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The Future is Here! Pediatric Surgery and the move to the Royal College of Physicians and Surgeons of Canada's Competence by Design

Farhan Bhanji^{a,*}, Grant Miller^b, Warren J. Cheung^c, Pramod S. Puligandla^d, Andrea Winthrop^e, Robert Baird^f, Dafydd Davies^g, Steven R. Lopushinsky^h, Eric M. Webber^f

^a Royal College of Physicians and Surgeons of Canada, Professor of Pediatrics, Faculty of Medicine, McGill University, Montreal, Quebec, Canada

^b University of Saskatchewan, Saskatoon, Saskatchewan, Canada

^c Department of Emergency Medicine, University of Ottawa | The Ottawa Hospital, Ottawa, Ontario, Canada

^d The Harvey E. Beardmore Division of Pediatric Surgery, Department of Pediatric Surgery, Faculty of Medicine, McGill University, Montreal, Quebec, Canada

^e Queen's University School of Medicine, Kingston, Ontario, Canada

^f University of British Columbia, British Columbia Children's Hospital, Vancouver, British Columbia, Canada

^g Faculty of Medicine, Dalhousie University, IWK Health Centre, Dartmouth, Nova Scotia, Canada

^h Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada

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ABSTRACT

This interactive session was held at the 51st Annual Meeting of the Canadian Association of Pediatric Surgeons (CAPS) in preparation for the transition of Pediatric Surgery training in Canada to Competency by Design (a CBME-based model of residency training developed by the Royal College of Physicians and Surgeons of Canada).

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Medicine's social contract with society provides Pediatric Surgeons with trust, autonomy, professional self-regulation, and both financial and non-financial rewards in exchange for altruism, morality and integrity, transparency and accountability, and to assure competence of its members [1]. Reflecting on the question 'Would I allow ALL of our graduates to care for my child / grandchild with a common surgical condition? To communicate well, and maintain an appropriate level of professional conduct?', in a situation where you might not be present to guide or monitor care, may cause many surgeons to stop and consider whether we are truly meeting the expectations of society. Specifically, are we expecting a different standard for the care of our own families than the standard we require of graduate trainees to care for the general population, and if so, how might society perceive that? Perhaps more important than the consideration above is that resident education is critical for 'imprinting' - which program a clinician trains in influences

patient outcomes for many years into their practice [2]. Even the best trainees can benefit from better structured teaching and feedback, yet may not receive it because they 'already meet the bar'. Competency-based Medical Education (CBME) offers the theoretical benefit to both identify learners in difficulty early, allowing them opportunity to improve and to distinguish those that cannot, while also supporting the majority of 'succeeding' residents to achieve closer to their true potential. Well designed and implemented CBME models can support surgical skills development through deliberate practice [3] and apply mastery learning [4] principles which have been shown to improve patient outcomes.

Currently, the training of pediatric surgeons in Canada comprises 5 years in a general surgery residency program followed by 2 years in a pediatric subspecialty residency ('fellowship') program, essentially the same as in the United States. The Royal College of Physicians and Surgeons of Canada (the 'Royal College') conducts the certifying examinations for all specialties and subspecialties (except for the specialty of Family Medicine which has its own College for examination,

* Corresponding author.

E-mail address: fbhanji@royalcollege.ca (F. Bhanji).

certification and accreditation), confers certification of individual (sub) specialists, and accredits the specialty and subspecialty residency programs at all 17 medical schools in Canada. Over the last 5 years, the Royal College has been working with all specialty and subspecialty programs to convert to a CBME model. This manuscript outlines the rationale of this program, along with the anticipated opportunities and challenges going forward.

CBME is defined as an 'outcomes based approach to the design, implementation, assessment and evaluation of medical education programs, using an organizing framework of competencies' [5]. Through the hard work and dedicated efforts of the Royal College Specialty Committee in Pediatric Surgery, all eight of the accredited training programs in Canada will be transitioning to Competence by Design (CBD), the Royal College version of CBME, in July of 2020. Unique to this model is the creation of four stages of training progressing from Transition to Discipline (an introduction to the field of Pediatric Surgery and an opportunity to verify if learners have the requisite skills from their prior surgical training), to Foundations of the Discipline (focusing on broad-based competencies that every trainee must have before moving on to more specific discipline specific competencies), to Core of the Discipline (where they develop the majority of the competencies related to Pediatric Surgery) and finally to Transition to Practice (where the senior trainee acquires and demonstrates the competencies needed for unsupervised practice). Progression between stages is deliberate, rather than automatic, and requires decision making at the level of a Competence Committee. While CBME is theoretically 'time-free' or 'time independent', the proposed model of CBD is a 'hybrid' where the vast majority of learners will still require the full 2-year training program in order to complete training.

The core components framework of CBME [6] was utilized in the development of the Pediatric Surgery CBD model and included the following:

- Competencies are clearly articulated in an outcomes framework
- Competencies are arranged progressively
- Learning experiences facilitate the progressive development of competencies
- Teaching practices promote the progressive development of competencies
- Assessment practices support and document the progressive development of competencies

The Specialty Committee in Pediatric Surgery met for three 3-day meetings over the course of 1.5 years, with additional work between meetings. The Committee reconsidered the scope of the specialty, defined the competencies and at what stage they should be developed within the training program, developed the framework for the required and recommended additional training experiences (e.g. Pediatric Advanced Life Support courses) and developed a national assessment program to guide decisions on progression and eventual readiness for certification. A resident in Pediatric Surgery participated in the process and represented the learner voice in the development of the CBD model. Although the model of education is changing, Royal College certification will continue to entail a program level attestation of clinical competence, based on the principles below, along with a successful result on the national, high-stakes examination delivered by the Royal College.

Entrustable Professional Activities (EPAs) are utilized throughout the CBD model (to facilitate learning and to guide assessment) and are conceptualized as key tasks of a discipline that an individual can be trusted to perform in a given health care context, once sufficient competence has been demonstrated. [7] EPAs are commonly utilized as an approach in CBME around the world but are not universal. They are utilized uniquely in the CBD model by linking them to multiple supporting CanMEDS-specific milestones that underpin the task – an

Table 1
Considerations in developing a robust assessment program.

CARVE mnemonic	
C	Cost effectiveness (dollars, human cost, practicality, feasibility) Cohesion Comprehensiveness
A	Acceptability (learners, the specialty and the Royal College, society)
R	Reliability
V	Validity
E	Educational impact and the catalytic effect to the educational system

approach to milestones that also differs from other jurisdictions. Concretely in the CBD model, an EPA may be articulated as 'Obtaining informed consent and assent' while a milestone might include the written documentation of the encounter.

The approach to assessment utilized for CBD in Pediatric Surgery was designed to align predominantly with the framework for good assessment [8]. We utilized the CARVE mnemonic to support clinicians to consider important principles in their development of the national assessment model (see Table 1). Starting with 'what we are trying to assess' being the readiness of the Pediatric Surgery resident to progress through successive stages of training, ultimately leading to the readiness for unsupervised practice, we were able to use the CARVE mnemonic to operationalize the program of assessment as follows.

Cost Effectiveness – any assessment model needs to consider the related costs, including the surgeon time (often not a direct financial cost as it is not remunerated, but it is an opportunity cost, taking them away from other important activities), involved in the program of assessment. Other issues such as the practicality / feasibility of the assessment also need to be factored into the decision making (e.g. a novel artificial intelligence linked simulator may be great for assessment but it may not be practical because it is only available at one training program in the country). As a clinical analogy of this principle, we would not order a CT scan when a plain x-ray would suffice. Similarly, the program of assessment should be an achievable model that gathers enough information to be confident in the judgments on learner progression without creating an excessive assessment burden that adds to costs (without making better decisions) that may frustrate faculty and residents. Utilizing opportunities that already exist for direct observation (e.g. in the operating room, at multidisciplinary meetings) and operationalizing assessment in those contexts, can optimize the number of assessment points and support the transition to CBME.

The additional **C's** of CARVE include **cohesion** (of different assessment pieces such as the work-based assessment and the Royal College examination) and **comprehensiveness** to ensure all of the relevant competencies are addressed in the program of assessment.

Acceptability – the assessment model needs to be acceptable to learners, to the specialty of Pediatric Surgery, to the Royal College and, equally importantly, to society at large (i.e. our patients and their families). The current culture of a 'failure to fail' [9, 10] within health professions education needs to be overcome and a focus on the patient or societal expectation is an important driver.

Reliability – the consistency of the decisions made from the assessment process. Ensuring faculty understand the expectations of the performance standard will be critical to building a reliable and fair assessment program.

Validity – in simple terms, the determination of whether the assessment is measuring what it is intended to measure. A full discussion of validity is beyond the scope of this article but it is important for readers to understand that validity is not an inherent property of a test or assessment. It is more appropriate to think of validity as building an argument or justification for the intended use and interpretation of the results of an assessment. Interested readers may appreciate further reading on the validity frameworks proposed by Kane and Messick [11, 12].

Educational Impact – ‘assessment drives learning’ so it is important to make the assessment worth learning towards. Learners improve by preparing for assessment and from the feedback provided. Authentic, frequent feedback based on workplace-based assessment, coupled with the preparation for a national examination, were felt to be synergistic in supporting acquisition of practical clinical competence and preparation for less common but important clinical presentations. When utilized at a program level or national level, aggregate assessment information can be utilized for its catalytic effect to improve educational systems. For example, if all of the recent Pediatric Surgery graduates were having difficulty in trauma management, modifications could be made to the training rotations / experiences or to the formal educational program.

Miller's classic pyramid outlines four successively more important levels of assessment [13]. Starting at the base with ‘Knows’ representing factual knowledge, moving up to ‘Knows How’ that might be determined in an oral examination, to ‘Shows How’ as in a simulation and finally up to ‘Does’ or a representation of what someone is able to perform in clinical practice. Assessment in CBD can be considered as ‘back to the bedside’ with a predominant focus on assessment at the ‘Does’ level, supplemented by simulations at the ‘Shows How’ level for more rare presentations or when safety considerations may require initial skill acquisition outside of the patient care environment.

In designing the CBD model, there was particular emphasis on using assessment forms that: 1) presented the EPA with the relevant underpinning milestones (which were deliberately restricted in number to aim for quality of the judgments, rather than absolute thoroughness, which often does not obtain the intended results [14]) or 2) using the O-SCORE for surgical procedures [15]. Although not designed to be specific to a particular surgical procedure, the O-SCORE has developed validity evidence in multiple contexts and seems to work across different procedures, allowing a more feasible approach to faculty development, a critical piece and risk to CBME implementation [16]. The O-SCORE utilizes an entrustment scale, which may be theoretically challenging when the focus should be on the performance of the learner, rather than the degree of entrustment offered by the faculty (which can incorporate factors in to the decision beyond the actual performance). However, the O-SCORE does work in practice, perhaps by aligning to the thought process of raters and allowing them to use the full range of the scale, while also having the trainees accept lower scores as they move towards improvement [17].

Beyond the numerical scoring used on the assessment forms, that may be important for documentation and aggregation of data for a Competence Committee, was an emphasis on the use of narrative comments in the assessment process. Recognizing that improvement does not occur simply by reviewing numerical scores, but rather by dialogue on strengths and areas for growth, Pediatric Surgery training programs will be looking to support their faculty to write more constructive, pertinent comments for learners. You cannot tell a learner ‘Today you are a 3/5, tomorrow please be more of a 4 or 5/5’. Improvement requires narrative comments that are specific, actionable and perceived as

constructive on the part of the learner. Learners are more likely to incorporate feedback when they respect the competence of the faculty in that domain and they trust that the faculty is trying to help them improve. Having faculty consider the assessment they are conducting as the equivalent of an ‘educational progress note’, rather than a more definitive ‘discharge summary’ may help them understand the developmental nature of learning, and their role in highlighting areas for growth through appropriate documentation. Such awareness may also help faculty provide more honest, constructive feedback that can help overcome the ‘failure to fail’. If learners don’t meet the expected EPAs early during a stage but subsequently improve and achieve competence, then the documented suggestions for improvement will have no impact on their progression decisions. If the performance gaps were sustained, then there would be a record to demonstrate a pattern of performance that needed to be addressed by the Competence Committee. Finally, since coaching may not come naturally to all faculty, resources such as the Royal College’s Rx-OCR model [18] may support faculty to utilize the assessment moments for their potential educational impact.

Competence Committees will be utilized within the CBD model to make collective decisions on the progression of residents through the defined stages and their ultimate readiness for certification (coupled with a Royal College examination). Analogous to our decision making in clinical practice, where more complex decision making is handled by a group of experts reviewing the available data and integrating various perspectives (e.g. a complex patient to be discussed at Tumor Board), a Competence Committee brings together a group of experts that are focused and prepared to make more consequential decisions. The effective functioning of the Competence Committee is a critical piece within the CBD design – recognizing this and the need for accountability to the public, the Pediatric Surgery Specialty Committee chose an approach where each individual training program's Competence Committee will have an ‘external member’ (e.g. a Program Director from another specialty at that institution or a Program Director in Pediatric Surgery from another institution), to ensure a degree of transparency and rigor to the process.

Ultimately the proposed changes to education in CBD will have their greatest impact if there is a culture change and move to a growth mindset [19] in our learners and our faculty. The structures put in place in CBD are designed to support learning through dedicated educational activities, clarifying the expectations for a generally high achieving group of learners (which in and of itself may improve their developmental trajectory), and providing opportunities for assessment and coaching that build greater expertise in the learner. The ultimate goal is to ensure we are confident in all of our graduates, to know that our junior colleagues are achieving their full potential and, through that, to ultimately improve patient care – our goal as teachers has to be to train people that are ‘better’ than us.

As CBD evolves, it is expected to guide the Continuing Professional Development (CPD) of Pediatric Surgeons, and it is perhaps in that phase where it has its greatest potential. Recognizing the rapid evolution of clinical practice and the limited coaching most surgeons

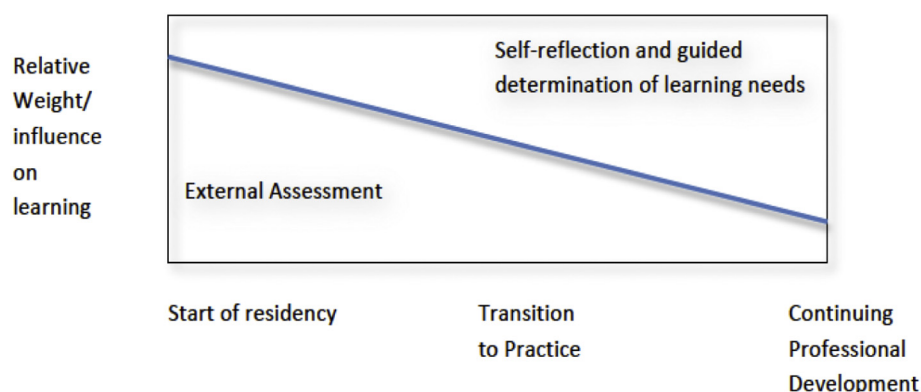


Fig. 1. Learner self-reflection related to external assessment over training.

receive, there is at least the potential to make large inroads towards improvement. At present in Canada, there is little to no direct observation of clinical practice and no re-certifying examinations as part of physicians' and surgeons' CPD (noting that the implementation of recertifying exams is unlikely given they are perceived to be best suited for entry into unsupervised practice, and recognizing that clinicians' scopes of practice evolve/narrow over time making a generic, broad based examination perhaps less relevant to improving practice). Individual practitioners determine their own learning goals and this might be problematic given their limited ability to self-assess [20]. A more appropriate model for the continuum of medical education may be to support learner development of self-reflection through progressively less structured external assessment as they progress through training, yet maintaining some degree of external assessment (e.g. direct observation and coaching, scope of practice specific cognitive knowledge testing, simulation-based performance testing for new surgical techniques, etc.) while in professional practice to guide surgeons' directed learning (Fig. 1).

A proposed model of guided self-reflection across the continuum of practice. CBME has the potential to be the largest change to surgical education since the introduction of the Halsted model at John Hopkins over a 100 years ago. What ultimately determines its utility may rely less on the particular models chosen for training, but rather whether the culture can change to increasing coaching and support for learners, while improving our accountability to our patients, their families and the public at large. In this paper, we have outlined the rationale for CBME, the key principles and the Royal College approach of CBD in Pediatric Surgery.

Author contributions

Study Conception and Design: Bhanji.

Data Acquisition: Bhanji, Miller, Webber, Puligandia, Winthrop, Baird, Lopushinsky, Davies.

Analysis and Data Interpretation: Bhanji, Miller, Webber, Puligandia, Winthrop, Baird, Lopushinsky, Davies.

Drafting of the Manuscript: Bhanji, Cheung.

Critical Revision: Bhanji, Cheung, Winthrop, Baird, Lopushinsky.

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