

Resident
Doctors
of Canada



Médecins
résidents
du Canada



POSITION PAPER

Implementing a Competency- Based Approach to Medical Education

June 2016

residentdoctors.ca

Resident Doctors of Canada (RDoC) represents over 10,000 resident doctors across Canada. Established in 1972, we are a not-for-profit organization providing a unified, national voice for our membership. RDoC collaborates with other national health organizations to foster excellence in training, wellness, and patient care.

Implementing a Competency-Based Approach to Medical Education

Competency-based medical education (CBME) has emerged as a new curricular paradigm for the medical education continuum. Its focus lies on outcomes-driven education and assessment to ensure that graduates are able to meet the needs of their patients rather than spend a pre-specified amount of time in training. CBME is a way to carefully define which specific competencies resident doctors require to ensure competence in all areas of practice for a particular specialty upon graduation – i.e., the accomplishment and mastery of “Milestones” and “Entrustable Professional Activities.”

While the concept of CBME dates back to the mid-twentieth century (Frank, 2010a), the growing interest in developing outcomes-based curricula has helped renew enthusiasm for CBME. Objective outcome measurement has grown increasingly important in the modern era of medicine, as greater accountability for quality care delivery has risen in prominence (Frank, 2010a). This shift has challenged the balance between delivery of patient care and achievement in education and training. As residents play a crucial service provider role in the health care system, training time will continue to be an element in Canadian medical education balanced with an outcomes-based approach and regular, continuous assessment of performance.

For the purposes of this paper, Resident Doctors of Canada (RDoC) will focus on the risks and best practices inherent in implementing a competency-based approach to medical education, and identify the mitigation strategies needed to ensure its success. CBME is “fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of societal and patient needs. It de-emphasizes time-based training and promises greater accountability; flexibility, and learner-centredness,” (Frank, 2010b). If implemented in a thoughtful and conscious fashion, CBME has the potential to be an objective method for training competent physicians and achieving balance with service demands.

As a new paradigm, CBME will result in a dramatic shift in the way physicians are trained. We must ensure, from a resident and patient-centered point of view, that our medical education and postgraduate training systems continue to meet the needs of our patients. The ongoing transition to CBME must harness the strengths of our current approach while mitigating any unintended consequences. In order to ensure successful implementation, RDoC has developed four principles and calls for action to help ensure a smooth transition during this time of great change in Canadian medical education. These recommendations concern the transition to CBME, curriculum design, assessment and promotion, and resources required to properly implement competency-based medical education.

Principles for CBME Implementation

Theme 1: Transition to CBME

Rationale

CBME is hailed as a step forward in medical education that aligns training to the learning needs of a future practitioner. Nonetheless, the transition to CBME will present a number of new challenges and potential risks to medical education. To ensure a smooth transition for residents, faculty, and programs alike, the Canadian medical community must anticipate these challenges and devise tools to address them.

Calls for Action:

1. Create a clear, robust, and comprehensive transition strategy to facilitate successful implementation, seamless incorporation, and buy-in of new assessment methods and teaching approaches in residency.
2. Develop a standardized language for CBME that includes shared definitions of Entrustable Professional Activities (EPAs), Milestones, and Competencies.
3. Ensure collaboration, coordination, and information exchange between local and national planning efforts and amongst programs during development of specialty-specific EPAs to ensure cohesion and consistency.

Theme 2: Curriculum Design

Rationale

Many novel approaches to CBME curriculum design exist, but in each approach, the learner must exhibit the specific competencies required for independent practice in a graduated manner through increasing levels of responsibility. In Canada, medical education and postgraduate training systems typically adopt a hybrid model that is not organized solely around time-based rotations but also around the abilities expected of graduates, and how these abilities are learned, demonstrated, and assessed.

Calls for Action

1. To ensure effective harmonization between educational and health care service provider roles in a CBME system, training requirements, as well as service expectations, must be clearly defined and made transparent to faculty and residents alike.
2. The CBME curriculum must ensure that high standards do not overburden faculty and residents, and continue to advance the provision of efficient, high quality care for safe and independent practice.
3. Milestones and EPAs should reflect future practice and the development of wholly competent and integrated physicians, while avoiding reductionism.
4. Programs, as opposed to residents, must assume responsibility for ensuring that residents have a sufficient variety and depth of clinical exposure to meet necessary milestones and attain EPAs. While alternative curricular elements can supplement residency education, achievement of competencies should occur primarily through direct clinical exposure.
5. Healthcare organizations should consider novel approaches to service scheduling and delivery to ensure equity among residents regardless of whether they are in traditional or CBME training cohorts.
6. As evidence of the success of CBME curricular approaches is limited, organizations should ensure continuous quality improvement during implementation of CBME – particularly in relation to assessment, promotion, evaluation and accreditation systems – and use those results to improve and adjust approaches.

Theme 3: Assessment and Promotion

Rationale

Canada's certification colleges are re-engineering their credentialing, accreditation and examination processes to align with a competency-based approach. The success of CBME hinges on the system's ability to identify resident competencies and appropriately advance residents through their training programs. Residents within College of Family Physicians of Canada (CFPC) programs are formatively assessed daily using 'field notes', which track clinical encounters and, cumulatively, can contribute to final summative assessments. The Royal College is in the process of developing a resident e-Portfolio to track such competencies for residents nationwide. This is a shift away from the current process in which universities – at arms-length from credentialing and certifying bodies – record the learning achievements of most residents.

Calls for Action

1. Develop assessment methods that use multiple assessment tools, enlist various assessors, adapt to varied learning environments, and promote formative feedback and self-reflection.
2. Use a learning portfolio system to track resident progress through a training program. Whether the portfolio is maintained nationally, regionally, or locally, the type of information collected, location of storage, ownership, use, and access of information must be clearly defined. This process should include safeguards that ensure that resident information is protected and used appropriately.
3. Assessment and promotion in CBME must be transparent to residents to ensure that progress through their training truly reflects their status along the competency continuum and does not unduly reflect service demands or other secondary needs of the system or program.
4. As early as possible, assessment and promotion processes must identify residents who require additional resources or a change to their training schedule so as to minimize training disruptions or time to promotion.
5. Examinations for the purposes of licensure or certification should be composed of content that accurately reflects an eligible trainee's stage of training and competency regardless of their exam timing.
6. Develop a sufficient level of examination capacity so as not to delay training progression or limit the opportunity for a training period dedicated to transition to practice. This capacity could potentially include multiple examination sitting times per year.
7. Promotion through stages of training, and declaration of competency for the purposes of training program completion – independent of exams – should be the responsibility of the program and not the certifying or licensing bodies. Preferably, these decisions should be made by committee as opposed to by the program director alone.
8. Assessment should be uncoupled entirely from residency matching or hiring processes – especially as it pertains to individual narratives or daily formative activities – to ensure that there are no unintended punitive consequences to providing or receiving open, honest, constructive feedback.
9. Given the complex nature of clinical environments and the potential impact on a resident's career, data on patient outcomes should not be collected for the purposes of assessing competency, but may play a limited role in program evaluation.

Theme 4: Resources

Rationale

CBME will demand more time and resources to deal with unique and unexpected challenges. Specifically, faculty must increase direct observation for the purposes of assessing milestones, providing feedback, and developing learning plans to address learning gaps. As CBME is built upon a framework of direct observation, frequent assessment, and formative feedback, the Canadian medical community must place considerable focus on providing training and support to faculty and learners to succeed in these endeavours.

Calls for Action

1. There must be adequate physical, human, financial, and technological resources to support CBME. Resources diverted to the CBME transition must not compromise patient care.
2. Costs associated with CBME establishment and maintenance must be carefully considered and budgeted for ahead of implementation. Programs and Post Graduate Medical Education (PGME) offices must find cost-effective strategies, identify system inefficiencies, and support continuous quality improvement by adopting “lean” strategies.
3. Respect time demands for resident and faculty who will be adapting to and employing new assessment and teaching methods; and offer adequate staff, staff support, and time to provide real-time observation and feedback.
4. Dedicate significant resources to faculty development – particularly during transition – including the establishment of CBME champions and coaches who can mentor and guide programs and faculty. Faculties should also empower residents in this process.

Complete Findings & Calls for Action

Introduction

Canada’s medical education system has long been characterized by time-based training periods within structured educational environments that allow for escalated levels of responsibility in patient care (Long, 2010). This paradigm, as well as that of standardized board examinations, has shaped the majority of medical education programs for more than half a century, with the time a learner spends on defined rotations used as a surrogate marker for competence (Royal College, 2014).

According to the Royal College of Physicians and Surgeons of Canada, competency-based medical education (CBME) is one method that ensures that “physicians possess the knowledge and abilities they need for every stage and role of their career,” (Royal College, 2016a). It is an approach that prepares physicians for practice that is “fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of societal and patient needs. It de-emphasizes time-based training and promises greater accountability; flexibility, and learner-centredness,” (Frank, 2010b).

As CBME has the potential to be an objective way to train competent physicians and achieve balance with service demands, enthusiasm for the concept has resonated across countries and medical specialties. According to Saucier et al., a competency-based approach to medical education acknowledges the complexity of the professional practice environment, including its changing clinical context, and places greater emphasis on lifelong learning and self-reflection, which are important qualities for modern physicians (Saucier, 2012).

Background

The Royal College is adopting an outcomes-based approach to the design, implementation, assessment, and evaluation of medical education programs using a competency-based framework. Known as Competence-by-Design (CBD), this initiative will implement a competency-based approach to residency education and specialty practice in Canada, and align Royal College policies and processes to CBME. The College of Family Physicians of Canada (CFPC) has already transitioned Family Medicine programs in Canada to a competency-based curriculum called the Triple C curriculum.

In these systems, the focus is on learning and assessment in practice in addition to a certifying exam that remains essential for regulatory purposes. Pure CBME systems are independent of time, i.e., the resident doctor advances through training based on demonstrated competencies. However, the systems planned in Canada by the Royal College and the CFPC will continue to have a time-based component that reflects the crucial role that residents play as service providers in the Canadian health care system.

The Royal College has noted that there is no one-size-fits-all approach. Implementation will occur over several years and through a staged discipline-by-discipline method. This includes pilot projects in Medical Oncology and Otolaryngology (Head and Neck Surgery) which have both begun the iterative process of creating specialty-specific milestones and competency-based training standards. The second group of Royal College disciplines that will pilot CBME are Anesthesiology, Forensic Pathology, Gastroenterology, Internal Medicine, Surgical Foundations, and Urology. This new process also involves the simultaneous development of appropriate tools, document suites, processes, and faculty development resources needed to integrate competency-based practices into their disciplines, as well as a reengineering of the accreditation, exams, and credentialing processes at the Royal College (Royal College, 2014b).

Methods

The Training Committee at Resident Doctors of Canada conducted a search strategy from May 2015 to August 2015. The Committee conducted a Pubmed search using the following keywords and Boolean terms: (graduate medical education OR medical residency) AND competency-based education AND 2010-2015. The Committee retrieved 720 articles and cross-referenced them with the following terms for relevance: risks, challenges, successes, best practices, implementation, introduction, transition, cons, change, and concerns.

The RDOC Training Committee also screened abstracts for face validity. Specifically, the group excluded articles that dealt with the validation of a particular simulation intervention in assessing competency, rather than the more general role for simulation in CBME. The Committee also limited works to medicine, and excluded articles with a UME/CME focus. The group also excluded additional studies from countries with markedly different health systems and/or accreditation standards from Canada. In total, the group shortlisted 64 articles. In completing reference checks for the systematic review publication *Toward a definition of competency-based education in medicine: a systematic review of published definitions*, Med Teach. 32(8):631-7, Frank, J et al (2010), the Committee found an additional 35 articles. After screening out fourteen (14) duplicates, the Committee finished with 85 total articles ready for annotation.

Next, the Committee identified eighteen (18) CFPC papers of relevance that met its criteria and included these in its annotations. These 103 articles then served as an annotated bibliography, and the Committee included 62 subsequent articles to inform the initial draft and identify the themes, risks, benefits, and best practices in CBME discussed throughout. While carefully reviewed by the authors, many articles among the 62 do not serve as referenced work as they did not serve to advance or inform the discussion given their

inappropriate scope or lack of specificity. Conversely, in some cases, the Committee sought other works not identified in the original literature search to more directly inform concepts requiring further development. In all cases, literature was analyzed through the lenses of the informed trainees who compose the authorship.

Theme # 1 – TRANSITION TO CBME

CBME is considered to be a step forward in medical education as it aligns training to the learning needs of a future practitioner. Nonetheless, the transition to CBME will present a number of new challenges and potential risks to medical education. Anticipating these challenges and devising tools to address them are crucial to ensuring smooth transitions for residents, faculty, and programs alike. From previous experiences, such as those detailed in a 2013 report in *Academic Medicine*, the literature describes a number of lessons that promote successful implementation of CBME. As reflected in Table 1 (Carraccio, 2013), these include:

1. A need for standardized language
2. Direct observation in assessment
3. The challenge of developing meaningful measures of performance
4. Desired outcomes as the starting point for curriculum development
5. Dependence on reflection in the development of expertise
6. The need for exploiting the role of learners in their learning
7. Competent clinical systems as the required learning environment for producing competent physicians

Firstly and most importantly, implementation of CBME will require buy-in from a number of stakeholders at various levels of the medical education and health care system. Implementation will also require adequate time to plan, prepare, and train all involved parties. As one Entrustable Professional Activities (EPA) feasibility study identified, collaboration between clinical service and curriculum leaders is a key factor in ensuring success (Hauer, 2013). Including a variety of perspectives from all involved stakeholders during the strategic planning process may help identify challenges and reduce unexpected barriers during implementation.

While local variation in practice patterns and patient populations require a diverse range of physician abilities, stakeholders should collaborate to create a national vision for physician training and ensure shared competencies within specialties across Canada. Educators and curriculum developers from all postgraduate medical education faculties must work together to ensure a strong and robust CBME framework by mitigating the risk of re-inventing the wheel and working in silos. This transition presents a collaborative opportunity for advocacy in medical education by building on specific competencies to ensure that the newly developed CBME framework meets the needs of the Canadian health care system. Having national stakeholders from various specialties involved at the ground level will promote collaboration and, consequently, improve the final product.

Moreover, it will be essential for the medical community to develop and utilize a shared, standardized language for the Canadian context during the development and implementation of CBME. Though the ethos of CBME may be similar internationally, specific terminology may vary from region to region and create confusion at a very basic level. This issue is exemplified by the concurrent development of competencies by both the Accreditation Council for Graduate Medical Education (ACGME), who have formulated six domains of competencies, and the Association of American Medical Colleges (AAMC), who have framed four domains of competence for undergraduate medical education. Though the spirit of these two programs was similar, the differing language “prohibited formation of a shared mental model” (Carraccio, 2013) along the continuum of medical education. The global literature on CBME uses similar terminology with occasionally different intent, signifying the need for a standardized language for Canadian postgraduate and undergraduate medical education.

Furthermore, a successful transition must include predetermined and validated evaluation tools that reliably assess clinically important outcomes. Transition of a surgical program in Denmark showed that the number of procedures performed varied greatly amongst residents, and there were no reliable tools available to assess mastery of a particular skill (Carlsen, 2014). Creating a predeveloped assessment tool will help not only with measuring important milestones, but also assist in setting expectations. These assessments should focus on direct observation, formative feedback, portfolios, and self-directed assessments (Lobst, 2010, Lewis, 2012).

A 2012 systematic review of national surveys of 1076 program directors from a wide variety of medical and surgical specialties explored hurdles to the implementation of the ACGME CBME recommendations (Malik, 2012). The most commonly identified barriers were:

1. Lack of time
2. Lack of faculty support
3. Resistance of residents toward the ACGME Mandate
4. Lack of funding
5. Low priority of the ACGME mandate
6. Inadequate salary support for program directors
7. Inadequate knowledge of competencies

The literature identified time and financial constraints as the most notable barriers. The remarkable similarities in responses from respondents indicate a level of face validity, and demonstrate that program directors are attuned to the needs of their program. Even so, there is a risk that the newly desired competencies may not perfectly reflect the realities of the modern clinical training environment (Deloney, 2012). A 2013 literature review in *Australasian Psychiatry* noted the “risk of an increasing gap between the ideals and the reality of training expectations and experiences” in Royal Australian and New Zealand College of Psychiatrists (RANZCP) residency programs. The authors found that the external funding constraints made it difficult to achieve competence in psychotherapy in a public mental health service setting (Parker, 2013). This highlights the importance of having clinical service leaders involved early in the development process to ensure that proposed EPAs, competencies, and milestones can be realistically achieved.

Theme # 2 – CURRICULUM DESIGN

Overview

The Royal College’s approach to CBME curriculum planning focuses on outcomes tied to the needs of patients served by graduates, and involves explicit definitions of all essential domains of competence to be acquired (Royal College, 2011). These domains of competence, and the stages at which they ought to be integrated, are reflected in the CBD Competence Continuum diagram (Royal College, 2015). Of note, the diagram highlights the unique hybrid structure of residency training in Canada that results from CBME implementation, and denotes the integrated stages of specialist education. It is important to note that assessment and curriculum design are necessarily linked in CBME; this paper has constructed an artificial distinction between these concepts for the purpose of explanation.

Unlike a pure time-free CBME model, the Royal College’s “hybrid” approach measures success by whether the curriculum increases the competence of trainees and not upon whether the curriculum is time-based (Royal College, 2011). The hybrid model of CBME is organized around the abilities expected of graduates, ensuring that these abilities are learned, demonstrated, and assessed. Table 2 (Royal College) outlines this CBME spectrum from time-dependent, to hybrid competency-based, to time-free curricular designs.

Table 2: The Spectrum of design approaches for residency curricula (Royal College, 2011)			
Characteristic	Time-dependent	Hybrid: Competency-based, Timed Rotations	Time-free
Organizing Structure	Time spent on rotations	Progression of competence	Progression of competency
Degree of Structure	Rotations and AHS	Structured flexible curriculum; rotations as only one learning method	Structured, learner-centred curriculum; time-independent; rotations secondary to learning
Role of Timed Rotations	Unit of curriculum	Resource for acquiring competencies	Irrelevant
Role of In-Training Assessment	“Pass rotations”	Document progression & milestone achievement	Document progression & milestone achievement
Role of summative Assessment	Infer readiness of exam	Ensure achievement of competencies	Ensure achievement of competencies
Key Assessment Tools	In-Training Evaluation Report (ITER), Final In-Training Evaluation Report (FITER), oral	Portfolio; many others	Portfolio; others as needed
Program Focus	Processes for rotations	Acquisition of competency outcomes via rotations and other activities	Acquisition of competency outcomes
Teacher Roles	Supervision, teaching	Supervision, teaching, direct observation	Supervision, teaching, direct observation
Learner Roles	Service on rotations; academic contribution; study for exam	Ownership of learning; plot course for progression of competence through rotations	Ownership of learning; plot course for progression of competence through activities

Developing, Improving, and Tracking Competencies

There are a variety of novel approaches to developing competency in CBME, which include simulation-based training and the creation of self-directed learning plans. In addition, milestones and EPAs provide the ability to establish competency benchmarks and ways to set them. In this way, milestones and EPAs provide shared mental models and concrete language to help clarify educational expectations of trainees when completing certain training objectives. They provide descriptions of behaviors that ground the more abstract language of competencies and inform assessment at a granular level (Carraccio, 2012) as they are observable markers of an individual’s ability along a developmental continuum (Royal College, 2016b).

One of the cited rationales for CBME is its focus on curricular outcomes (as opposed to process), particularly in an era of greater public accountability (Frank, 2010a). CBME advocates that educational and training content that does not contribute to preparation for practice should be dropped, and it is a shift away from an emphasis on knowledge towards “skills, attitudes and their synthesis into observable competencies,” (Frank, 2010a). The Canadian medical community must ask a number of key questions about the curricular approaches in CBME. These include:

- Will the curriculum be beneficial for trainees?
- Will trainees be available to participate in curricula and provide care without lengthening service hours?
- Who should establish and validate curricula?

Flexibility and Reflection of Independent Practice

CBME may offer training that better reflects future practice. Whereas time-based rotational and evaluative systems train learners to be excellent residents, CBME may have the flexibility and curricular approaches to train residents to be excellent, competent, independently practicing physicians. CBME offers the potential for greater learner-centeredness to allow for the tailoring of medical education, training, and curriculum delivery to an individual's learning needs. It also offers a flexible approach to accommodate learners who require more or less time in specific areas. Under CBME, areas of weakness identified by the resident or faculty member may be more readily strengthened in the journey to independent practice.

Another advantage of CBME is that high-level competencies associated with advanced areas of expertise may be identified and offered to residents as a framework. For instance, general internists might be able to demonstrate focused competence in obstetrical medicine or thrombosis, and family medicine residents might be able to demonstrate skills in psychotherapy. In the future, the regulatory colleges and individual programs might consider awarding certificates or diplomas based on these advanced skills. Training in an assessment-based CBME environment can provide opportunities for increasing levels of difficulty and skill progression that can improve trainee confidence and competence. This may occur in a way that may not be possible in an otherwise unstructured and unpredictable clinical environment.

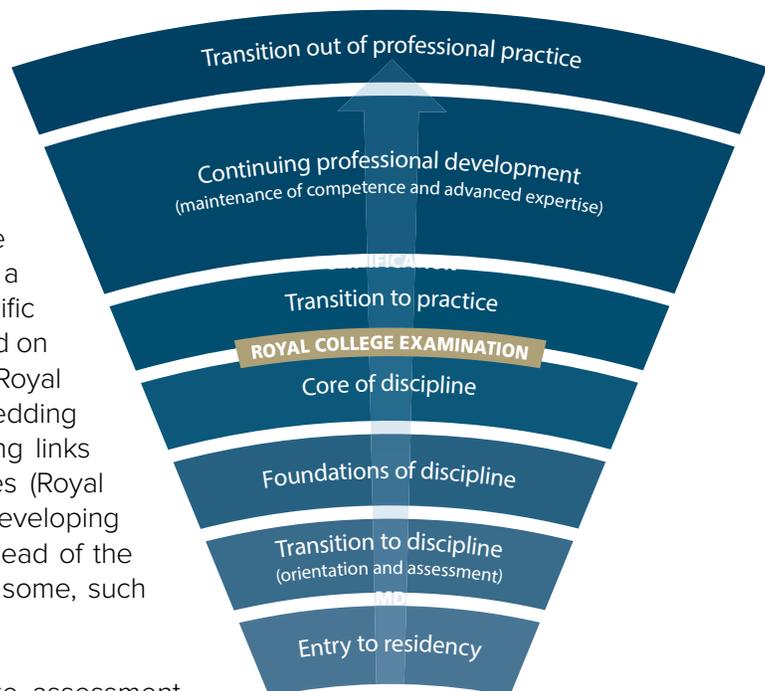
Conversely, if, despite the best efforts of the trainee and the system, a resident is unable to demonstrate a particular competency, it is not clear what the consequences would be. Should an unmet EPA be considered a core aspect of the physician's intended scope of practice? Does this introduce the concept of license restrictions before even entering into independent practice? Will this require further formal observed training via Continued Professional Development after completion of the residency training program? At what point does a resident exit extend his or her training time to achieve unmet competencies?

Establishment of Expectations

A key part of curriculum design is the development of milestones and Entrustable Professional Activities (EPAs). Generic milestones have already been written for each CanMEDS Role, and as each discipline transitions to Competence by Design (CBD), their respective Specialty Committee will use the CanMEDS Milestones Guide as a basis for developing their own specialty-specific milestones. They will also construct EPAs based on the discipline's context and responsibilities (Royal College, 2016b). CBME will also involve embedding new practices into the curriculum and creating links between the EPAs and assessment strategies (Royal College, 2014a). Some programs are already developing their own milestones and CBME programs ahead of the Royal College implementation schedule, and some, such as Family Medicine, have already transitioned.

Milestones and EPAs work together to make assessment more practical, and situate it in a clinical context. Typically,

Competence by Design (CBD)



Source:
Royal College of Physicians and Surgeons of Canada

each EPA integrates multiple milestones and generally requires the following eight components:

- Essential professional work in given context
- Adequate knowledge/skill
- Leads to output of professional labour
- Only performed by qualified personnel
- Independently executable
- Executable within a time frame
- Observable and measurable
- Reflects one or more competencies (Ten Cate, 2005)

Well-constructed milestones and EPAs with good validity are central to CBME curricula. While specific evidence for the medical context may be lacking, best practices developed from other fields suggest that comprehensive, iterative approaches such as the DELPHI method may be best.

If educational standards are set too low and a lowest-common-denominator approach is taken, this can adversely affect both medical training and learner motivation. On the other hand, if EPAs are poorly constructed with higher thresholds for achievement than needed, this may interfere with the provision of efficient, high-quality care and restrict residents from obtaining a sufficient volume of experience to practice independently and safely.

CBME will help ensure that residents are exposed to all clinical presentations necessary for practice. That being said, the potential remains for reductionism in medical training if milestones and other core curriculum components in CBME are reduced to their very basic components. Evaluators should not overlook the importance of maintaining a holistic view of a competently practicing physician. Discrete milestones and EPAs should reflect future practice and the development of wholly competent and integrated physicians, while avoiding reducing competencies to their rudimentary components.

Clinical Exposures and Service Requirements

Programs must ensure that they have sufficient breadth and depth of clinical experiences in order to allow residents to achieve necessary competence. Many programs address this problem by arranging for their residents to rotate at other sites with the necessary clinical capacity such as trauma, critical care, and surgical sub-specialties. This approach provides true clinical exposure for residents in all necessary competencies, and these solutions can be supplemented by ancillary curricular elements, including simulation, self-directed learning plans, facilitated cases, journal clubs and online modules. Simulation-Based Training places learners in a simulated scenario, such as an acute medical or surgical emergency, and allows residents to gain experience and increase confidence and competence in a protected, simulated learning environment.

By creating self-directed learning plans, learners can identify skills that require improvement, and prioritize their learning and skills development around those goals. Goals should be specific, measurable, accountable, and include a timeline for achievement. Programs **must** assume responsibility for ensuring that residents have sufficient variety and depth of clinical exposure to meet necessary milestones and attain EPAs. While alternative curricular elements can supplement residency education, achievement of competencies should occur primarily through direct clinical exposure.

CBME has the potential to ensure that when residents offer clinical service, they also gain relevant experience that will add to their learning as they train to become independently practising physicians. Attached to

this opportunity is the equitable distribution of call and other service coverage among house-staff. Many programs will undergo a transition period in which some residents will follow a traditional curriculum and others will participate in CBME. Should this occur, programs should make every effort to justly treat residents from each group. In particular, all residents should have equitable access to sought-after clinical experiences based on level of training. Furthermore, there is a risk that residents in a time-flexible CBME program who have demonstrated competencies and moved on from a rotation will leave the remaining house-staff with an increased burden of service and after-hours calls. It is optimal for programs to fix requirements in advance in accordance with contracts, and maintain them regardless of rotation progression.

Continuous Improvement

As it is novel, there exists a paucity of evidence relating to the construction of competency-based post-graduate medical curricula. A thorough literature review by RDoC demonstrated many case reports of programs making the transition, however they lacked a process or outcomes-based comparison of curricula that might be used to justify claims of the superiority of CBME.

The ongoing transition to CBME provides Canada with the opportunity to serve as an international leader in a novel method for training medical professionals. As current evidence is limited, the medical community should focus on continuous quality improvement during implementation, particularly in relation to assessment, promotion, evaluation and accreditation systems. It is inevitable that the first edition of competencies, milestones, and EPAs will have identifiable gaps and deficiencies. It is therefore essential that programs adopt an attitude of continuous improvement in which the discrete elements of CBME are repeatedly refined and validated.

Theme # 3 – ASSESSMENT & PROMOTION

Overview

Observable and demonstrable competency serves as a focal point to CBME and its successful implementation. Canadian medical colleges are re-engineering their credentials, accreditation, and examination processes to align with a competency-based approach. CBD proposes an abandonment of traditionally used ITERs in favour of increased programmatic assessment of milestones and EPAs. The CFPC's Triple C curriculum relies upon direct observation and daily documentation in the form of Field Notes to guide formative-focused regular assessments. Each system utilizes a portfolio to track the learning and assessment of residents and will continue to examine residents using national standardized examinations.

Assessment

Assessment in a competency-based education model is likely to require additional time and resources. Assessment comprises methods, tools, and processes used to generate information about learners' readiness to progress in training or start practice. Examples include direct observation, formative feedback, portfolios, Objective Structured Clinical Exams (OSCEs), simulation, and mini-clinical examinations (mini-CEX). It has been suggested that CBME will rely on direct observation of residents by well-trained faculty in order to properly evaluate milestones (Barr, 2014). Given that CBME is currently emerging in the Canadian medical education context, there are limited examples of assessment tools, in Canada or elsewhere, that are validated for evaluation of trainees' competencies within a CBME curriculum. The ongoing evaluation, validation, and continuous quality improvement of assessment tools must be a focus of CBME implementation both regionally and nationally.

One study reviewed current assessment methods for evaluating the ACGME core competencies, which define the American PGME curriculum, and found direct observation and global assessment to be the primary assessment tools utilized (Lowry, 2013). Still, differences between the tools being used and the evaluator applying them were present and dependent upon the competencies being assessed. The environment in which the resident was being trained (e.g. ambulatory vs inpatient) also appeared to influence assessment strategy (e.g. the use of patients as evaluators) which suggests that assessment in CBME is multi-faceted and that no single solution will exist. Several studies have shown that achievement of milestones and competencies is best assessed with a multi-pronged approach, and that common assessment tools often fail to sufficiently evaluate all competencies equally or sufficiently over longitudinal experiences (Donato, 2012. Hauff, 2014).

Studies of the adoption of ACGME's core competencies have identified a number of deficiencies within existing assessment tools. Many current methods rely on Likert Scale evaluations, which one study showed fail to identify trainees requiring additional supports to achieve competencies early enough by deeming "everyone exceptional and no one satisfactory," (Lowry, 2013). Researchers identified faculty inexperience, time restrictions, and the poor use of goals and objectives in daily interactions as the main drivers behind these problems.

The Royal College has proposed that ITERs, which often rely on Likert Scales, be abandoned in favour of more programmatic assessment at regularly scheduled intervals. Still, scale-based assessment will presumably continue to be used in some capacity. The use of entrustability scales offers an interesting contrast to traditional Likert Scale evaluations (Rekman, 2016). These novel scales require that a supervisor assess how entrustable a trainee is to complete a given task independently which is, in essence, the goal of EPAs for independent physician training. For example, on a scale of 1-5, all residents would typically start at 1/5 (i.e. requires complete hands on guidance) with the goal of reaching 5/5 (i.e. complete independence) for each EPA. This abandons the notion of being compared to your peers on a scale that enlists the use of qualifiers such as above- or below-average, or satisfactory/unsatisfactory. More importantly, it provides more clarity and transparency on a learner's progress and allows programs to identify additional opportunity to develop competence. Still, it does highlight the subjectivity of competency assessment, which increasingly puts onus on a supervisor's comfort level with a resident's capabilities. This approach also requires an increase in daily interaction between supervisors and residents.

An increasingly popular concept in medical education is the mining of patient outcome data for the purposes of evaluation. This has been applied to the evaluation of obstetrical and gynecology programs in the US (Asch, 2014) and has successfully demonstrated that significant differences in maternal complication rates exist among graduates of different residency programs. Some would favour the application of these concepts in the evaluation of all residency programs, while others would see this applied to the assessment of individual residents. Significant caution needs to be applied in both circumstances, however, as clinical environments are complicated. Asch et al. acknowledge that maternal complications are likely more directly relatable to the physician than other clinical environments, given the relative health of their patient and nearly one-on-one care provided by the physician. Further, the Canadian PGME environment is quite complicated in terms of provincial variations in population health status and clinical systems, which may unduly influence patient outcomes independent of a resident or his or her training program. Finally, tracking patient outcome data for individual residents runs the risk of compromising the formative experience in the educational context and/or potentially harming the individual's employment prospects should their information be handled inappropriately.

Field Notes

Assessment tools such as field notes, paper portfolios, and regular progress reviews with advisors allow for ongoing formative assessment of residents (Ross, 2012). Field notes, in particular, were developed to track comments and feedback that are case-specific during daily clinical encounters (CFPC, 2010; Lacasse,

2013). They are meant to require less than one minute to complete, but “serve as a marker that clinical competence has been assessed,” (Donoff, 2009). The focus is on engaging in formative assessment with the learner rather than directed toward the learner. Cumulatively, field notes can be used as (one of) the main contribution(s) to ITERs, or other more global, final assessments (Donoff, 2009).

The CFPC began the process of incorporating field notes into their CBME curriculum in 1998. The Working Group on the Certification Process employed a survey of practicing family practitioners to establish various “domains of competence” within Family Medicine. The four primary components include:

1. Skill dimensions of competence
2. Phases of clinical encounter
3. Priority topics, core procedures, and themes
4. Key features and observable behaviours

Combining these features allows for competence to be determined “through a process of continuous sampling, observation, and reflection of learner performance with respect to key features and observable behaviours for a series of problems (priority topics, procedures, themes) throughout the phases of the clinical encounter until evaluators are satisfied that the physician is competent in all the skill dimensions,” (CFPC, 2010).

A mixed methods study at Université Laval (n = 55) highlighted that the intention to use field notes or not is influenced by the components of Azjen’s “Theory of Planned Behaviour.” These components include: i) attitude towards the activity (favourable versus unfavourable), ii) normative belief (social perception of pressures to engage in the activity), and iii) perception of how difficult or easy it is to engage in the behaviour (Lacasse, 2013, Azjen 1991). To obtain the greatest benefit, Lacasse et al. recommend that interventions targeting salient beliefs about field notes be used before their implementation.

Given the forthcoming transition to CBME, the Royal College should learn from the observations and difficulties CFPC encountered during their curricular and assessment changes – including their successful integration of field notes.

Portfolios

Another assessment tool with mounting evidence in support of its effectiveness is the learning portfolio. Successful implementation of this tool requires clear expectations, incorporation of pre-existing trainee functions, flexible content, review from experienced clinical educators, ‘buy-in,’ and adequate training time for learners and mentors (Donato, 2012. Ross, 2012). Learning portfolios have been shown to facilitate the assessment and progress tracking of trainees and serve as an effective educational tool in the achievement of trainee competencies (Lewis, 2008). Key to the portfolio’s potential as a learning tool and its successful implementation through resident buy-in appears to be its ability to foster formative feedback and promote guided self-reflection (Ross, 2012). A UK study (Holt, 2010) highlighted the importance of self-reflection to CBME assessment. A self-administered surgical competency checklist underlined different aspects of residents’ skill-sets (e.g. leadership and decision-making) as compared to a faculty-led summative assessment of performance on the same case (e.g. communication). The results showed that the global and technical assessments were well correlated. This identifies self-reflection as an important part of competency assessment (where perhaps external evaluation may fall short) and an essential skill for ongoing professional development.

The Royal College is in the process of developing a resident e-Portfolio to track progress for residents nationwide. This new service will allow residents to record the achievement of milestones during their

residency program; monitor their progress and receive feedback against specialty-specific milestones; plan, track, and document achievement of personal learning goals; and record their procedures and patient care activities. This approach is similar to that taken by the CFPC with the Triple C curriculum whereby frequent, low-stake formative evaluations are amalgamated into a portfolio for the purpose of identifying gaps and determining exam eligibility.

The e-portfolio is a shift away from the current process in most schools. For the most part, residents record their learning achievements with their university. This creates a process that is arms-length from credentialing and certifying bodies. A national system provides opportunity for increased standardization, improved technical support, and less redundancy between institutions. Significant concerns exist, however, with regards to what this shift means for the protection of resident information.

Those involved in developing a national portfolio for individual residents should pay careful attention to a number of critical elements. These include the location of resident data storage and type of data stored, such as summative and/or formative data. Resident confidentiality should be protected throughout the training program and beyond. The access, ownership, and use of residents' personal and educational information (even if only in aggregate) should be clearly defined, and residents should retain ownership of their own information. Promotion, remediation, exam eligibility, and final determination of competence (outside of the Royal College exams themselves) should be the sole purview of program directors, promotion/assessment committees and/or faculty. If educational information is to be collected, it should not be used to supersede the authority of individual programs in assessing residents. Finally, as many schools have local portfolios, these should be recognized as acceptable alternatives to national portfolios for the purposes of tracking resident competencies and progress through their program.

Many trainees currently use their information when preparing a training program application through our resident matching process. This is especially true for students entering the system via the PGY-1 match, but remains a factor in subspecialty program applications. ITER narratives and, in some cases, quantitative information are sought by programs for the purposes of ranking applicants. This has contributed to a fear of either providing or receiving a negative assessment, which would otherwise be interpreted as constructive feedback and therefore useful and positive. If CBME is to be successful, all groups must work to eliminate this failing of our current system. Feedback, especially that which is intended to be frequent and formative, should be uncoupled from any matching or hiring process so that the unintended consequence of negatively impacting one's application is not a concern for any party. Additionally, the medical community must be conscious of potential privacy concerns around relinquishing a resident's information in favour of a central depository such as the e-portfolio.

Promotion

With the shift in focus away from a strictly time-based curriculum, promotion is proposed to progress along a continuum rather than discrete year-by-year advancement. In a traditional training program, residents moved from Junior to Senior trainees to certified physician on the basis of passing their time-based rotations through ITER assessment and a final certification exam. In CBD, residents are expected to progress from 'Transition to Discipline' to 'Foundations of Discipline' to 'Core of Discipline' and finally to 'Transition to Practice.' The former two stages roughly correspond to Junior resident status, and the latter two to Senior resident.

Adjudication on competency for the purpose of determining advancement should ultimately be made centrally in each program. There are a number of examples in the literature of competency committees that have been formally delegated authority for this purpose. Best practice suggests that the composition

of these committees be diverse (French, 2013). In addition to academic staff physicians in the relevant field, programs may consider the involvement of senior residents, community physicians, and non-clinicians with expertise in assessment and evaluation (e.g. psychometricians). There is a lack of consensus regarding the role or involvement of the program director. Regardless of composition, these committees should have terms of reference that clearly delineate roles and responsibilities, including attendance and pre-determined methods for considering advancement. Consistent principles and standards should be applied to each resident, which may require iterative evaluation by multiple members of the committee. Decisions on promotion or remediation should be transparent, and residents receiving them should be confident that their status accurately reflects training needs and not a secondary need of the system or program (e.g. service demands). A method of appealing decisions of the committee to a higher-body should be included in the terms of reference or by-laws. If a committee strategy is adopted, the group would have to meet regularly and frequently enough to meet the needs of their residents and ensure no delays of remediation or promotion due to administrative process.

Examinations

The Royal College is assessing the feasibility of moving certification exams to the end of the “Core of Discipline” stage training. This runs counter to its current position at the end of training and thus after the newly touted “Transition to Practice” stage for most RC specialty programs. This move would allow the final year of training to be dedicated to preparation for independent practice (Royal College, 2016c). Royal College certification will be granted at the successful completion of the “Transition to Practice” stage as determined by the program. CFPC programs have already seen an uncoupling of their certification exam from the Medical Council of Canada Qualification Exam part two (MCCQE2), which has led to an earlier opportunity to write the latter.

The ongoing need for the passing of certification exams for the purposes of credentialing also serves as a hybridization point between the traditional time-based system and an ideal time-free competency-based one. The exam itself serves as a hurdle for trainees to overcome in their training, but not necessarily to prove their competency. College examination timing has typically been static due to issues around capacity and the resources necessary to stage exams. Organizations offering examinations should consider developing the capacity necessary to offer the exam multiple times a year so as not to delay training or transition to practice, or limit the opportunity for a period of training dedicated to transition to practice. Regardless of the timing of the exam, every effort should be made to ensure that those eligible to write the exam, as determined by their program, are qualified to do so.

Theme # 4 – RESOURCES

Overview

The Royal College has noted that development of associated faculty development support tools will begin and continue for several years following the official launch of CanMEDS 2015. This will include specialty-specific training objectives and other associated resources. Once the integration of specialty specific milestones begins, the Royal College will roll out a large number of education and faculty development tools and supports, including assessment templates, a series of faculty development workshops, face-to-face meetings, webinars, and special sessions at the International Conference on Residency Education to help faculties teach and assess competencies. The Royal College has also created the Educational Product Development and Dissemination unit to help support this work in partnership with the medical education community and faculties across the country. It will also provide strategic faculty development activities and tools designed specifically to help programs implement the CanMEDS 2015 updates.

Resource Considerations

As discussed above, the identified barriers to successful CBME implementation always include resource concerns – typically funding and time deficiencies (Malik, 2012). In the Future of Medical Education Postgraduate report on Competency-Based Education in Postgraduate Medical Education, the key resources identified and included were time, interest, and money. These were listed in case studies and interviews as “lessons learned from development” or “top successes or challenging factors for implementation.” Additionally, buy-in and support was outlined as a “must for success,” (Glover Takahashi, 2011).

The potential financial, human, technical, and physical resource needs of CBME are uncertain at this juncture. Our current system operates predominantly in silos, and resource realities are different between provinces, cities, universities, programs, and hospitals. Thus, each is likely to be impacted by CBME adoption differently. Regardless of these realities, our system must assure adequacy of resources for CBME support as these are paramount to its successful implementation. Additionally, resource demands should not put undue strain on clinical systems, compromise clinical care, or negatively impact the training of residents in traditional training programs or that of non-physicians (nursing, rehab services, medical students, etc.).

The financial impacts are likely to be significant. This is particularly true of the transition phase, necessitating a careful and thorough budgeting period well ahead of implementation to ensure that the costs will not overburden the system. Health care expenditures remain on the rise, striking fear when new demands are proposed. When stakeholders identify budget constraints, they should make every effort to identify inefficiencies in the system and employ ‘lean’ strategies as part of the aforementioned continuous quality improvement strategies to reduce costs over time.

Faculty Development

One of the most daunting challenges presented by a transition to CBME is the need to re-train medical educators and faculty in new methods of assessment and training. Having trained themselves in an almost exclusively time-based model, academic faculty will require intensive support to ensure that the restructuring of medical education goes smoothly and is implemented effectively. In an era of dwindling financial support, CBME will demand more time and resources from an increasingly burdened staff team. It is clear that programs must be provided with time and remuneration for dealing with unique and unexpected challenges. Specifically, anticipated challenges for faculty involve assessing set milestones, providing feedback, and developing learning plans to address learning gaps.

As CBME is built upon a framework of direct observation, frequent assessment, and formative feedback, the medical community should place considerable focus on providing the faculty training needed to succeed in these endeavours (Barr, 2014). A lack of funding and development will serve to antagonize learning and service requirements to the detriment of learners and faculty alike (Wang, 2011). Although research regarding risks and best practices for faculty development in a Canadian context is limited, early studies highlight a need for extensive faculty development and an understanding that competency assessment will require a significant paradigm shift (Aagaard, 2013).

We can look to international examples to provide insight into potential risks and best practices. The Alliance for Academic Internal Medicine Education Redesign Task force examined advantages and disadvantages of CBME in US internal medicine programs, calling for a robust faculty development program (Weinberger, 2010). The review also noted that early adopters and faculty role models, who serve as CBME champions and coaches, were useful in training and educating other staff. A review of CBME practices in European cardiothoracic surgery programs highlighted two challenges: lack of expert trainers to observe and assess

trainees, and a lack of funding available for those willing to perform the task (Wang, 2011). The authors highlight the importance of faculty choice in becoming involved in resident education, and further recommend brief and validated assessment measures with multiple educators involved in the process of evaluating residents. On the other hand, the experience of other groups suggests that mandating a new structure may be the impetus required in order to drive the change as there are always laggards who resist change to the system in which they have been trained (Glover-Takahashi, 2011).

Challenges associated with how faculty develop the capacity to assess CBME have also been cited in the literature. The competency-based education model is a complete paradigm shift from the way that most faculty members were trained, and developing individualized learning plans to address competency gaps in CBME remains a novel challenge for teachers to overcome. Other novel strategies including reflection exercises, role-play scenarios, and videotaped attending-resident sessions have been described to improve faculty's role in addressing competencies such as communicator, collaborator, and professional (Brauch, 2013, Cote, 2014). In addition, some may perceive that the change in assessment and evaluation methods requires increased time commitment and resources (Swing, 2010, Malik, 2012). Iobst et al. (2010) state that, "faculty development focusing on reliable and valid assessment is critical to the successful implementation of CBME," (Iobst, 2012). This is especially important given that CBME assessment systems themselves will require metrics to ensure quality, which inherently requires multiple evaluators applying a variety of tools in a consistent manner.

An example of faculty development is provided by the University of Ottawa Family Medicine program and the development of the Academic Support Process (ASP) website (Stodel, 2012). An evaluation of the ASP found that preceptors are looking for tools and resources to augment their teaching strategies. The website provided a framework for developing learning plans, both for residents in difficulty and those who were academically strong. A survey of preceptors noted that the resource was helpful in providing language to identify and articulate concrete goals for residents, and preceptors felt more confident in their ability to develop a learning plan for a resident in need after having used the resources.

References

1. Aagaard, E. et al. (2013). Early Feedback on the Use of the Internal Medicine Reporting Milestones in Assessment of Resident Performance. *Journal of Graduate Medical Education*, September 2013.
2. Asch, DA. et al (2014). How do you Deliver a Good Obstetrician? *Acad Med*. 2014; 89:24–26.
3. Barr, K. and Teresa Massagli (2014). New Challenges for the Graduate Medical Educator Implementing the Milestones. *Am J Phys Med Rehabil* 2014; 93: 624-631.
4. Brauch, R. et al. (2013). A Qualitative Study of Improving Preceptor Feedback Delivery on Professionalism to Postgraduate Year 1 Residents Through Education, Observation, and Reflection. *The Ochsner Journal* 13:322–326, 2013.
5. Carlsen, C. et al. (2014). Is Current Surgical Training Efficient? A National Survey. *Journal of Surgical Education* Volume 71 Number 3, May/June 2014.
6. Carraccio, C. (2002). Shifting Paradigms: From Flexner to Competencies.
7. Carraccio, C. (2012). Entrustable Professional Activities (EPAs): The Competencies and Milestones in Context. PowerPoint presented at the SCTC Meeting, May 23, 2012.
8. Carraccio, C. and Robert Englander (2013). From Flexner to Competencies: Reflections on a Decade and the Journey Ahead. *Academic Medicine* 2013; 88: 1067–1073.
9. Cote, L and Patricia-Ann Laughrea. (2014). Preceptors' Understanding and Use of Role Modeling to Develop the CanMEDS Competencies in Residents. *Academic Medicine*, Vol. 89, No. 6, June 2014.
10. Deloney, L. et al. (2012). What Program Directors Think: Results of the 2011 Annual Survey of the Association of Program Directors in Radiology. *Acad Radiol* 2012; 19:1583–1588.
11. Donato, A. and David L. George (2012). A Blueprint for Implementation of a Structured Portfolio in an Internal Medicine Residency. *Academic Medicine*, Vol. 87, No. 2, February 2012.
12. Frank, JF, Snell, L et al. (2010a). Competency-based medical education: theory to practice.
13. Frank, J.R. et al. (2010b). Toward a definition of competency-based education in medicine: a systematic review of published definitions. *Medical Teacher* 2010; 32(8):631-637.
14. French, J, Dannefer, E, and Colbert, C (2014). A Systematic Approach Toward Building a Fully Operational Clinical Competency Committee. *Journal of Surgical Education*. 2014; 71(6) e22-e27.
15. Glover Takahashi S, Waddell A, Kennedy M, Hodges B. Innovations, Integration and Implementation Issues in Competency-Based Training in Postgraduate Medical Education. Members of the FMEC PG consortium; 2011.
16. Hauer, K. et al (2013). Developing Entrustable Professional Activities as the Basis for Assessment of Competence in an Internal Medicine Residency: A Feasibility Study. *J Gen Intern Med* 28(8): 1110–4.
17. Hauff, S. et al (2014). Programmatic Assessment of Level 1 Milestones in Incoming Interns. *Academic Emergency Medicine* 2014; 21(6); 694-8.
18. Iobst, W. et al. (2010). Competency-based medical education in postgraduate medical education. *Medical Teacher* 2010; 32: 651–656.
19. Lewis, C. et. al. (2010). Web-Based Portfolios: A Valuable Tool for Surgical Education. *Journal of Surgical Research* 161, 40–46 (2010).
20. Long, DM. (2000). Competency-based Residency Training: The Next Advance in Graduate Medical Education.
21. Lowry, B. (2013) et al. Applying the Milestones in an Internal Medicine Residency Program Curriculum: A Foundation for Outcomes-Based Learner Assessment Under the Next Accreditation System. *Acad Med*. 2013; 88: 1665–1669.
22. Malik, M. et al. (2012). Barriers to Implementing the ACGME Outcome Project: A Systematic Review of Program Director Surveys. *Journal of Graduate Medical Education*, December 2012.
23. Parker S. et al (2013). Challenges faced by trainee psychiatrists working towards competency in psychotherapies. *Australas Psychiatry*. 2013 Feb; 21(1):56-9.
24. Rekman, J et al (2016). Entrustability Scales: Outlining their Usefulness for Competency-Based Clinical Assessment. *Acad Med*. 2016; 91:186–190.
25. Ross, S. et al (2012). Involving users in the refinement of the competency-based achievement system: An innovative approach to competency-based assessment. *Medical Teacher*: 2012; 34: e143–e147.
26. Saucier, D et al (2012). Competency-based curriculum for family medicine. *Canadian Family Physician*. Vol 58: June 2012, 707-708.
27. Stodel, E. et al. (2012). The Academic Support Process (ASP) website: Helping preceptors develop resident learning plans and track progress. *Medical Teacher*: 2012; 34: e300–e308.
28. Swing, S. (2010). Perspectives on competency-based medical education from the learning sciences. *Medical Teacher*: 2010; 32: 663–668.
29. Ten Cate, O. (2005). Entrustability of professional activities and competency-based training. *Medical Education* 2005; 39: 1176–1177.
30. The Royal College of Physicians and Surgeons of Canada (2011). White Paper on Competency-based Medical Education. http://www.royalcollege.ca/portal/page/portal/rc/common/documents/educational_initiatives/cbme.pdf
31. The Royal College of Physicians and Surgeons of Canada (2014a). Competence by Design: The work begins. *Dialogue*: Vol. 14 No. 10, October 2014. http://www.royalcollege.ca/resources/publications/dialogue/vol14_10
32. The Royal College of Physicians and Surgeons of Canada (2014b). Competence by Design (CBD): Testing and Consultation. http://www.royalcollege.ca/portal/page/portal/rc/common/documents/canmeds/cbd/cbd_testing_consultation_infosheet_e.pdf
33. The Royal College of Physicians and Surgeons of Canada (2015). CBD Competence Continuum diagram. http://www.royalcollege.ca/portal/page/portal/rc/common/documents/resources/cbd_competence_continuum_diagram_legal_e.pdf
34. The Royal College of Physicians and Surgeons of Canada (2016a). Competence by Design (CBD): Moving towards competency-based medical education webpage. <http://www.royalcollege.ca/portal/page/portal/rc/resources/cbme>
35. The Royal College of Physicians and Surgeons of Canada (2016b). Milestones and EPAs: Practical and manageable teaching and assessment in residency training webpage. <http://www.royalcollege.ca/portal/page/portal/rc/canmeds/canmeds2015/milestones>
36. The Royal College of Physicians and Surgeons of Canada (2016c). Frequently Asked Questions: Competency-Based Medical Education and Competence by Design. http://www.royalcollege.ca/portal/page/portal/rc/resources/cbme/faq_cbd#six-1
37. Wang, T. et al. (2011) A competency framework in cardiothoracic surgery for training and revalidation — an international comparison. *European Journal of Cardio-thoracic Surgery* 40 (2011) 816-825.
38. Weinberger, S. et al. (2010). Competency-Based Education and Training in Internal Medicine. *Ann Intern Med*. 2010; 153: 751-756.



402-222 Queen Street, Ottawa, ON K1P 5V9
Phone: 613-234-6448 | Fax: 613-234-5292 | info@residentdoctors.ca

residentdoctors.ca