skillset that is already divided and taught across the four years of undergraduate medical learning. For instance, EPA 1 on history taking, which is normally taught with every new organ system learned, could be divided into milestones based on said organ systems. Once all of the milestones are achieved, the student is able to proficiently take a comprehensive organ system-specific history. Procedural EPAs like number 7 (Handover) could be divided into milestones of increasing independence (e.g. the student starts by performing hand over of in-class cases with assistance of tutor, then graduates to performing them independently). However, once again, to ensure that instructions are clear for students and tutors embarking on this curriculum, the milestones need to have been determined and planned before implementation.

B. <u>System Transition</u>
4.   The UGME should establish a system in order to assess EPAs in their UGME curriculum. As with any curriculum, a system will be required to collect preceptor assessments of students.

Medical schools are currently using a variety of methods for medical student assessment. These include electronic assessments, logging of experiences, and periodic meetings with preceptors, all which can be used to assess EPA progress. These evaluation systems enable students to view their progress and address the areas in which they may be lacking, while also providing the UGME promotions committee (the decision-making body responsible for approving medical student promotions) with the assessments they need to make their decisions. This process has been demonstrated by both the Queen's University and MUN assessment systems.

Queen's University, for instance, uses electronic clinic cards of achievements to assess students during certain rotations.[21] Some challenges in evaluating EPAs were reported by the VP Academics at Queen's University, such as the burden on preceptors to manage an abundance of paperwork. The use of an electronic format was implemented to alleviate this challenge, yet clerkship students have reported issues with getting preceptors to complete the online evaluations. For a solution to this issue, please see Recommendation 5. There are also some challenges associated with faculty development and with a limited number of supervisors at smaller regional sites which have to be addressed (see Recommendation 7).

Memorial University, on the other hand, has implemented their own system for evaluating EPAs. Clerkship assessments are completed using electronic clinic cards that are completed daily or weekly depending on the rotation. Assessments are then summarized for each student at 6, 9, and 12 months to allow students to identify and address EPAs that are not yet entrustable, and to continue to develop entrustability of other EPAs. The Phase 4 Lead reviews the assessment profiles of each student to ensure the progression of entrustability.[23] One challenge identified at MUN is the issue of transitioning to an electronic evaluation system, as preceptors would require training on the new system. A larger challenge is reluctance of preceptors to evaluate students as entrustable on certain rotations or certain EPAs. Students have found that preceptors are willing to assess physical exams, oral exams, and communication skills (e.g. documenting patient history), but are less keen to do so with other EPAs (such as EPA 2 and 7). This is also addressed in recommendation 5.

The University of Ottawa's UGME Office, in response to the increasing evidence for CBME curricula, created an EPA Working Group to review the possibility of incorporating CBME into UGME and to determine what would be required to create a cohesive transition. The product of their collaboration with various faculty members and stakeholders produced recommendations of specific methods of assessment that may ease the transition.

The EPA Working Group suggests that EPA competencies should preferably be measured using a scaling system rather than the AFMC's dichotomy of entrustable vs pre-entrustable. We agree with this suggestion. Providing the student with a 5-point scale allows the student to recognize their improvement as well as their potential for growth. Within this system, each skill would be divided into the various steps required to perform the skill (i.e. milestones). Under the guidance of their tutor, the student would progress to improve their performance. The scale would match the level of entrustability to the student's independence in each skill. For instance, a 3/5 could mean ability to perform 60% of the steps independently and a 5/5 would signify complete trust in a student's ability to perform 100% of the skill independently. The narrow scale of the AFMC, which may label the student as pre-entrustable even though they may have achieved most of the competencies, can lead to student anxiety or discouragement.

We also agree with the EPA Working Group's suggestion that evaluation of the student's progress should be performed in multiple settings, such as OSCEs, and not just limited to clinical settings.[26] Evaluating in multiple settings allows the tutors to recognize various strengths and weaknesses that may appear in one setting and not another. Finally, the assessment process should span both pre-clerkship and clerkship. Although we understand that not all EPAs can be assessed in pre-clerkship, evaluating as many as possible can help set the groundwork for clerkship and residency.

In order to facilitate a smoother UGME transition to CBME, schools should have valid and reliable assessment systems available prior to transition to ensure all tutors have a chance to be trained on the system and have experience navigating the software.

5. The UGME program should establish a development program to train its staff and faculty on the CBME learning model before implementation.

Feedback from Queen's University and MUN suggest CBME curricula could be improved by ensuring staff have a unified level of expectation regarding what defines a student as "entrustable", in regards to procedural EPAs.[21,23] Therefore, it is important to provide training for faculty that emphasizes the expectations and standardized milestones of each EPA which can be used in decision-making when evaluating learners. Furthermore, the expectations need to match the level of education of the student (i.e. a first-year student would have a different level of expectations in any specific EPA from a second-year student). It will be crucial that the process of designing EPAs and their nested milestones involves the staff that will be evaluating these competencies, such that expectations are clearly defined. Once expectations are defined, the staff needs to be educated on how to assess students within a CBME curriculum. This can be accomplished by providing staff and faculty with educational opportunities such as seminars, online modules, simulations, role playing, and other coaching strategies. All of these tools and resources can emphasize and strengthen CBME goals.[26]

It will be important to ensure staff are properly trained at providing effective feedback and appropriately completing evaluations for students' EPAs. Firstly, it will be critical to emphasize that CBME is most effective when the student and assessor have a reciprocal understanding that EPA assessment is both formative and summative.[26] Initially when a student is "pre-entrustable" there should be shared understanding that EPA assessments are formative and serve to identify areas of strength and weakness in a student's approach, which can guide subsequent training. However, both staff and learner must also appreciate that the end goal of becoming "entrustable" is a summative assessment. By implementing training sessions for both tutors and students regarding the implementation of EPAs, these central aspects of the CBME framework can be clarified, which may potentially avoid the hurdles that have been faced by other UGME programs (see recommendation 6 for student-specific recommendations). Finally, creating a system to

compare the assessments of the various tutors who have interacted regularly with the student will allow for inter-rater comparison to assess reliability of the feedback.

OMSA should urge UGME offices to collect regular feedback from students on each tutor. The feedback forms would allow each UGME office to monitor for any issues with a tutor and retrain them accordingly to ensure consistency of expectations among staff.

6. Ontario Medical schools should educate their UGME students on the goals and justification of a CBME curriculum.

A change in curriculum is difficult for all those involved. It is often met with resistance due to uncertainty. It requires a new level of adaptation and acceptance from faculty, staff, and students. To ensure the adoption of CBME is well-received and properly implemented, training at all levels of UGME is necessary. This includes training staff, faculty, and, very importantly, students. This is essential in order to ensure the students understand CBME expectations, assessment methods, and requirements for progression. There are various ways in which CBME background training and education can be done. For example, having information sessions to facilitate open discussions regarding topics such as the benefits and potential problems of CBME, the implementation at other schools, and the proposed implementation in the UGME program. It is important to be transparent, as all curricula come with challenges. Another way to educate students is to have workshops with outside students who are either in a CBME program, or have graduated from one. This would give students a chance to be educated by those who have experienced this shift in curriculum first-hand. This process will be more manageable with new medical students since they will be introduced to the system from the onset of medical training.

Due to the limited CBME curricula in UGME programs currently, there is a lack of research into the effects on students if transition is done halfway through their studies. However, through the research done on other curricular changes, we could learn about some of the challenges that students face and what could be done to decrease their stress. For instance, a sudden change in pre-clerkship curriculum from 2 years to 1 year at Vanderbilt University School of Medicine in Nashville, Tennessee led to many of the challenges expected of a transition to CBME in UGME.[27] For example, many students voiced concern regarding lack of communication as to the reasoning behind the changes. This stress was especially evident in students who had already succeeded in transitioning to a medical curriculum and faced the challenge of reacclimatizing to another curriculum. Using regular townhall meetings to reinforce the rationale and tackle any arising issues early proved successful in mitigating these stressors.[27]

Furthermore, the UGME offices need to understand the multifactorial nature of students' anxiety. The stress could be due not only to the sudden change, but also the lack of senior peer support since the previous cohort would not have experienced this system. Thus, online pre-entrance modules to educate the students on the expectations and the structure of the new curriculum could help tackle the stress of the sudden change. The UGME offices also need to create new support systems for the transitioning students, since senior peer support would not be available.[27]

OMSA can help ease the stress of students by urging UGME programs to create a credible source of information on the changes in the curriculum, the reasoning behind said changes, and answers to FAQs. OMSA can assist by ensuring that the information shared is consistent among UGME offices to guarantee that all students are equally informed.

7. The Ontario Medical Schools should involve all stakeholders in the process of implementation.

Ensuring transparent communication amongst students, faculty, staff, and administration is important, since these stakeholders contribute a wide range of different experiences and perspectives that are important for the success of CBME. This can be done through regular town hall meetings with representation from each party. Obtaining feedback from individuals at all levels of the curriculum (i.e., staff, faculty, and students), is crucial in continuing the development and optimization of CBME. This should be done throughout the process of CBME development and following implementation.

OMSA should also advocate for the student voice in these meetings by urging UGMEs to include a minimum of one representative of the student body. Moreover, they should allow sufficient time for the student body to vote on major decisions regarding CBME implementation, to ensure that the student perspective is included. OMSA can also help in the sustainability of this new curriculum by gathering information on the issues faced by each UGME program as CBME curricula are implemented, as well as potential solutions. Sharing this information with every UGME office allows faster problem-solving for all Ontario UGME programs.

REFERENCES

1) Ten Cate, Olle. "A primer on entrustable professional activities." *Korean journal of medical education* 30.1 (2018): 1.

2) Stodel, Emma J., et al. "Designing and implementing a competency-based training program for anesthesiology residents at the University of Ottawa." *Anesthesiology research and practice* 2015 (2015).

3) Wagner, Justin P., et al. "Use of entrustable professional activities in the assessment of surgical resident competency." *JAMA surgery* 153.4 (2018): 335-343.

4) AFMC. "Entrustable Professional Activities for the Transition from Medical School to Residency". (2016).

5) Pinsk, Maury, Jolanta Karpinski, and Euan Carlisle. "Introduction of Competence by Design to Canadian Nephrology Postgraduate Training." *Canadian Journal of Kidney Health and Disease* 5 (2018): 2054358118786972.

6) Sterkenburg, Anneke, et al. "When do supervising physicians decide to entrust residents with unsupervised tasks?." *Academic Medicine* 85.9 (2010): 1408-1417.

7) Englander, Robert, et al. "Toward defining the foundation of the MD degree: core entrustable professional activities for entering residency." *Academic Medicine* 91.10 (2016): 1352-1358.

8) Frank, Jason R., et al. "Competency-based medical education: theory to practice." *Medical teacher* 32.8 (2010): 638-645.

9) van Loon, Karsten A., et al. "Experiences with EPAs, potential benefits and pitfalls." *Medical teacher* 36.8 (2014): 698-702.

10) Carraccio, Carol, et al. "Building a framework of entrustable professional activities, supported by competencies and milestones, to bridge the educational continuum." *Academic Medicine* 92.3 (2017): 324-330.

11) ten Cate, Olle, and John Q. Young. "The patient handover as an entrustable professional activity: adding meaning in teaching and practice." *BMJ Qual Saf* 21.Suppl 1 (2012): i9-i12.

12) Touchie, Claire, et al. "Supervising incoming first-year residents: faculty expectations versus residents' experiences." *Medical education* 48.9 (2014): 921-929.

13) Steiman, Jennifer, et al. "Measuring Competence in Surgical Training through Assessment of Surgical Entrustable Professional Activities." *Journal of surgical education* 75.6 (2018): 1452-1462.

14) Asch, David, et al. "How Do You Deliver a Good Obstetrician? Outcome-Based Evaluation of Medication Education." *Journal of the Association of American Medical Colleges* 89.1 (2014): 24-26.

15) Yoon, Chang-Hwan, et al. "Implementing Competency-Based Medical Education in Internal Medicine Residency Training Program: the Process and Impact on Residents' Satisfaction." *Journal of Korean Medical Science* 34.29 (2019): e201.

16) Meyer, Eric G., et al. "The RIME Model Provides a Context for Entrustable Professional Activities Across Undergraduate Medical Education." *Academic Medicine* 93.6 (2018): 954.

17) Chen, H. Carrie, et al. "Developing entrustable professional activities for entry into clerkship." *Academic Medicine* 91.2 (2016): 247-255.

18) Heimroth, Jamie, et al. "Utilizing Surgical Bootcamps to Teach Core Entrustable Professional Activities to Senior Medical Students." *The American Surgeon* 84.6 (2018): 783-788.

19) Chamberlain, Neal R., et al. "Physician-Mentored Patient Rounds to Observe and Assess Entrustable Professional Activities 1 and 2 in Preclinical Medical Students." *The Journal of the American Osteopathic Association* 118.3 (2018): 199-206.

20) Elnicki, D. Michael, et al. "An entrustable professional activity (EPA)-based framework to prepare fourth-year medical students for internal medicine careers." *Journal of general internal medicine* 32.11 (2017): 1255-1260.

21) Queen's School of Medicine. "Queen's University Competency Framework: Curricular Goals & Competency-Based Objectives". 6th Edition (2018)

22) Queen's School of Medicine. "Designing Competency at Queens: Executive Summary." Accessed from: https://meds.queensu.ca/source/Exec-Summary-for-Web_1.pdf

23) Memorial University of Newfoundland. "Faculty Handbook: An Online Reference Guide: Entrustable Professional Activities (EPA) assessment". (2017)

24) Filipe, Helena P et al. "Continuing professional development: best practices." *Middle East African journal of ophthalmology* vol. 21,2 (2014): 134-41. doi:10.4103/0974-9233.129760

25) Telio, S., Ajjawi, R., and Regehr, G. "The "Educational Alliance" as a Framework for reconceptualizing feedback in medical education" *Academic Medicine* 90, 5 (2015): 609-614

26) Campbell R., et al. UGME Entrustable Professional Activities Working Group: Draft Recommendation. 2019.

27) Yengo-Kahn, A. M., Baker, C. E., & Lomis, A. K. D. Medical Students' Perspectives on Implementing Curriculum Change at One Institution. *Academic Medicine*, 92, 4 (2017):455–461. doi: 10.1097/acm.0000000000001569

28) Innovations in medical internship: benchmarking and application within the King Saud bin Abdulaziz University for Health Sciences - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/CanMEDS-Seven-Physician-Roles_tbl1_44853556 [accessed 27 Apr, 2020]