

The Development of Entrustable Professional Activities for Competency-Based Veterinary Education in Farm Animal Health

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ABSTRACT

Entrustable professional activities (EPAs) are professional tasks that can be entrusted to a student under a given level of supervision once he or she has demonstrated competence in these tasks. The EPA construct was conceived to increase transparency in objectives for clinical workplace learning and to help ensure patient safety and the quality of care. A first step in implementing EPAs in a veterinary curriculum is to identify the core EPAs of the profession. The aim of this study was to develop EPAs for farm animal health.

An initial set of 36 EPAs for farm animal health was prepared by a team of six veterinarians and curriculum developers and used in a modified Delphi study. In this iterative process, the EPAs were evaluated until higher than 80% agreement was reached. Of 83 veterinarians who participated, 39 (47%) completed the Delphi procedure. After two rounds, the panel reached consensus. A small expert group further refined and reorganized the EPAs for educational purposes into seven core EPAs for farm animal health and 29 sub-EPAs.

This study is an important step in optimizing competency-based training in veterinary medicine. Future steps are to implement EPAs in the curriculum and train supervisors to assess students' ability to perform EPAs with increasing levels of independence.

Key words: entrustable professional activity, EPA, competency-based, farm animal health, student development, workplace learning

INTRODUCTION

An important aim of veterinary education is to ensure that students can competently practice relevant professional activities by the time they complete their training. The demonstration of appropriate skills during clerkships and direct assessment of clinical competence are important targets of competency-based educational programs.^{1,2} However, research has shown that the assessment of distinct competencies can be difficult in a clinical learning environment.^{3,4} Competencies tend to be defined in a rather abstract manner, making providing meaningful feedback challenging for clinical supervisors.

The recent educational innovation of entrustable professional activities (EPAs) could, however, increase insight into students' clinical abilities and competencies in clinical practice.⁵ EPAs are units of professional practice that clinical faculty may entrust to a student to execute unsupervised once he or she has obtained adequate competence to do so. EPAs should be carried out within a given time frame, be observable and measurable, and allow focused entrustment decisions.⁶ Assessing students by means of EPAs requires that assessment moments be aligned with the students' clinical workplace

experiences.⁷ With the EPA concept, an entrustment decision reflecting a *readiness for unsupervised practice* is a significant milestone and a central goal of clinical education.^{8,9}

In recent years, several graduate and undergraduate medical education programs have started to consider incorporating EPAs in their competency-based curricula.^{6,8,10,11} Veterinary education has also shown interest in applying EPAs in competency-based educational programs.^{12,13} The aim of this study was to identify, by means of a consensus procedure, EPAs for farm animal health that veterinary students should have mastered by the time they graduate.

METHODS

Setting

The study was conducted at the Faculty of Veterinary Medicine (FVMU), Utrecht University, the Netherlands. FVMU offers a three-year bachelor (pre-clinical) program and a three-year master (clinical) program. Each student must choose one of three clinical tracks: companion animal health, equine health, or farm animal health. In the clinical program, students are almost completely involved in

clinical rotations. In this study, EPAs were identified for the farm animal health clinical track.

Design

A draft list of professional activities was compiled by FVMU staff members. This group consisted of researchers in medical education (CD, OtC, and HB) and three clinical teachers with expertise in bovine and pig health. The FVMU program outcomes,¹⁴ the VetPro (veterinary competency framework),¹⁵ and the various clinical examinations and options for further diagnostic procedures described by Kuiper and Van Nieuwstadt¹⁶ were used to identify 36 possible EPAs.

This list was then used as input for a modified Delphi procedure.^{17–19} This technique is an iterative consultation of independent experts, without interaction, resulting in equal weighting of all individual opinions to create a final list of EPAs.^{6,9,20} The Delphi procedure was chosen as the consensus method for this study because it allows a large group of people to participate without time management and geographical issues, and because it was used in prior studies to identify EPAs.^{21–23}

Participants

A national sample of 83 veterinarians was approached to participate in the Delphi procedure. To cover a wide range of expertise with respect to relevant professional activities in farm animal health training, the following individuals were invited to serve on the Delphi panel:

- all clinical teachers/faculty staff members involved in farm animal health intramural clerkships at Utrecht University (the only veterinary school in the country);
- all supervising veterinarians working in veterinary practice involved in farm animal health extramural studies; and
- randomly selected early-career (up to five years after graduation) veterinarians from FVMU working in farm animal health.

Procedure

The Delphi procedure was conducted between August 2014 and January 2015. The preliminary EPAs needed to be rated as relevant for the following statements: (Q1) “This EPA connects with relevant clinical practice in farm animal health,” and (Q2) “I would (advise to) include this EPA in a farm animal health educational program.” The panel members were invited, by means of a digital questionnaire, to judge relevance on a 5-point Likert scale (1 = fully disagree; 5 = fully agree) and to review the wording of the EPAs. In addition, there was a question about the expected level of supervision^{5,24} required for each EPA by the time a student graduated, based on current veterinary practice.

All participants of the first Delphi round were invited to participate in the second round. In both rounds, the non-responders were sent a reminder. Textual comments were used to refine the EPA descriptions. For each stage, an online electronic survey tool¹ was used. Two successive rounds were carried out until sufficient agreement between experts was reached.

Analyses

After each Delphi round, mean agreement scores were calculated. For inclusion, at least 80% of respondents had to give an “agree” or “fully agree” rating to a potential EPA. This resulted in three possible conclusions:

1. The agreement score for Q1 and Q2 was above 80%: the EPA was accepted.
2. The agreement score for Q1 or Q2 was less than 80%: the EPA was adjusted based on the narrative feedback and included in the following Delphi round.
3. The EPA was excluded from the list when the agreement score of Q1 and Q2 was less than 80%.

Final List

After the two Delphi rounds, the research group, which consisted of an expert in EPAs and medical education research (OtC); an expert in research in medical education (HB); a farm animal practitioner, the primary researcher (CD); and the vice dean of education of FVMU (WK), discussed the outcome of the Delphi procedure and its usability for education. To optimize the practical usability of EPAs within the curricular structure of FVMU, the EPAs were reorganized into core requirements and sub-requirements.⁶

Ethical Considerations

Ethical approval for this study was provided by the Ethics Review Board of the Netherlands Association for Medical Education (NERB file no. 00370, 2014). Participation was voluntary, and full confidentiality was ensured. Informed consent from the participants was obtained before the first round of the Delphi procedure.

RESULTS

Delphi Round 1

The questionnaire with 36 preliminary EPAs was answered by 47 out of 83 veterinarians (response rate: 56.6%). Respondents were 16 early-career veterinarians (one to five years after graduation at the FVMU), 15 supervisors of farm animal health at FVMU, and 16 supervisors of extramural studies in the Netherlands. Five respondents did not fully complete the survey; their scores on Q1 and Q2 were excluded, but their narrative feedback on the different EPAs proved valuable and was included.

The answers to the question “Are there EPAs lacking that should definitely be included in the curriculum?” were used to identify new EPAs. Four new preliminary EPAs were created and included in the second Delphi round, based on the narrative comments. In the first Delphi round, 28 preliminary EPAs were accepted, four preliminary EPAs had an agreement score on Q1 or Q2 below 80%, and two had an agreement score below 80% on Q1 and Q2. The EPAs with an agreement score below 80% on Q1 or Q2 were modified based on the narrative feedback of the participants.

Delphi Round 2

The second Delphi round consisted of eight EPAs: four new EPAs derived from the narrative comments and four EPAs adapted based on the comments from the first round. The

final question also included the 30 accepted EPAs from the first Delphi round and asked whether, in respondents' opinion, any EPAs were missing. This adjusted questionnaire was sent to the 47 participants from the first round. There were 39 responses, of which 34 were complete. Respondents were 14 early-career veterinarians, 14 supervisors of farm animal health at FVMU, and 11 supervisors of extramural studies.

In this Delphi round, six preliminary EPAs were accepted, two had an agreement score below 80% on Q1 and Q2, and there were no missing EPAs. This resulted in a list of 36 preliminary EPAs after two Delphi rounds.

Final List

To increase curricular usability of the EPAs, minor EPAs were classified (or *nested*) within the larger EPAs by the authors.⁶ This resulted in a total of 7 core EPAs and 29 sub-EPAs (see [Table 1](#) for the final list). For each sub-EPA, participants' opinion about the required level of supervision by the time of graduation is included in [Table 1](#).⁵

DISCUSSION

Meaningful assessment of farm animal health in competency-based veterinary education (CBVE) can be supported by the evaluation of students' performance of core professional activities.²⁵ This study describes a comprehensive approach using the Delphi procedure to gain consensus on the content for specific EPAs in farm animal health. The generic approach to EPA design applied in this study could be applicable in other training contexts. EPAs have the benefit of defining learning outcomes as relevant profession-specific core activities. Linking competencies with clinical practice through EPAs may help to optimize effective competency-based education.^{6,26}

In recent years, several scholarly reports appeared that critically evaluated competency-based education in general and EPAs in particular.^{27–32} While trust is an essential and important component of the assessment with EPAs, the nature of objectivity versus subjectivity in such assessment is a topic of broad debate.³³ One reason is that entrustment decisions as assessment imply a transfer of responsibility,³⁴ and entrustment thus requires a social judgment.¹¹ EPAs might be viewed as a vulnerable concept, since it depends on two essential foundations—an adaptive workplace and highly trained faculty—but this vulnerability is inevitable in any good workplace-based learning and assessment culture.³⁵

EPAs were initially designed for post-graduate medical specialty training, as they particularly pertain to the transition to unsupervised practice of critical tasks in health care. They have been considered applicable to undergraduate medical education,^{11,36} but the less clear transition to post-graduate training gives rise to some discussion.³² However, the lack of post-graduate training for most veterinarians could make EPAs more directly suitable for veterinary training. Some aspects of EPAs may be reconsidered to increase their usability in veterinary education. Veterinary students always have either direct supervision (with the supervisor directly in the room) or indirect supervision (with the supervisor immediately available to assist), which creates

a need to adapt the entrustment and supervision scales that are common in medical training.^{36,37}

To be useful for assessment, an EPA must be observable, replicable, and understandable to students and supervisors.^{5,6,31} However, the evaluation of students' clinical performance is strongly influenced by subjective measures, and there is considerable inter-supervisor variation in student assessments.³⁸ This evaluation depends on various factors, such as the nature of the task, the qualities of the supervisor, the qualities of the student, and the quality of the relationship between the supervisor and the student, as well as the circumstances surrounding the clinical task.³⁹ Therefore, a necessary next step in the development of EPAs is to specify further details for each EPA, including information about the patient, the owner, the context, and the student's behavior.⁴⁰ Only through implementation can we test the hypothesis that entrustment-based assessment on these clinical tasks will result in veterinarians being sufficiently prepared to bear responsibilities and provide safer care to their patients from day one.¹¹ Early signs of good psychometric properties of entrustment as assessment are now appearing in the literature.^{41,42}

This study identified requirements in terms of EPAs for veterinary practice regarding farm animal health. Determining a set of EPAs is the first step in implementing EPAs in a curriculum. More research needs to be conducted on how to implement EPAs, and small pilot studies will evaluate whether EPAs could help to improve workplace learning.

Limitations

The predefined EPAs were based on FVMU program outcomes and may not necessarily be appropriate for other veterinary curricula. The limited response rate of 57% may have affected the validity of our findings. Some non-response may have been caused by the timing or length of the survey, which could have affected willingness to participate in the second round. Nevertheless, we believe that the number of participants was sufficient to provide relevant results. The number of participants was consistent (the first round) and slightly smaller (the second round) than panel sizes in several other studies that have used the Delphi method. Furthermore, participating experts were familiar with the recommended best practices in farm animal health in the Netherlands.

During the Delphi procedure, participants may have developed a growing understanding of the concept of EPAs, after having received written information about the study and EPAs. However, several participants suggested additional EPAs to the list already after round one, which suggests that they had a fair understanding of the concept.

The authors are aware of the continuing debate on changes and developments in veterinary medicine that will affect veterinary practice. The presented EPAs must therefore be considered as suitable for current practice, but they need to be reviewed and updated regularly.

Practical Implications

A necessary next step in EPA development is to specify the details and limitations of each EPA. Subsequently, the EPAs need to be validated in actual training practice. For

Table 1: Final list of entrustable professional activities (EPAs) for farm animal health, including sub-EPAs with the expected level of required supervision

EPA title	Sub-EPAs	Level of supervision at graduation*5,25
1. History and (physical) examination to arrive at a differential diagnosis	<i>This EPA pertains to:</i>	
	a. Individual animals	5
	b. Herds of animals	5
2. Development and implementation of a diagnostic plan	<i>This EPA pertains to:</i>	
	a. Individual animals	5
	b. Herds of animals	5
3. Management of a common problem	<i>This EPA covers nine common problems:</i>	
	a. Circulation case	5
	b. Digestion case	5
	c. Infectious and notifiable diseases	4
	d. Locomotion case	5
	d.II. Claw case	5
	e. Neurologic case/neurologic problem	4
	f. Respiration case/respiratory problem	5
	g. Skin disease or a wound	4
h. Udder case	5	
4. Common surgical procedures and other therapeutic interventions	<i>This EPA covers nine common procedures or interventions:</i>	
	a. Rectal exam	4
	b. Injections	4
	c. Pain relief	4
	d. Vaccination by indication	4
	e. Sampling for further diagnostics and screening tests	4
	f. Obstetric deliveries	4
	g. Cesarean section	3
	h. Surgery of a displaced abomasum	3
	i. Common minor surgical procedures	3
5. Preventive health care and biosecurity	<i>This EPA covers five preventive and security procedures:</i>	
	a. Dehorning	5
	b. Drawing up, explaining, and using the farm animal treatment plan and farm animal health plan	4
	c. Recommending and interpreting fertility and pregnancy diagnostic investigations	4
	d. Performing and interpreting transition management	4
	e. Performing and interpreting nutrition management	4
6. Intercollegial communication of case relevant information		4
7. Urgent or emergency care with initial evaluation and management	<i>This EPA covers three critical procedures:</i>	
	a. Resuscitation, stabilization, and care for unstable or critically ill patients (excluding shock and sepsis)	4
	b. Resuscitation, stabilization, and care for patient in shock or with sepsis	4
	c. Care for a dying patient and performing euthanasia	4

*1 = be present and observe; 2 = act with direct supervision; 3 = act with indirect supervision; 4 = act without supervision; 5 = provide supervision

educational purposes, the development of less complex (sub-)EPAs that are part of more complex EPAs may be useful for early learners. This also reflects to the broader responsibilities of more advanced learners.

Our findings could be relevant for the development of assessment tools to evaluate whether students are ready for safe and high-quality practice in farm animal health without supervision. The developed core EPAs could be a starting point for developing EPAs for companion and equine health. Further research is needed to determine how to implement EPAs in actual clinical practice and how to encourage supervisors to trust students to perform activities with increasing independence. Furthermore, supervisors and students should be trained to enhance giving and receiving feedback to ensure entrustment decisions are based on competencies and not perceptions of experience or exposure.⁴³

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest. The authors alone are responsible for the content and writing of the article.

NOTE

- a SurveyMonkey LLC, Palo Alto, CA, <http://www.surveymonkey.com>.

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