

Entrustable professional activities framework for assessment in predoctoral dental education, developed using a modified Delphi process

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Abstract

Purpose/objectives: The purpose of this study was to define and develop a set of Entrustable Professional Activities (EPAs) for dental education using a modified Delphi consensus approach. EPAs define the core tasks that a graduating dentist needs to perform independently in practice. The EPA framework facilitates assessment of competencies as they manifest in the tasks and independence needed to be ready for practice.

Methods: Feedback was obtained from participants about a list of EPAs, with modifications made after each of the 3 rounds, using a modified Delphi approach. Phase 1 included attendees at the ADEA Fall 2017 meeting (n = 35) who participated in an EPA workshop primarily composed of academic deans. The Phase 2 “reactor panel” consisted of 10 dental schools’ academic deans and other individuals with expertise and interest in dental curriculum and assessment (n = 31). Phase 3 participants were attendees at the ADEA CCI 2019 meeting (n = 91) who also participated in a 2-day EPA workshop.

Results: In phase 1, overall ratings for acceptability of the EPAs were satisfactory. In phase 2, the next iteration of EPAs was judged as satisfactory for inclusion in curriculum, match well with clinical practice and clarity. In phase 3, the EPAs were judged as satisfactory for being an “entrustable, essential, and important task of the profession.” Qualitative feedback suggested wording, measurability, and specific focus of EPA statements is important.

Conclusions: A preliminary set of EPAs was designed for predoctoral dental education through a systematic, careful consensus building approach involving a diverse set of participants.

KEYWORDS

assessment, competency based education, Delphi, entrustable professional activities, EPA (s), trust

1 | INTRODUCTION

Dental education has recently developed an interest in Entrustable Professional Activities (EPAs) as a useful framework for assessment of competency.¹⁻⁵ The concept of EPAs has been adopted in many health professions education programs since it was introduced in 2005.⁶ Why has this framework gained in popularity? The EPA framework expands upon the competency-based education concept to facilitate assessment of trainees' abilities (competencies) and readiness for practice through the assessment of performance of the tasks associated with the job and its specified roles within an authentic workplace setting.^{2,7} Competencies are comprised of knowledge, skills and attitudes. In contrast, EPAs are units of professional practice, the core observable activities of a profession.^{8,9} Each EPA requires multiple competencies to perform, and therefore assessment of an EPA leads to a more holistic assessment of competency.⁹ EPAs denote the highest level of clinical competence according to the Miller's pyramid that conceptualizes clinical performance in terms of four hierarchical levels: knows; knows how; shows how; and does. An EPA is an evaluation at the "does" level in the Miller's pyramid that denotes clinical performance in workplace like settings.^{10,11} Figure 1 modified from Englander et al.^{12,13} illustrates the value of the EPA framework in assessing patient care.

EPAs bridge the gap between internal attributes of the professional, and the tasks required of the professional in clinical practice. Instead of evaluating whether trainee A is competent in a particular knowledge, skill, or attitude, this framework evaluates whether trainee A can be trusted to perform an activity (using a collective combination of

knowledge, skills, or attitudes), at a specified level of supervision and independence. A comparable analogy here is a teen with a recently acquired driver's license who has passed the particular requirements but who yet cannot be trusted to drive independently under all possible circumstances such as on an icy road or in tedious traffic conditions. Similarly, we need to be certain that all our graduates can be entrusted to independently perform necessary and core activities required of the profession. Herein lies the advantage of an EPA framework (Figure 1). By focusing on actual behavior rather than individual competencies, the EPA framework allows a profession to assess trust and thereby effectively manage risks.^{2,14}

EPA statements are constructed using specific guidelines.¹⁵⁻¹⁷ First of all, the title of an EPA should be a recognized and discrete core activity. It should not be too broad or too specific. The EPA description should include multiple assessment methods, and there should be guidance to define for learners their stage of progress toward independence and overall competence (milestones).

How does one define a set of core activities (EPAs) in a profession? This is essentially standard-setting, and evidence supports the value of consensus building in setting professional standards.¹⁸ A recent review of EPAs in graduate medical education identified the most frequently used method was to develop an initial set of EPAs through a working group and review it through further deliberation.¹⁹ The most common consensus building approaches identified included surveys, the Delphi method, and stakeholder deliberation.²⁰ This review highlighted the need for a more standardized approach to the development of EPAs, one that includes development,

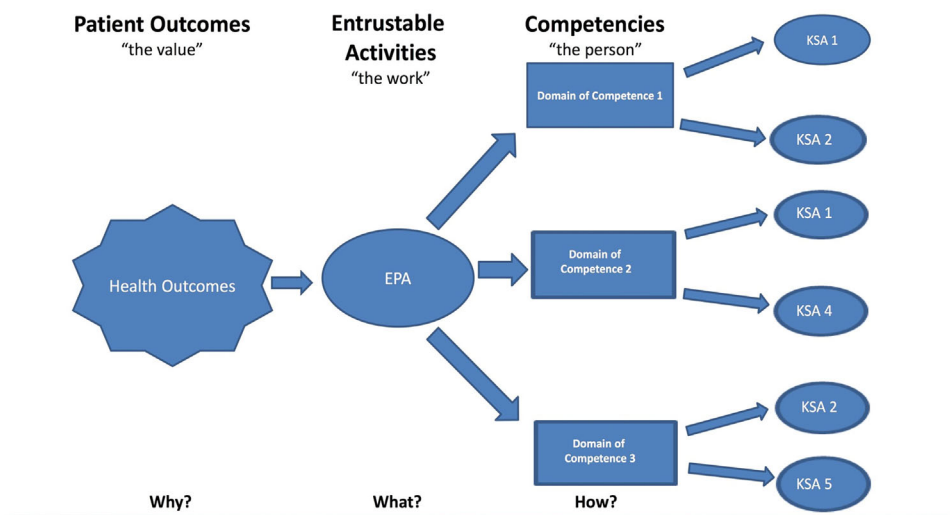


FIGURE 1 EPA framework linked to patient outcomes. Adapted from Englander R, Frank JR, Carraccio C, et al. Toward a shared language for competency-based medical education. *Med Teach*. 017;39(6):582-587. Abbreviation: KSA, Knowledge, Skills, Attitudes

implementation, and assessment. Only four studies in this systematic review adhered to the three steps of initial development, expansion, and validation.¹⁷

In our study, we used the Delphi method as a core process to build and assess consensus. The Delphi approach has been used to define EPAs in different health profession disciplines¹⁸ and specialties in medical education, including²⁰ internal medicine,²¹ pharmacy,²² nursing,²³ and veterinary medicine.²⁴ In this method, a group of experts (from different locations) are asked individually for feedback through a survey. There are multiple rounds of data collection, and modifications are made after each round.

The objective of this paper is to describe the consensus building approach used to develop, expand, and validate the proposed EPAs for pre-doctoral education and present the results.¹⁹ We describe the Delphi process that we used to develop the EPAs, obtain nationwide expert feedback and prepare for clinical implementation. We present data produced from several surveys, and from stakeholder deliberation and feedback from a series of workshops that were used to modify the draft EPAs with the goal creating a set of EPAs that best represents the intended educational outcomes of predoctoral dental education.

2 | METHODS

This study (HUM00132427) was determined to be exempt by the Institutional Review Board (IRB-HSBS) at the University of Michigan.

2.1 | Core advisory group

At the University of Michigan School of Dentistry a core advisory group (CAG, $n = 7$) representing diverse educational and clinical expertise and social backgrounds (community-based education, general dentistry, oral and maxillofacial pathology, hospital dentistry, oral medicine, and dental curriculum and assessment) was formed to oversee the project. The CAG approached this project as a professional learning community with simultaneous goals to learn about EPAs as well as develop a draft of core activities for predoctoral dental education. For this exercise we defined general dentistry as “primary care dentistry”. After a yearlong review of EPAs in multiple disciplines such as pediatrics, internal medicine, and family medicine, the CAG decided to model a first draft of EPAs based on family medicine²⁵ as it most closely aligned with the “primary care across the lifespan” nature of general dentistry. The CAG group met regularly over 3 years (2017 to 2019). The initial list of EPAs was further revised using

the Delphi approach through feedback from three groups sequentially.

The CAG presented a 2-day in-person workshop on EPAs at the ADEA CCI conference in June 2019⁴ with the addition of a faculty co-presenter from with UNC Adams School of Dentistry, who had developed a set of EPAs for predoctoral dental education.¹ On the first day, participants were presented the concepts as well as the draft EPA framework over a 3-h session. On the second day, participants were invited for a 2-h discussion session. The workshop focused on current gaps and challenges in assessment for competency-based education and explained why the EPA framework would be of relevance to dental education. Core elements of the EPA framework were explained including the different elements in EPA construction. Challenges and solutions for incorporating EPAs into dental education were presented.

2.2 | Delphi participants

Table 1 provides details about the Delphi process participants in the three phases. Participants included academic deans, and educational representatives including ADEA (American Dental Education Association) CCI (Commission on Change & Innovation) attendees.

2.3 | Materials provided to Delphi participants

Participants in all three phases were provided all or some of these training materials including a video defining the EPA framework in dental education²⁶ an example of the EPA diagrammatic framework based on Englander et al.,²⁷ Ten Cate’s “Nuts and Bolts of EPAs” journal article,⁹ and a list of core competencies defined for predoctoral dental education.

3 | RESULTS

For phase 1, 2, and 3 drafts of the EPAs, please refer to Tables 2, 3, and 4, respectively.

3.1 | Phase 1: ADEA 2017 Fall Session for the Academic Deans

The first draft of the EPAs (Table 2) was presented at an in-person workshop for dental school academic deans and other interested attendees at the ADEA Fall 2017 meeting. Since most participants may not have been familiar with

TABLE 1 Delphi process participant details

Phase	Participants	When?	Survey mode	Number who responded (range)*	Total number of participants
1	Academic Deans who attended EPA workshop at the ADEA Fall Meeting Academic Deans Session	Fall, 2017	Paper copies	20-24	35
2	Reactor Panel: Ten dental school academic deans, interested faculty and administrators from different schools & ADEA staff representatives	July- Aug 2019	Qualtrics	20-21	31
3	ADEA CCI participants	June 2019	Qualtrics	12-18	91

*there were missing responses across items, and we report a range of responses.

the concepts of EPAs, an 85-min workshop presented the basic concepts of the EPA framework that included 30 min of discussion. A co-presenter was one of the co-authors of the “AAMC Core EPA’s for Entering Medical Residency,” which were developed using a Delphi process.²⁷

The attendees were invited to respond to the first draft of EPAs and for each one of the EPAs evaluate if the EPA was acceptable “as is” or not acceptable (Table 2). Approximately 35 people attended the workshop and 24 attendees responded to the survey (response rate, 69%). Responses were captured on paper copies and transferred to an excel file.

The EPAs “*Diagnose and manage dental emergencies and dental trauma*” and “*Manage medical emergencies in the dental setting*” were judged to be “acceptable as is” by most participants (n = 23 and n = 22, respectively). Similarly, the EPA “*Provide care that speeds recovery from illness and improves function*” was judged “not acceptable” by 11 of the 24 participants. Eight participants judged the EPA “*Care for patients and families in multiple settings*” “not acceptable.”

3.2 | Phase 2: Academic Deans and ADEA Representatives Reactor Panel

Based on feedback received in Phase 1 and continuous review by the CAG, the Phase 2 EPA list (Table 3) was changed in three ways. First, parts of EPAs 2, 3, 5, 11, 12, and 13 in Phase 1 were incorporated into the other EPAs. A new EPA 6 was added. Second, a new EPA 13 was added that focused on pain and anxiety. Third, the language of many EPAs was changed to be more specific.

In Phase 2, feedback was obtained from a reactor panel that included the associate deans for academic affairs from 10 dental schools (University of Illinois-Chicago, Indiana University, University of Iowa, The Ohio State University, University of Michigan, University of Maryland, Univer-

sity of Minnesota, University of Nebraska, and Rutgers University), ADEA representatives, and specific faculty experts in dental education (including two from Germany and Saudi Arabia). The EPAs and associated evaluation questions were distributed via email, with a link to the electronic Qualtrics™ survey. A total of 31 persons were contacted and the number who responded was 21 (68%).

The survey asked respondents to evaluate each EPA statement and its associated brief description. The CAG decided on the three criteria for each EPA to be rated by participants, as indicated by their level of agreement with the two criteria: (“I would include this EPA in the general dentistry curriculum at my school”; “This EPA matches well with clinical practice”) Respondents’ ratings of agreement were evaluated using a 5-point Likert scale, with responses ranging from Strongly Disagree (SD-1) to Strongly Agree (SA-5) for the first two criteria. Ratings across all EPAs ranged between 4.10 and 4.81 for the statement “I would include this EPA in the general dentistry curriculum at my school” and between 4.29-4.86 for the statement “This EPA matches well with clinical practice.” Participants also rated the clarity (the 3rd criteria) of the EPA scale using a 10-point Likert scale, with values ranging from 1 (low) to 10 (high). Ratings for clarity ranged from 6.15 (“*Provide a primary care dental home for comprehensive longitudinal oral care for individuals of all ages and their families, including people with special healthcare needs*”) to 9.37 (“*Manage medical emergencies in the dental setting*”).

The EPA “*Provide for control of pain and anxiety during provision of care, including local anesthesia and behavioral techniques, with consideration of the impact of prescribing practices and substance use disorder*” was rated highly for all three criteria: inclusion in the curriculum, match with clinical practice, and clarity. Participants answered yes (n = 14, 74%) or no (n = 5, 26%) to the question: “Do you think this list of 15 EPAs cover the scope of a general dentist in practice.”

TABLE 2 Phase 1 evaluation of acceptability of EPA statements

	Acceptable	Not Acceptable	One example qualitative comment
1. Provide a dental home for comprehensive longitudinal dental care for people of all ages, including patients with special healthcare needs.	17	6	Tough to assess/measure care for special needs. Definition/limitation of 'special needs.
2. Care for patients and families in multiple settings.	13	8	Multiple setting? Retirement/nursing homes? Family homes?
3. Provide first contact access to care for oral health issues and dental problems.	18	2	Combine 1.2.3
4. Provide preventive care that improves wellness, modifies risk factors for illness and injury, and detects illness in early treatable stages.	21	3	Probably could merge with EPA #5
5. Provide care that speeds recovery from illness and improves function.	12	11	Combine with EPA#4
6. Diagnose and manage chronic dental conditions and multiple comorbidities.	18	4	Should be able to recognize what co-morbidities should be referred
7. Diagnose and manage dental emergencies and dental trauma.	23	1	Question of triage in dental and medical specialties
8. Perform common procedures in the outpatient or inpatient setting including (Could be individual EPAs)	18	6	Change to one title; like 'Perform Operative procedure
9. Manage medical emergencies in the dental setting.	22	2	Limited observational opportunities
10. Develop trusting relationships and sustained partnerships with patients and families and communities.	16	6	Aspirational. Hard to measure (e.g.: ... Relationships)
11. Use data to optimize the care of individuals, families and populations.	20	1	Data, literature, best evidence?
12. In the context of culture and health beliefs of patients and families, use the best science to set mutual health goals and provide services most likely to benefit health.	20	2	Could 10 and 12 be combined around cultural competency in some way?
13. Advocate for patients, families and communities to optimize health care equity and minimize health outcome disparities.	16	6	What does advocate mean? Too broad
14. Provide leadership within interprofessional care teams.	16	6	Yes, but we don't have those teams yet
15. Coordinate care and evaluate specialty consultation as the condition of the patient requires.	18	3	Could be part of #14

*The total number of attendees who were invited to respond to the survey is unavailable. This is an estimate.

Phase 1 draft set of EPAs & number of respondents who evaluated each EPA as "acceptable as written" or "not acceptable as written". Total n = 35*; range of responses: 20-24; response rate 57% to 69%.

3.3 | Phase 3: ADEA CCI participants

In Phase 3 (table 4), the only changes made were to categorize Phase 2 EPAs **9 to 12** into one category (9 a to 9 f) under the statement: "*Perform common procedures in multiple settings*" with some EPAs split further, for example, "*Perform dento-alveolar surgery*" in Phase 2 was split into "*Management of soft tissue diseases/disorders*" and "*Hard and soft tissue surgery*" in Phase 3.

Following the workshop, ADEA CCI participants (n = 91, representing 40 schools) were invited to evaluate the list of EPAs using the EQUAL rubric via a Qualtrics survey.²⁸ The EQUAL rubric is an established, reliable tool to evaluate EPAs in respect to three areas or domains: Discrete activity (six items); Entrustable, Essential, and Important Task of the Profession (four items); and EPAs as an educational tool (four items). Each domain is scored on a five-point scale with different defining criteria for the

TABLE 3 Phase 2 evaluation of EPA statements using 3 criteria

	Include in curriculum (1 SD- 5 SA) Mean (SD)	Matches well with clinical practice (1 SD- 5 SA) Mean (SD)	Clarity (1 unclear – 10 very clear) Mean (SD)	One example qualitative comment
EPA 1: Provide a primary care dental home for comprehensive longitudinal oral care for individuals of all ages and their families, including people with special healthcare needs	4.10 (.92)	4.40 (.75)	6.15 (2.08)	I think that “primary care dental home” may need to be further operationalized so that the assumption is not that “primary care dental home” is referring to traditional private dental practice exclusively.
EPA 2: Develop trusting relationships and sustained partnerships with individuals, families, communities and other professionals to deliver person-centered care.	4.14 (.97)	4.29 (.85)	7.52 (2.04)	I agree with the EPA as described in the description. The use of the word “communities” in the EPA is unclear to me.
EPA 3: In the context of culture and health beliefs of individuals and families, use the best scientific evidence to set mutual health goals and provide recommendations most likely to benefit health.	4.24 (.99)	4.52 (.60)	7.20 (1.82)	I struggle with the word “culture” here-are there databases like “Up to Date” that can take best evidence (medical/dental) and place this into the context of “culture”-if not again how do we define/meet expectations?
EPA 4: Using motivational communication and other health promotion techniques, provide preventive care recommendations that optimize wellness and function, modify risk factors for disease and injury, detect disease in early manageable stages, and expedite healing and recovery.	4.33 (.98)	4.67 (.58)	7.62 (1.85)	From my point of view these are two different EPAs in one. I would separate the part “detect disease in early manageable stages, and expedite healing and recovery” from the rest, as these activities are very different ones. Furthermore, the status of trust could also be very different for these two parts of the EPA.
EPA 5: Provide leadership within the oral healthcare team and work collaboratively across disciplines and professions as a member of interprofessional care teams.	4.48 (.99)	4.52 (.88)	8.45 (2.21)	IPE is not well enough developed for this to succeed. In many of our training environments, the opportunities to really engage do not exist. And again, more of a competency that is needed for overall successful treatment, rather than an entrustable treatment itself.
EPA 6: Perform patient assessment, diagnosis, and comprehensive treatment planning, determine prognosis and obtain informed consent.	4.76 (.44)	4.81 (.52)	9.10 (1.38)	Good and clear.
EPA 7: Diagnose and manage acute and chronic oral conditions and comorbidities, including oral manifestations of systemic diseases.	4.62 (.75)	4.57 (.60)	8.33 (1.88)	Very much agree with this – again a good emphasis on the need for IP collaborative care for the patient. My only concern is that I believe there is good coordination and communication with the interdisciplinary team (other dental specialists) BUT I feel this is very lacking with the interprofessional team, even from my own experience – with other healthcare providers) i.e., physicians.

(Continues)

TABLE 3 (Continued)

	Include in curriculum (1 SD- 5 SA) Mean (SD)	Matches well with clinical practice (1 SD- 5 SA) Mean (SD)	Clarity (1 unclear – 10 very clear) Mean (SD)	One example qualitative comment
EPA 8: Diagnose and manage oral emergencies, trauma and infection.	4.67 (.87)	4.81 (.52)	8.95 (1.86)	I'm not sure that schools can provide students with enough experiences to be more that competent for this EPA. While students usually see enough patients in pain and know how to treat that condition, trauma and true cases of infection are more rare.
EPA 9: Preserve, restore and replace teeth.	4.81 (.52)	4.81 (.69)	9.00 (1.88)	Very important EPA, beautifully summarizing the bread-and-butter skills in dentistry. It is very important to determine the breadth and depth of this EPA as it overlaps most dental specialties. This can be only evaluated once the complete picture is known and shared. On a side note, some schools consider endodontics as part of operative dentistry... is this the case here?
EPA 10: Perform periodontal therapy	4.65 (.95)	4.60 (.69)	8.80 (2.06)	The EPA is critical – but some changes would be need in the description for this to match well with clinical practice. Sometimes the dentist will collaborate with the dental hygienist to provide this care. Periodontal therapy is probably more often provided by a dental hygienist than a general dentist.....perhaps a better choice of words would be – Collaboration with a dental hygienist is one strategy used for providing periodontal therapy.
EPA 11: Perform dento-alveolar surgery.	4.65 (.68)	4.60 (.76)	8.95 (1.52)	Does the word manage need to be included?
EPA 12: Manage space and treat/manage occlusion.	4.55 (.83)	4.65 (.83)	8.65 (2.06)	Agreed, very straight forward, self- explanatory
EPA 13: Provide for control of pain and anxiety during provision of care, including local anesthesia and behavioral techniques, with consideration of the impact of prescribing practices and substance use disorder.	4.81 (.61)	4.86 (.67)	9.35 (.94)	This is excellent with the emphasis on impact on prescribing practices and substance abuse
EPA 14: Manage medical emergencies in the dental setting.	4.29 (1.06)	4.43 (.93)	9.37 (1.36)	Manage medical emergencies ... “in the dental setting”; is there a better phrase to describe the situation/setting or the EPA should simply focus on manage medical emergencies.
EPA 15: Coordinate care and evaluate specialty consultation and referral as the condition of the individual requires and execute appropriate handoffs to other members of the healthcare team.	4.38 (.93)	4.52 (.68)	8.75 (1.68)	Excellent and important EPA. In my humble opinion, the most important part of consultation is how are the outcomes of that consultation handled and how are patients helped to make decisions afterwards. That and other important aspects of consultations and referrals could be only evaluated after the mapping process is clear.

TABLE 4 Phase 3 evaluation of EPA statements and ratings

	Criteria for assessing the EPA				One example qualitative comment
	Very important and essential to professional practice	A clear and defined outcome consistently produced from the work	Exclusively performed by trained and qualified individuals within the profession	Clearly expected of a physician as part of delivering competent clinical care	
1. Provide a primary care dental home for comprehensive longitudinal oral care for individuals of all ages and their families.	10 (56%)	4 (22%)	7 (39%)	8 (44%)	My concern is the ability to measure and predictably expect all students to achieve this.
2. Develop trusting relationships and sustained partnerships with individuals, families, communities and other professionals to deliver person-centered care.	9 (56%)	3 (19%)	5 (31%)	7 (44%)	This encompasses inter professional care as well as patient-centered care. Less clear on how measurable this would be. Patient satisfaction? How are entrustable partners instructed prior to measuring?
3. In the context of culture and health beliefs of individuals and families, use the best scientific evidence to set mutual health goals and provide recommendations most likely to benefit health.	10 (67%)	5 (33%)	8 (53%)	9 (60%)	Cultural competence and social determinants of health care practice are definitely important, but definitions and execution vary widely in response to the individual. I do not feel this aspect of care lends itself to universally answering the question, "Can this student be trusted to perform this activity with minimal or no supervision?" in all cases.
4. Using motivational communication and other health promotion techniques, provide preventive care recommendations that optimize wellness and function, modify risk factors for disease and injury, detect disease in early manageable stages, and expedite healing and recovery.	8 (57%)	5 (36%)	7 (50%)	8 (57%)	I think this is another area where we don't focus enough. Especially since there isn't always the easiest way to bill this time, which in practice is the measurable variable. This is where our profession should head but unsure if these question-and-answer possibilities state this enough. Is important to clinical care, is important to the profession, but unfortunately (and clearly) a dental practice could succeed without encompassing this.

(Continues)

TABLE 4 (Continued)

	Criteria for assessing the EPA				One example qualitative comment
	Very important and essential to professional practice	A clear and defined outcome consistently produced from the work	Exclusively performed by trained and qualified individuals within the profession	Clearly expected of a physician as part of delivering competent clinical care	
5. Provide leadership within the oral healthcare team and work collaboratively across disciplines and professions as a member of interprofessional care teams.	6 (46%)	4 (31%)	5 (38%)	6 (46%)	While it seems likely that there is bound to be overlap, there seems to be a lot of overlap between this and #2. I suppose #2 is more about relationships with patients rather than team members and other health care professionals. That wasn't as clear to me when reading #2.
6. Perform patient assessment, diagnosis, and comprehensive treatment planning, determine prognosis and obtain informed consent.	12 (92%)	10 (77%)	9 (69%)	11 (85%)	These items seem more traditionally measurable/quantifiable. They also seem more in line with current competencies/CODA standards, which probably makes it easier to acknowledge as an integral piece of the picture.
7. Diagnose and manage chronic oral conditions and comorbidities, including oral manifestations of systemic diseases.	8 (62%)	8 (62%)	10 (77%)	9 (75%)	The diagnosis and initial management I really see, but in a longitudinal aspect how do you measure if the students are actually able to manage some of these conditions long term.
8. Diagnose and manage oral emergencies, trauma and infection.	10 (77%)	10 (77%)	10 (77%)	11 (85%)	No comment available
9a. Perform common procedures in multiple settings: Preservation and restoration of teeth.	9 (75%)	10 (83%)	10 (83%)	11 (92%)	Unclear on multiple settings. Are we talking electricity goes out, or on special care patient population? Not sure what the variable output is. Either something is clinically acceptable or it's not
9b. Perform common procedures in multiple settings: Replacement of teeth.	10 (83%)	10 (83%)	10 (83%)	11 (92%)	No comment available
9c. Perform common procedures in multiple settings: Periodontal therapy.	10 (83%)	10 (83%)	10 (83%)	10 (83%)	Based on the clinical severity, this is often also difficult to measure. Huge failing in our profession to better define management, especially knowing the limitation with care as disease severity increases.

(Continues)

TABLE 4 (Continued)

	Criteria for assessing the EPA				One example qualitative comment
	Very important and essential to professional practice	A clear and defined outcome consistently produced from the work	Exclusively performed by trained and qualified individuals within the profession	Clearly expected of a physician as part of delivering competent clinical care	
9d. Perform common procedures in multiple settings: Management of soft tissue diseases/disorders.	8 (67%)	9 (75%)	9 (75%)	9 (75%)	No comment available
9e. Perform common procedures in multiple settings: Hard and soft tissue surgery.	8 (67%)	10 (83%)	11 (92%)	10 (83%)	Are you considering endodontic therapy to be a hard/soft tissue surgery? Just curious as to where it fit in.
9f. Perform common procedures in multiple settings: Management of space and treatment/management of occlusion.	8 (67%)	9 (75%)	10 (83%)	10 (83%)	I don't agree with the last statement in that it is crucially important to the management of the patient but not necessarily clearly expected.
10. Provide for control of pain and anxiety during provision of care, including local anesthesia and behavioral techniques, with consideration of the impact of prescribing practices and substance use disorder.	10 (83%)	8 (67%)	8 (67%)	10 (83%)	Unsure of standardization for measurability
11. Manage medical emergencies in the dental setting.	9 (75%)	10 (83%)	8 (67%)	11 (92%)	Again, very underrepresented. And absolutely crucial especially moving our profession forward.
12. Coordinate care and evaluate specialty consultation and referral as the condition of the individual requires and execute appropriate handoffs to other members of the healthcare team.	8 (67%)	6 (50%)	7 (58%)	6 (50%)	Definitely crucial part to management of a patient but difficult to standardize how measurable this is

Phase 3 draft set of EPAs and corresponding number of respondents (%) that rated each EPA as 5 on a 5 point scale (1-5) for each of the criteria for the domain of "entrustable, essential, and important task of the profession, and clarity" from the EQuaL rubric.²⁴

Total no of respondents (n = 91); total responses ranged from 12 to 18 across items, response rates 13% to 20%.

TABLE 5 EQual rubric statements with scale points 1 and 5 defined

EQual rubric statements	Definition of scale point 1	Definition of scale point 5
This EPA describes work that is essential and important to the profession.	very low importance to professional practice	very important and essential to professional practice
Performing this EPA leads to recognized output or outcome of labor.	no discernible product or recognized outcome from work	a clear and defined outcome consistently produced from the work
The performance of this EPA in clinical practice is restricted to qualified professional.	is routinely done by untrained persons	Exclusively performed by trained and qualified individuals within the profession
This EPA addresses professional work that is suitable for entrustment.	Has no influence on the well-being of patients and public as a whole	Clearly expected of a physician as part of delivering competent clinical care

scale points. In this study, only one domain “Entrustable, Essential, and Important Task of the Profession” was used in the survey with the rationale that this was the most important assessment at this point of time of development of the EPAs.

The response rate was low, with about 12-18 (response rate of 13% to 20%) of the 91 respondents answering the survey across all questions possibly because this was still a new concept and participants may have found it overwhelming to evaluate the entire set of EPAs (Table 5).

3.4 | Qualitative feedback themes across the three phases

An example of an open-ended comment is provided for each EPA in each of the Phases in Tables 2–4. The main points that emerged were as follows. In Phase 1 (Table 2), there were a lot of suggestions to combine EPAs as reflected by comments for EPAs 3, 4, 5, 12, 15. There was concern about language and terminology. For instance, the use of the words such as “advocate” (Phase 1 EPA 13), “primary care dental home” (Phase 2, EPA 1), “communities” (Phase 2, EPA 2 “culture” (Phase 2, EPA 3), cultural competence (Phase 3, EPA 3) seemed to cause concern. There were also concerns about the word “manage” (Phase 2, EPA 11). Measurability of some of the EPAs also emerged as a theme (eg, Phase 1, EPAs 9 & 10; Phase 3, EPAs 1, 2, 10, and 12). Comments on EPA 14 (Phase 1), EPA (Phase 2), and EPA 7 (Phase 2) suggest that interprofessional education and care is still underdeveloped in dental education. Participants also provided positive feedback about many of the EPAs, complimenting them for clarity (e.g., Phase 2, EPAs 6 7 13) and for capturing essential tasks of dentistry (eg, Phase 2 EPAs 9, 10, 13, and 15 and Phase 3, EPA 12.).

4 | DISCUSSION

The primary purpose of this study was to create an initial draft set of EPAs that identified core activities for dentistry. Identifying these activities and assessing graduating dentists’ ability to perform these activities with complete independence has tremendous value for patient care and safety (Figure 1). In order to develop the list of EPAs, the process we used was designed to cover development, expansion and validation. In our study, for the development of EPAs, the CAG members engaged in a scoping review and evaluation of the literature on EPAs, as well exploring the value of consensus approaches such as the Delphi method to develop an initial set of EPAs.²⁹ For expansion and validation of these EPAs, feedback was obtained using the Delphi method and through the use of surveys involving stakeholders such as academic deans, faculty, and staff from multiple, geographically distributed dental schools over three iterative Delphi phases. The EPA workshops also served as an opportunity for stakeholders to discuss and provide feedback. Thus, we followed a systematic process in developing this initial set of EPAs.

In Phase 2, 74% of participants agreed that the EPA framework covered the scope of work/practice for a general dentist. In Phase 3, EPAs 8, 9a, 9b, and 9c were rated high overall on the four criteria of the EQual rubric in the domain “Entrustable, Essential, and Important Task of the Profession.”

Four issues were identified in the analysis of data. One, open-ended comments from participants suggested that in defining EPAs, language and terminology is important. For instance, terminology such as “advocacy,” “multiple settings,” “provide first contact,” “illness,” “inpatient,” “manage,” and “primary care home” were indicated as confusing by our Delphi participants. As Ten Cate has suggested, it’s critical that we have common definitions and a shared understanding of terminology.³⁰ This transparency

will enable the dental field to collaborate on a national and international scale not limited to local contexts.

Second, in creating a set of EPAs that define what a graduating dentist needs to be able to perform with independence, its important criteria are clearly defined, for the learner and the assessor.¹⁶ Some criteria for a good EPA statement are that it should be specific and focused, have a clearly defined scope, and a clear beginning and an end. Thus, the EPA “*Provide for control of pain and anxiety during provision of care, including local anesthesia and behavioral techniques, with consideration of the impact of prescribing practices and substance use disorder*” was rated highly (table 2). The EPA “*Preserve, restore and replace teeth*” was described by participants as “beautifully summarizing the bread-and-butter skills in dentistry” in Phase 2. The EPA “*Perform patient assessment, diagnosis, and comprehensive treatment planning, determine prognosis and obtain informed consent*” was seen as “very clear.” In contrast, the EPA: “*Provide care that speeds recovery from illness and improves function*” and the EPA “*Care for patients and families in multiple settings*” were not judged well in Phase 1. In phase 3 (Table 4), the ratings for EPAs 9a to 9f suggest that these were seen as core tasks of the dental profession and were clearly written as such. Based on participant feedback, we also combined and split EPAs to address scope and specificity.

A third issue that emerged was concern about how one would measure an EPA in practice. For instance, in Phase 3 for EPA 1 “*Provide a primary care dental home for comprehensive longitudinal oral care for individuals of all ages and their families,*” there was concern about the ability to measure this. There were similar concerns about EPA 2 “*Develop trusting relationships and sustained partnerships with individuals, families, communities and other professionals to deliver person-centered care.*” Assessment of entrustability and the act of entrustment by the individual faculty or the institution requires contexts that consistently pair the trainees with faculty that allow for multiple, longitudinal observations and multi-source feedback.^{6,9,16,31} Assessments of work and work products such as product evaluations (health record entries; self-reported activity logbooks, reflective essays) and *post hoc* checks such as evaluations of work quality, patient satisfaction data, and knowledge and skills tests, together provide multi-source feedback about how close the trainee is to exhibiting independence in the actual work environment.³¹ The assessment of entrustability should also include an evaluation of the trainee’s integrity (honesty; benevolence), reliability (conscientiousness), and humility (discernment of one’s own limitations).³² Finally, the literature supports the use of clinical competence committees to facilitate a holistic review of trainee progress.^{33,34} It is also important to acknowledge the need for faculty development and calibration to build skills for observation, assessment of non-

cognitive traits such as integrity, and to conduct holistic assessments.³⁵

A fourth issue emerged. This set of EPAS brought into focus an expanded vision of the role of the dentist, beyond a primary focus on technical procedures, to a role as a primary care provider: the “Oral Physician.” For instance, the lack of comfort with EPAs that focused activities on inter-professional education and interprofessional care (EPA 1, 2, 3, 7 in Phase 2 and EPAS 1, 2, 3, 4 in Phase 3) suggests there is still hesitancy in seeing this as essential to the practice of dentistry. There were concerns raised about dental schools not having enough examples of team-based collaborative care settings in which to provide longitudinal and immersive opportunities to teach IPE/IPC skills. Similarly, Phase 2 (EPA 7) focuses on the need for dentists to work with not only interdisciplinary teams but also interprofessional teams. The IPE/IPC focused EPAs warrant further discussion in terms of these EPAs being seen as core activities of the graduating dentist.

Where do we go next? This project was an initial effort to draft a set of EPAs for pre-doctoral dental education that define the outcomes of the educational program to prepare trainees for general dental practice. This draft EPA framework needs to be validated and further revised by a broader and more diverse stakeholder group, including representatives from more dental schools, patients, preceptors in the community, dental accrediting bodies, and dental licensing boards. As next steps, clear alignment with CODA accreditation standards will be essential for the EPAs to be accepted and adopted by dental educators. It is not surprising that those EPAs that closely resembled corresponding CODA standards statements (eg, Phase 2/EPA 6 and Phase 3/EPA 9) were highly rated for this reason.³⁶ Stakeholders need to understand the EPA framework if they are to accurately evaluate its relevance to dental education; therefore, faculty development and clear communication about the EPA framework and the reasons for change are essential.¹² Finally, if we do adopt this framework, future research on implementation of EPAs in the curriculum is the logical next step.¹⁹

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REFERENCES

1. Wolcott MD, Mason MR, Broome AM, Tittlemore AJ, De Rossi SS, Quinonez RB. Faculty perspectives of an entrustable professional activity (EPA) framework in predoctoral dental education. *J Dent Educ.* 2020;84(9):955-963.
2. Wolcott MD, Quinonez RB, Ramaswamy V, Murdoch-Kinch CA. Exploring the relevance of “Entrustable Professional Activities” in dental education. *J Dent Educ.* 2020;84(9):945-948. Can we talk about trust?.

3. Murdoch-Kinch CA. It's Time to Reimagine the "New Dental Graduate. *J Dent Educ.* 2018;82(11):1123-1126.
4. Murdoch-Kinch CA, Ramaswamy V, Danciu T, et al. *Innovation workshop: Developing Entrustable Professional Activities (EPAs)*. Portland OR: Workshop presentation at: American Dental Education Association Commission on Change and Innovation in Dental Education; 2019.
5. Tonni I, Gadbury-Amyot CC, Govaerts M, et al. ADEA-ADEE Shaping the Future of Dental Education III: assessment in competency-based dental education: ways forward. *J Dent Educ.* 2020;84(1):97-104.
6. Cate OT. A primer on entrustable professional activities. *Korean J Med Educ.* 2018;30(1):1-10.
7. Ten Cate O. When I say ... entrustability. *Med Educ.* 2020;54(2):103-104.
8. ten Cate O. Entrustability of professional activities and competency-based training. *Med Educ.* 2005;39(12):1176-1177.
9. Ten Cate O. Nuts and bolts of entrustable professional activities. *J Grad Med Educ.* 2013;5(1):157-158.
10. El-Haddad C, Damodaran A, McNeil HP, Hu W. The ABCs of entrustable professional activities: an overview of 'entrustable professional activities' in medical education. *Intern Med J.* 2016;46(9):1006-1010.
11. Miller GE. The assessment of clinical skills/competence/performance. *Acad Med.* 1990;65(9 Suppl):S63-67.
12. Englander R, Frank JR, Carraccio C, et al. Toward a shared language for competency-based medical education. *Med Teach.* 2017;39(6):582-587.
13. Nadershahi N GL, Bender D, Murdoch-Kinch CA, ADEA meeting – Board of the Director's Symposium on Assessment. Chair of the Board Symposium: Revisiting Assessment. 2019.
14. Damodaran A, Shulruf B, Jones P. Trust and risk: a model for medical education. *Med Educ.* 2017;51(9):892-902.
15. Ten Cate O, Chen HC, Hoff RG, Peters H, Bok H, van der Schaaf M. Curriculum development for the workplace using Entrustable Professional Activities (EPAs): aMEE Guide No. 99. *Med Teach.* 2015;37(11):983-1002.
16. Ten Cate O, Pool IA. The viability of interprofessional entrustable professional activities. *Adv Health Sci Educ Theory Pract.* 2020;25(5):1255-1262.
17. ten Cate O, Young JQ. The patient handover as an entrustable professional activity: adding meaning in teaching and practice. *BMJ Qual Saf.* 2012;21(Suppl 1):i9-12.
18. Fink A, Kosecoff J, Chassin M, Brook RH. Consensus methods: characteristics and guidelines for use. *Am J Public Health.* 1984;74(9):979-983.
19. O'Dowd E, Lydon S, O'Connor P, Madden C, Byrne D. A systematic review of 7 years of research on entrustable professional activities in graduate medical education, 2011-2018. *Med Educ.* 2019;53(3):234-249.
20. Baghus A, Giroldi E, Muris J, et al. Identifying entrustable professional activities for shared decision making in postgraduate medical education: a national delphi study. *Acad Med.* 2020.
21. Hauer KE, Kohlwes J, Cornett P, et al. Identifying entrustable professional activities in internal medicine training. *J Grad Med Educ.* 2013;5(1):54-59.
22. Haines ST, Pittenger AL, Stolte SK, et al. Core entrustable professional activities for new pharmacy graduates. *Am J Pharm Educ.* 2017;81(1):S2.
23. Al-Moteri M. Entrustable professional activities in nursing: a concept analysis. *Int J Nurs Sci.* 2020;7(3):277-284.
24. Duijn C, Ten Cate O, Kremer WDJ, Bok HGJ. The development of entrustable professional activities for competency-based veterinary education in farm animal health. *J Vet Med Educ.* 2019;46(2):218-224.
25. AFMRD; Association of Family Medicine Residency Directors. Entrustable Professional Activities (EPAs). Entrustable Professional Activities (EPAs). Accessed June 5, 2018.
26. University of Michigan Entrustable Professional Activities. 2018. At: http://www.youtube.com/watch?v=nAVO_DL3m_0&feature=youtu
27. Englander R, Flynn T, Call S, et al. Toward defining the foundation of the MD degree: core entrustable professional activities for entering residency. *Acad Med.* 2016;91(10):1352-1358.
28. Taylor DR, Park YS, Egan R, et al. EQual, a novel rubric to evaluate entrustable professional activities for quality and structure. *Acad Med.* 2017;92:S110-S117.11S Association of American Medical Colleges Learn Serve Lead: Proceedings of the 56th Annual Research in Medical Education Sessions).
29. Lomis K, Amiel JM, Ryan MS, et al. Implementing an entrustable professional activities framework in undergraduate medical education: early lessons from the AAMC core entrustable professional activities for entering residency pilot. *Acad Med.* 2017;92(6):765-770.
30. Ten Cate O. Competency-based education, entrustable professional activities, and the power of language. *J Grad Med Educ.* 2013;5(1):6-7.
31. Peters H, Holzhausen Y, Boscardin C, Ten Cate O, Chen HC. Twelve tips for the implementation of EPAs for assessment and entrustment decisions. *Med Teach.* 2017;39(8):802-807.
32. Ten Cate O. Entrustment as assessment: recognizing the ability, the right, and the duty to act. *J Grad Med Educ.* 2016;8(2):261-262.
33. French JC, Dannefer EF, Colbert CY. A systematic approach toward building a fully operational clinical competency committee. *J Surg Educ.* 2014;71(6):e22-27.
34. Hauer KE, Chesluk B, Iobst W, et al. Reviewing residents' competence: a qualitative study of the role of clinical competency committees in performance assessment. *Acad Med.* 2015;90(8):1084-1092.
35. Favreau MA, Tewksbury L, Lupi C, Cutrer WB, Jokela JA, Yarris LM. Constructing a shared mental model for faculty development for the core entrustable professional activities for entering residency. *Acad Med.* 2017;92(6):759-764.
36. Accreditation CoD. Accreditation Standards for Dental Education Programs. *American Dental Association* Web site <https://www.wada.org/~media/CODA/Files/pdpepdf?la=en> 2020.

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