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AMEE GUIDE

Curriculum development for the workplace using Entrustable Professional Activities (EPAs): AMEE Guide No. 99

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Abstract

This Guide was written to support educators interested in building a competency-based workplace curriculum. It aims to provide an up-to-date overview of the literature on Entrustable Professional Activities (EPAs), supplemented with suggestions for practical application to curriculum construction, assessment and educational technology.

The Guide first introduces concepts and definitions related to EPAs and then guidance for their identification, elaboration and validation, while clarifying common misunderstandings about EPAs. A matrix-mapping approach of combining EPAs with competencies is discussed, and related to existing concepts such as competency milestones. A specific section is devoted to entrustment decision-making as an inextricable part of working with EPAs. In using EPAs, assessment in the workplace is translated to entrustment decision-making for designated levels of permitted autonomy, ranging from acting under full supervision to providing supervision to a junior learner. A final section is devoted to the use of technology, including mobile devices and electronic portfolios to support feedback to trainees about their progress and to support entrustment decision-making by programme directors or clinical teams.

Introduction

An Entrustable Professional Activity (EPA), a concept introduced in 2005, can be defined as a unit of professional practice that can be fully entrusted to a trainee, as soon as he or she has demonstrated the necessary competence to execute this activity unsupervised. The concept was developed to operationalise competency-based postgraduate medical education (ten Cate 2005; ten Cate & Scheele 2007), but is now more widely applied in health professions education (Mulder et al. 2010; Chen et al. 2015b).

The purpose of this Guide is to provide a practical framework for workplace curriculum development with EPAs. The Guide draws from the existing literature on competency-based education in the health professions that relates to Entrustable Professional Activities (EPAs). Central in this Guide is the conceptualisation of workplace competencies and EPAs as a two-dimensional matrix. While competencies are descriptors of the qualities of individual persons, EPAs describe the work that is being done or must be done in the workplace. Essential in our approach is that competencies are mapped to work, with the fundamental question in mind: does this trainee or professional have the requisite competencies and attitude to carry out the task that is demanded?

Much of the work in health care can be captured by tasks or responsibilities that must be entrusted to individuals. EPAs usually require a practitioner to integrate multiple competencies from several domains, such as content expertise, skills in collaboration, communication, and management. Conversely, each domain of competence is relevant to many different activities. Combining domains of competence and EPAs in a matrix reveals which competencies a trainee must achieve before being trusted to perform an EPA (ten Cate 2013, 2014a).

Practice points

- Entrustable professional activities (EPAs) are an emerging concept used in the implementation of competency-based medical education.
- An EPA is a unit of professional practice that can be entrusted to a sufficiently competent learner or professional.
- An EPA requires proficiency in multiple competencies simultaneously, and is a more suitable focus for assessment than separate competencies.
- EPA-based assessment results in summative entrustment decisions to act under a specified level of supervision.
- Mobile technology and electronic portfolios may serve to support EPA-related feedback and entrustment decision-making.

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This matrix provides specifications for assessment and feedback, for individual development and to ground entrustment decisions. This approach to workplace curriculum development leads to four overarching questions.

(i) *What is the work to be done?*
This question leads to the identification of EPAs. EPAs can theoretically be small (measuring and reporting blood pressure) or large (managing a clinical ward), but always have a *professional* nature, which excludes activities such as taking a lunch break or cleaning your desk.

(ii) *What must trainees demonstrate before we can trust them to do the work?*
For each EPA, the competencies necessary to enable entrustment decisions must be determined. All these competencies need to be present at a required level before a trainee should be entrusted with that task.

(iii) *How should trainees be prepared to meet these requirements?*
If EPAs are the primary focus of training, the conditions for entrustment decisions should guide training activities. Trainees must fully understand the components constituting each EPA. It is useful to specify the expected experience, knowledge, skill, and attitude to guide trainees in their preparation for entrustment. Some preparation can occur outside the workplace, most require training in the workplace.

(iv) *How do we assess trainees' readiness to pass the threshold of entrustment?*
Instead of using common assessment scales with their difficulties (Albanese 2000), the entrustment questions are: Do I need to assist this trainee? Can I leave the room/ward to come back later? Will I trust the information in the electronic patient record to be adequate and sufficient when I see it tomorrow? Assessment is framed in the context of supervision. The assessment becomes meaningful when translated to entrustment decisions for a specified level of supervision.

This Guide addresses these four questions and was written to support the building of a competency-based workplace curriculum.

Basic concepts and definitions

Workplace and workplace curriculum

The workplace is the context in which much, maybe most, of the learning occurs for health professionals. Workplace learning has been the dominant instructional setting for millennia (Billett 2014), but is only recently in the literature being acknowledged for its contribution to the attainment of essential professional competencies (Billett 2001). The development of educational theories and principles for classroom learning may have overshadowed the significance of learning in the workplace (Billett 2001). Trainees are expected to gradually learn the "tricks of the trade" by executing workplace activities. Efforts to analyse what happens in workplace learning have guided improvements to its quality and the workplace's effectiveness as a learning environment (Teunissen 2009; Dornan et al. 2014). In the 1980s, educational scientists introduced *experiential learning* (Kolb 1984) and also reinvented the term (*cognitive*) *apprenticeship* (Brown et al. 1989; Collins et al. 1989; Collins 2006) to stress the importance of authentic activities and social interaction to learning. *Situated learning* and *legitimate peripheral participation* within a *community of practice* (Lave & Wenger 1991) serve the same purpose. In health care education, clinical teachers have frequently complained about the lack of connection between what trainees learn in the classroom and what they can apply once placed in real work settings with patients. Integration of learning in the classroom with *learning in situ* has, therefore, been stressed to optimise medical curricula (Harden et al. 1984; Koens et al. 2005; Cooke et al. 2010). In particular, *vertical curriculum integration* (Dahle et al. 2002; Koens 2005; Wijnen-Meijer et al. 2010) implies a better connection between basic sciences and clinical practice. Published objectives for medical education in the past decades have consistently intended basic science knowledge to be instrumental to a higher clinical purpose (Anderson 1999; General Medical Council 2009; Van Herwaarden et al. 2009), and not to be an objective in itself of medical training.

We define a workplace curriculum as an organised set of experiences in a real-world setting that fosters the acquisition of competencies that are necessary to act as a professional. Features that characterise a workplace *curriculum* include (i) a trajectory of participation from low to high accountability, (ii) access to knowledge that would not be learned by discovery alone, (iii) direct guidance from more experienced others and experts, and (iv) indirect guidance provided by the physical and social environment (Billett 2001). It is against this background that curriculum building with EPAs takes place.

Competency-based education

Competency-based education, widely applied in medical training but also in other domains as veterinary medicine (Bok 2014), is defined by a tangible capability to perform in the workplace as the outcome of education. Competency-based education and its assessment require a workplace environment, even though preparation for it can happen before entering the workplace. The acquisition of competencies, integrating knowledge, skills and attitudes for the sake of working in practice (Epstein & Hundert 2002; Albanese et al. 2008; ten Cate 2014b), should be confirmed in a workplace environment. Competency-based medical education has been called "*an approach to preparing physicians for practice that is fundamentally oriented to graduate outcome abilities and organised around competencies derived from an analysis of societal and patient needs. It de-emphasises time-based training and promises a greater accountability, flexibility, and learner-centeredness*" (Frank et al. 2010).

Key elements of competency-based education focus on clearly defined outcome and independence of time (Orgill & Simpson 2014). Since workplace experience for trainees is usually organised in a rotational system with fixed periods of time, competency-based education may pose logistical challenges, as it requires some flexibility in time. Fundamental to competency-based education is that trainees are only certified

for competencies that they have been demonstrated to possess, or, phrased differently, for which they have passed a threshold that allows for limited supervision or unsupervised practice (ten Cate et al. 2010). Competency-based training with EPAs is basically a mastery learning approach to education. Mastery learning leads to certification only if trainees meet all requirements, regardless of the time needed to get there. This curriculum approach has proven effective (Kulik et al. 1990; McGaghie et al. 2010).

Entrustable professional activities (EPAs)

EPAs can best be considered discrete tasks or responsibilities that supervisors entrust a trainee with unsupervised, once s/he has obtained adequate competence (ten Cate 2005, 2014c). EPAs are units of professional practice (e.g. anaesthetic care of an uncomplicated patient), while competencies describe people's abilities (e.g. knowledge, professional attitude, communication skill). EPAs are executable within a given time, observable, measurable, confined to qualified personnel and suitable for focused entrustment decisions. EPAs were introduced to ground competencies in day-to-day practice (ten Cate 2005; ten Cate & Scheele 2007), as competencies are often felt to be too theoretical to validly assess (Grant 1999; Talbot 2004; Brooks 2009; Malone & Supri 2010; Glass 2014). EPAs as a focus of assessment lead to more integrated, holistic evaluation of trainees, which include both specific skills and the more tacit but important impressions of the trustworthiness of a trainee concerning a professional activity.

EPAs have now been identified for many graduate medical education programmes including obstetrics/gynaecology (Scheele et al. 2013), paediatrics (Gilhooly et al. 2014), internal medicine (Caverzagie et al. 2015), family medicine (Shaughnessy et al. 2013; Schultz et al. 2015), psychiatry (Boyce et al. 2011), haematology and oncology (Shumway et al. 2015) and pulmonary and critical care (Fessler et al. 2014a,b). Examples of EPAs from the literature are providing preoperative assessment, managing care of patients with acute common diseases across multiple care settings, providing palliative care, managing common gastro-intestinal infections in non-immunosuppressed and immune-compromised populations, conducting a family education session for schizophrenia, conducting a risk assessment, serving as the primary admitting paediatrician for previously well children suffering from common acute problems, pharmacological management of an anxiety disorder, providing end-of-life care for older adults and office-based counselling in developmental and behavioural paediatrics.

The EPAs-competencies matrix

Units of work and abilities of persons can be viewed as two dimensions of a grid. Mapping EPAs to competencies is basically answering the question: Which competencies must an individual possess before a critical activity can be entrusted to this person to complete unsupervised?

In most cases, an educational programme has an existing list of competencies, outcome-oriented objectives, or knowledge, skills and attitudes that define the desired qualities of graduates. A well-known framework in the medical domain is CanMEDS that defines these qualities in seven roles or competency-domains (Frank 2005), including, among others, content expertise, communication and collaboration ability, and a professional attitude. The matrix combines EPAs with competencies as depicted in Figure 1.

	EPA1	EPA2	EPA3	EPA4	EPA5	EPA6
Competency 1	•		•	•	•	
Competency 2		•	•	•		
Competency 3		•	•	•		•
Competency 4	•	•				
Competency 5	•	•	•		•	•
Competency 6			•			
Competency 7		•	•			•

Figure 1. EPAs-competencies matrix.

Figure 1 illustrates that competencies almost invariably map to multiple EPAs and that the trustworthy execution of any EPA requires multiple competencies. In the example shown, some EPAs are broad and complex, requiring competencies in various domains (EPA3), while other EPAs may be more focused (EPA5). Conversely, some competencies may be so general that they are important requisites for many EPAs (Competency 5), while others are rather specific, and only needed for few EPAs (Competency 6). The literature shows several examples of such matrices (Mulder et al. 2010; Jones et al. 2011; ten Cate 2013; Rose et al. 2014).

The significance of the matrix lies in the assessment guidance it provides for both trainees and supervisors. Trainees know the expectations for earning trust to complete a specific EPA; supervisors know what to evaluate before making an entrustment decision. For each dot, the most appropriate sources of data to inform entrustment decisions and feedback to the trainee should be determined.

Matrix mapping of an educational programme requires careful analysis of the expected professional activities. Ideally, a comprehensive list of EPAs constitutes the core of the profession, expressed in all activities that professionals are expected to carry out. As a next step, these activities are mapped against an existing framework of competencies. Competencies that need to be present to execute the EPA must be identified and should guide the assessment of trainees to enable entrustment decisions. To give a simple example: if an EPA is "taking a history", clearly both medical knowledge and communication skill are competencies that, in an inseparable combination, must be present. Both should be assessed before a trainee is trusted to enact this EPA without supervision or confirmation of collected history information.

Learning to assume responsibility

A major challenge for medical educators is to let trainees assume responsibility for patient care. Pressure on patient safety has resulted in stricter supervision in several countries as well as a decrease in trainee responsibility. Work time restrictions for residents, the need to provide care as quickly and efficiently as possible, and the introduction of managed care, only reimbursable if provided by licensed specialists, have likewise put attending physicians in more dominant roles, over trainees (Kennedy et al. 2005; Teman et al. 2014). This trend is justifiable from a patient safety perspective but not from an educational perspective (Halpern & Detsky 2014). Delaying full supervision for patients until the end of postgraduate training may actually jeopardise safe patient care after certification. While still in training, learners can and should practice with some autonomy while having the opportunity to debrief and correct actions with a supervisor. If graduates from residency programmes have never learned to assume this responsibility, they place their patients and themselves in potential danger. An EPA-based competency curriculum aims to establish this gradual increase of responsibility and autonomy in a safe and justifiable way (ten Cate et al. 2010).

Levels of supervision

EPA-based assessment is framed as entrustment to carry out critical activities under a designated level of supervision. In other words, a trainee is primarily evaluated to determine how much supervision s/he needs for a specified EPA, designated by five levels of supervision (ten Cate & Scheele 2007; ten Cate 2013): (1) no permission to act, (2) permission to act with direct, pro-active supervision present in the room, (3) permission to act with indirect supervision, not present but quickly available if needed, (4) permission to act under distant supervision not directly available ("unsupervised") or (5) permission to provide supervision to junior trainees. This supervision concept will be explained in detail later.

Portfolios to organise and support competency-based development

Portfolios were originally showcases of personal accomplishments in arts, crafts, architecture and other domains, used in job applications and for potential customers. In health professions education, they have evolved into personal repositories of evidence or information, usually trainee-owned, to document progress and to stimulate reflection (Carraccio & Englander 2004). Since the turn of the century, portfolios have gradually become accepted as a useful tool in health professions education with this two-fold purpose (O'Sullivan et al. 2004; van Tartwijk & Driessen 2009). Electronic portfolios are becoming the standard, allowing access to different parts of the content by various target groups. As workplace learning grows more individualised and its assessment becomes dependent on multiple information sources, portfolios gradually become inevitable repositories to document where trainees are positioned. Whoever works with the trainee in health care settings should know which EPAs this trainee has mastered at the level of unsupervised practice (level 4). Access to this part of a portfolio may be granted to colleagues and nursing staff.

Translating professional work into EPAs

Programmes that consider applying EPAs usually have an existing framework of objectives, constructed locally, regionally or nationally. They may have existing competencies, milestones or other frameworks. These can be enhanced by the use of EPAs. While useful as a tool to ground competencies and milestones in the workplace, Entrustable Professional Activities are not an educational concept per se, but merely structured descriptions of professional work. One purpose of defining an EPA is to ground assessment in the activities of the workplace. Thus, curriculum building with EPAs begins with a clear elaboration of what professionals do in practice. It is *job analysis* with an educational purpose in mind. Job task analysis leads to an overview of tasks sometimes categorised by frequency (very rarely to multiple times per day), importance (not to very) and difficulty to master (easy to difficult) (Jonassen et al. 1999). For EPAs in health care, "importance" would also include how critical it is that the task be done safely. Labelling EPAs this way is not always necessary, but it may help trainees focus on the most important experiences. Key steps are identifying, elaborating and validating EPAs.

Identifying EPAs

Identifying EPAs as suitable units of professional practice is usually an iterative process among professionals. One method is to have a small group of professionals with a similar background analyse a week of work in the profession, starting Monday morning and ending Sunday evening, at a typical location, such as a health care subspecialty ward, and identify units of work that can serve as an EPA. An important question to ask is what graduates of the programme are expected to do when starting a new phase in the trajectory, such as a residency after graduation, a fellowship after residency or unsupervised practice after a residency or fellowship. Several authors have provided such lists of activities (Raymond et al. 2011; Dijkstra et al. 2013).

Number and breadth of EPAs

Activities can be small or large. There is no easy answer to the "right" breadth of EPAs and consequently to the number of EPAs. If the question is "What is the scope of responsibility that is covered when an EPA is entrusted to a trainee for indirect supervision?" then clearly big differences can arise depending on the level of trainee in question. The first EPA that may be entrusted to a medical student could be "measuring blood pressure". If we consider this unit of professional practice or activity that one can trust a trainee to complete unchecked, then it is a true EPA. But clearly, this responsibility is part of a full standard physical examination that is a more logical activity for entrustment for more advanced medical trainees. The full standard physical examination, in turn, can be included in a broader EPA of a standard outpatient

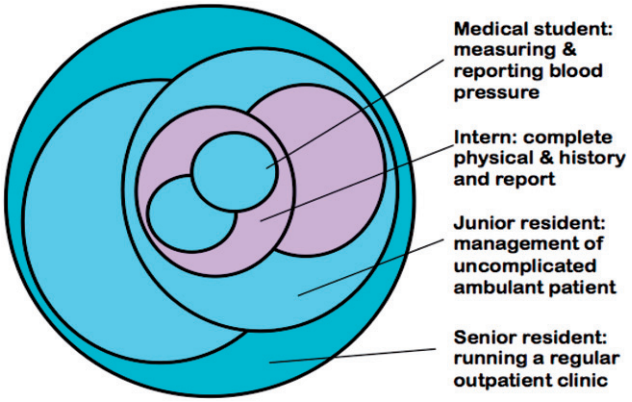

Figure 2. Nested EPAs.

consultation that also includes the history. In technical terminology, smaller EPAs are nested within larger EPAs (Figure 2).

The breadth of an EPA can be related to the end-of-training programme requirement, or the entrance requirement for the next phase of training. Examples are the "EPAs for entering residency" (Englander et al. 2014) or the geriatric "end-of-training EPAs" (Leipzig et al. 2014). This does not mean that the EPAs are only mastered at the end of that training period. Indeed, key to competency-based training is that EPAs may be mastered and awarded with a decrease of supervision and increase in autonomy as soon as the trainee demonstrates the required competence.

Another important consideration relates to the granularity of EPAs. EPAs are meant to be units of practice that can be awarded a STAR (statement of awarded responsibility), i.e. a formal acknowledgement of the ability and right to practice at a certain level of supervision. As this signifies a significant step towards joining a professional community, it does not make sense to distinguish hundreds of small EPAs, thereby losing their significance. Warm et al. (2014) have recently proposed to name such small units "observable practice activities" to be clustered into larger EPAs. Even for early EPAs such clustering makes sense. One proposed early EPA for a first clerkship at University Medical Centre, Utrecht, The Netherlands is "*Routine check-up of a stable adult patient*" (see Table 4). This EPA includes measuring vital signs – heart rate, respiratory rate, temperature, blood pressure and oxygen saturation – explaining all actions to the patient and documenting and reporting results to the members of the health care team. Each of these is an activity, but logically they constitute together one EPA that allows for formal permission to do all included activities with only indirect supervision. A medical student, entrusted with this EPA at a level of indirect supervision, is trusted to do any or all these activities without a supervisor present in the room.

The breadth or the size of EPAs is directly linked to the number of them, and the smaller they are the more are needed to cover professional practice. In an educational programme, entrustment decisions for EPAs are meant to be significant moments that constitute increasing trust and increasing responsibility in trainees aligned with a generally supported need for progressive independence or autonomy (ten Cate et al. 2004; Kennedy et al. 2005; Dijksterhuis et al. 2009; Kashner et al. 2010; ten Cate et al. 2011; Halpern & Detsky 2014). An EPAs-based workplace curriculum should map out a route for individual trainees with summative entrustment decisions at significant moments in their training that lead to acknowledged permission to act in patient care. The units of professional practice that the EPAs represent should be sufficiently large that entrustment for unsupervised practice means a significant step. Examples are "General procedures of a physician" for undergraduate training that include several procedures (Englander et al. 2014), "Complicated antenatal care" within obstetric residency (Scheele et al. 2013) and "Mammography" within radiology residency (Van Schaik & Bennink 2015) which are quite comprehensive EPAs.

This approach leads to the general recommendation that trainees have not much more than 10 moments per year of summative entrustment decisions for EPAs. The quickly growing literature that describes EPAs for educational programmes show the following numbers of EPAs (Table 1), mostly aligned with this recommendation.

Some common misunderstandings

Examples of EPAs may be found in the literature (see references from Table 1). While most of the EPAs that have been proposed comply with the characteristics provided earlier in this Guide, observable, measurable, having a designated time frame, and being suitable for an entrustment decision, some published EPAs do not and they may pose problems when assessment and entrustment are operationalised (ten Cate 2014c). Some common misunderstandings are useful to elaborate. They are illustrated with examples drawn from the published literature and from conversations with educators designing EPAs for their programmes.

(a) *EPAs that are not discrete tasks and unsuitable for focused entrustment decisions*

Examples include "Practicing personal habits of lifelong learning"; "Demonstrating professional behaviour"; "Identifying system failures and contributing to a culture of safety and improvement; minimising unnecessary care"; "Minimising unfamiliar terms during patient encounters; Improving the quality of health care".

There is no dispute that the ability to do these things is essential. It is, however, difficult to envision a moment at which trainees are entrusted to carry these out with only indirect supervision or unsupervised. They *are* activities, and they *are* important, but they do not fully meet the EPA definition. Rather, they are on-going habits that should be present as trainees mature to be professionals. They should be addressed in education and are conditions for entrustment of various different EPAs, but are not EPAs or units of work in themselves.

(b) *EPAs that are inseparable from other EPAs*

Examples include "Managing the sad patient"; "Recognising child abuse".

Somewhat similar is this caveat. These may be important skills, but as sad patients may have various diseases and may be sad because of medical conditions, managing sad

Table 1. Numbers of EPAs proposed, related to programme length.

Source	Programme	Length (years)	Number of EPAs
Mulder et al. (2010)	Physician assistant education	2.5	5–8
Boyce et al. (2011)	Psychiatry residency, 1st year	1	4
Jones et al. (2011)	Paediatric residency	3	17
Hauer et al. (2013)	General internal medicine residency	3	30
Chang et al. (2013)	Internal medicine (patient-centred med. home programme)	Unspecified	25
Shaughnessy et al. (2013)	Family medicine residency	3	76
O'Keeffe (2014)	Developmental-behavioural paediatrics residency	Unspecified	14
Englander et al. (2014)	Undergraduate medical education (± 2.5 year clinical)	2.5	13
Fessler et al. (2014a,b)	Pulmonary care residency	1–2	18
Fessler et al. (2014a,b)	Critical care medicine residency	1–2	13
Rose et al. (2014)	Gastro-intestinal fellowship	3	13
Caverzagie et al. (2015)	Internal medicine residency	3	16
Chen et al. (in press)	Undergraduate medical education pre-clerkship training	2	5
Shumway et al. (2015)	Haematology/oncology fellowship	2–3	5
Schultz et al. (2015)	Family medicine	2	35

Table 2. Sample of suggested EPAs ranked by typicality of being an EPA.

Features Activity	High Risk	Irreversible in its consequences	Key to safe health care on the spot	Would this typically be an EPA?
1. Conducting a laparoscopic cholecystectomy	+++	++	+++	Yes
2. Administering critical medication	+	+	++	Yes
3. Breaking bad news to a patient's family	±	±	±	Yes
4. Designing and presenting a new therapy protocol	−	−	+	Yes
5. Conducting a literature review	−−	−	−	No
6. Designing a personal development plan	−−	−−	−−	No

patients cannot easily be viewed as a stand-alone EPA. Rather one would hope that most medical graduates would be able to cope with sad patients across various EPAs. Likewise, recognising signs of abuse when examining a child is important but not a stand-alone EPA.

(c) *EPA titles and specifications that sound like educational objectives*

An example is (title:) "Evaluates and manages a high acuity, low complexity patient" (and specification:) "The resident must possess the fund of knowledge required in emergent circumstances where time is of the essence and the situation does not allow time to utilise resources . . . etc.". The EPA title should preferably be written as "Evaluating and managing high acuity low complexity patients" (note the plural) and the EPA specification should merely describe the activity in more detail, e.g. "This EPA includes the management of high acuity, low complex patients without the usual resources . . . etc."

EPAs are merely units of work. Reference to persons and their ability should thus be avoided.

(d) *EPA titles that include adjectives that refer to proficiency level*

Examples include "Skilfully facilitating a family meeting"; "Safely and efficiently performing common critical care procedures".

EPAs are features of work, not features of persons. Adjectives as to how well the job must be done are not necessary. "Skilfully" would hold true for any EPA, just as "carefully", "adequately", and "safely". They all connote how well the task is done; the task itself, however, should be neutral.

(e) *EPAs that are too broad*

An example is "Care for acute or new patients".

This EPA is too broad. The rationale for using EPAs is that smaller units of practice allow for feasible assessment and focused entrustment decisions (and part-certification). If an EPA is too broad or comprehensive, the benefit of such focus disappears. Registration for a specialty may be viewed as an entrustment decision for one larger EPA (i.e. executing the full specialty), but that makes little sense. The purpose of EPAs is the distinction of units of practice that allows for separate entrustment decisions and gradually increasing responsibilities.

(f) *EPAs that are discrete tasks, but not suitable for entrustment decisions*

An example is "Designing a personal development plan"

This may be important for personal education and development, but this EPA is not a task of patient care that needs to be carried out.

EPAs can differ in the degree to which they meet components of the EPA definition. To illustrate this, Table 2 shows six different EPAs that have critical features related to the question "can we trust someone to do this". The first EPA (conducting a laparoscopic cholecystectomy) is high risk, even with direct supervision. The last EPA is low risk, not at all irreversible and has basically no consequences for safe health care. EPAs 1–4 could be called true EPAs, 5 and 6 would not be called EPAs.

We recommend that "conducting a literature review" not be considered an EPA, as one cannot envision an entrustment decision before which a trainee is not permitted to do this unsupervised. Designing one's personal development plan is actually not part of the necessary tasks that must be carried out by the profession. One way to think of EPAs is to imagine a list of tasks that must be done and posted in a job advertisement. It would be unusual to hire personnel to design their own personal development plan.

Are all activities of professionals EPAs?

The question arises: do professionals ever do things that are *not* EPAs? The answer is yes (and often) and this is a source of confusion that requires clarification. First, not all activities are *professional* activities in the strict sense of EPAs. Professional activities are those that non-professionals are not usually trained, equipped or permitted to do (ten Cate 2005). Some things physicians do may only be indirectly related to health care execution (such as personal development activities) and cannot be envisioned as being permitted only with close supervision until entrustment. Others are not stand-alone EPAs, such as "cost effective utilization of resources" or "applying methods to maximise adequate patient experience". Recalling the matrix-mapping approach described earlier (Figure 1), these "activities" are rather competencies in domains such as professionalism, management or systems-based practice. They are important to verify when trusting trainees to execute true EPAs, such as "evaluating and managing low-acuity, low complexity stable patients in the ER", but are not EPAs themselves.

Can all EPAs together cover a profession?

Core EPAs of a profession should constitute the expected standards for all professional practitioners. The question here is whether the profession can be characterised by competencies and qualities that do not relate to EPAs. To some extent this is a philosophical question. If a specialist is defined by what he or she does, then EPAs should be able to cover this. If the specialist is defined by their attitudes and habits, EPAs may be inadequate to comprehensively describe physicians.

Elaborating EPAs

For educational purposes, it is not sufficient to identify EPAs only as a simple list of tasks or titles. The reason is that most formulations of tasks are open to multiple interpretations. To enable an entrustment decision ("the trainee may now do this with only indirect supervision"), there must be specifications. To illustrate this, if the EPA is "Gather a history and perform a physical examination", the entrustment decision must include specifications and limitations. For example, for medical students, high-risk, high-complexity patients requiring urgent care should be inappropriate. In addition, the matrix-approach to using EPAs requires specification of which competencies or sub-competencies should be present before trainees may be trusted to act unsupervised or with only indirect supervision. A plan for assessment is needed to guide trainees in their preparation for entrustment decisions.

The recommended full description of an EPA, therefore, includes the rubrics described in Table 3, evolved from earlier versions of this format (Mulder et al. 2010; ten Cate 2013). Some refer to assessment, supervision levels and entrustment decision-making explained later in this Guide.

Most sections are applicable to EPAs in multiple settings (departments, hospitals and clinics), and some may be context specific. Table 4 shows the full description of one early undergraduate EPA.

Validating EPAs

EPAs should be as relevant as possible, and supported by those who work with it. With validation we primarily focus on content validation (Is an EPA truly part of work, does it comply with the EPA definition and is it fit for its purpose?). Validation of EPAs aims to align them as closely as possible with common requirements for graduates from the programme and should lead to well-founded recognition of entrusted EPAs. Content validation of a set of EPAs also aims to cover all core activities of a profession. This can be done by comparing EPAs with existing documents such as curricular blueprints and publications, with expert opinions or by both. Soliciting expert opinions not only ensures the quality of the set of EPAs but also informs and involves faculty who may be working with these EPAs in the future. Evidence for content validity of EPAs can be gathered with several techniques as elaborated below (Table 5). A study by Chen et al. (in press) shows various approaches that can be used.

Expert meetings

Chang et al. (2013) gathered a wide range of internal medicine experts (programme directors, clinicians, educators and researchers) at a national two-day meeting preceded by multiple e-mail and telephone preparatory conversations reviewing the literature. At the summit, three sessions were held with different compositions of delegates to refine EPAs, resulting in a consensus list somewhat similar to a procedure conducted by Fessler et al. (2014a,b). Chen et al. (in press) used the opportunity at local, national and international education conferences to conduct structured group discussions to refine pre-clerkship EPAs. Leipzig et al. (2014) described how two national meetings of geriatricians, a year apart, were used to validate EPAs in geriatrics, proposed by a working group.

Surveys and interviews among experts

Boyce et al. (2011) surveyed 470 fellows of the Australia and New Zealand College of Psychiatry with 30 proposed EPAs for psychiatry training. They asked which should safely be entrusted to unsupervised residents at the end of the first year, leading to four priorities, subsequently developed into EPAs. Spenkelink-Schut et al. (2008) interviewed urologists with the question "what of your work would be suitable to trust well-trained physician assistants to take over as EPAs?".

Delphi procedure

In a Delphi procedure, experts are approached individually to answer a survey, are then fed back its aggregated results to

Table 3. Components of a fully described EPA.

1. Title of the EPA	An EPA title should be concise and informative, i.e. readily understood. As it only reflects work, it should not be stated as a learning objective, or skill, merely as an activity. Try to limit to 10 words or less. Use neutral infinitive tense to avoid the association with individuals (e.g. ''discharging patients'' instead of ''discharges a patient'')
2. Specification and limitations	This specification should clearly list what is included in the activity and what is not included, given the level of the intended trainees. It should also include the context and targeted transition (e.g. entering residency, fellowship, autonomous practice)
3. Most relevant domains of competence	This section relates the EPA to the competency framework used. Those domains of competence or competencies of the framework that are most applicable may be mentioned
4. Required experience, knowledge, skills, attitude and behaviour	Trainees should be aware what knowledge, skills and attitudes are expected before they can be trusted to carry out the EPA; this will help them to prepare for entrustment. It may also be helpful to understand which workplace experiences are considered necessary before entrustment (type of rotation, type of patients, number of procedures)
5. Assessment information sources to assess progress and ground a summative entrustment decision	Supervisors should be aware what sources of information should be used to determine progress. That can be observed behaviour or skill at the bedside or at morning report meetings; a skills test; information from colleagues, nursing and patients; a double-checked procedure; a case-based discussion and other sources. For trainees as well as supervisors it is important to state how many times an EPA or its constituent parts must have been observed to enable taking a summative entrustment decision, and to state who takes this decision. It is highly recommended that multiple staff members sign off such decisions. Supervisors should feel personal responsibility for these important decisions
6. Entrustment for which level of supervision is to be reached at which stage of training?	The consequence of an entrustment decision is stated as the permission to act under a designated level of supervision (e.g. indirect supervision, or distant supervision) not generally permitted before that time Next, it is necessary to state at which transition of training trainees must ultimately master the EPA at the designated level. Graduation should require that all core EPAs of the programme be mastered When building an individual workplace curriculum it is useful to estimate when this trainee is expected to receive the entrustment decision, based on prior training and expected rotations and experiences
7. Expiration date	Optional but recommended is stating expiration dates. Entrustment should drop if no maintenance of competence for this EPA happens, e.g. over a period of one up to 5 years, depending on the EPA. Revalidation may require a marginal or a more substantive check

refine their original responses. This is repeated in subsequent rounds as necessary. Hauer et al. (2013a,b) applied this technique among 22 educators and 12 residents at three hospitals and Shaughnessy among 21 experts for family medicine residency. Delphi procedures are being used regionally to establish validity of EPAs for end of undergraduate medical education at Charité University medical school in Berlin, for residency training in anaesthesiology in the Netherlands, and for undergraduate veterinary training in The Netherlands.

When validating EPAs through surveys or Delphi procedures, it is of great importance that respondents are aware of the EPA definition. Suggested but flawed EPAs such as ''Minimise unnecessary diagnostic tests'' have been added by Delphi respondents as very important. As it is not a task that can move from being directly supervised to indirectly supervised, it should not be identified as an EPA. Validating EPAs may gain buy-in from important target groups, but respondents are not always aware of its definition. Once adopted, flawed EPAs may be difficult to correct. This makes a combination of survey and face-to-face validation procedures that allow for explanation useful.

Nominal group technique

Touchie and colleagues used a nominal group technique to identify EPAs that residents in their first year in multiple specialties should accomplish doing independently (O'Neil & Jackson 1983). She asked eight subject matter experts during a brainstorm session to each list as many EPAs as possible that could meet this condition, yielding 25. A consensus discussion in the group led to 10 EPAs that subsequently were ratified by a national panel of nine medical educators (Touchie et al. 2014).

Building and maintaining an individualised workplace curriculum with EPAs

While some curricula are preferably standardised and uniform for all students, workplace curricula are far less standardised and hence different for each student. In a competency-based curriculum model, individual adaptations in curricula are necessary, guided by workplace and practice experiences. Building a workplace curriculum using a set of validated EPAs can be viewed as a *task-based instructional strategy*, described by Merrill (2007), following his five research-based ''first principles of instruction'' (1) *Task-centred* – learning is

Table 4. Example of an early EPA in undergraduate medical education.

1. Title of the EPA	Routine check-up of the stable adult patient
2. Specification and limitations	This EPA includes no more and no less than 1. Measuring vital parameters: heart rate, respiratory rate, temperature, blood pressure, oxygen saturation 2. Explaining all actions to the patient 3. Reporting results to the health care team including interpretation, orally and/or written *Context*: ambulatory and inpatient setting Targeted transition point: first fulltime clinical clerkship to next clerkship *Limitations*: only with haemo-dynamically stable patients 18 years old and older
3. Most relevant domains of competence	X Medical Expert ☐ Health Advocate X Communicator ☐ Scholar X Collaborator ☐ Professional ☐ Manager
4. Required experience, knowledge, skills, attitude and behaviour	Knowledge – basic knowledge of anatomy including relevant arteries – normal values of vital parameters Skill – skill in using necessary devices to measure vital parameters – recognition of stable and unstable patients Attitude and behaviour – professional communication with the patient – proactive alertness in case of adverse events – willingness to ask for help if needed Experience – all measurements done at least five times
5. Assessment information sources to assess progress and ground a summative entrustment decision	Observation: satisfactory observation of all measurements at least twice by experienced health care professionals (nurse, physician or other) Case-based discussions: one CBD with an qualified health care professional
6. Entrustment for which level of supervision is to be reached at which stage of training?	Indirect supervision (level 3) ultimately before the transition to the second full time clinical clerkship
7. Expiration date	One year without practice after summative entrustment decision

promoted when learners acquire concepts and principles in the context of real world tasks, (2) *Activation* – learning is promoted when learners activate relevant prior knowledge, (3) *Demonstration* – learning is promoted when learners observe a demonstration of skills to be learned, (4) *Application* – learning is promoted when learners apply their newly acquired knowledge and skill, and (5) *Integration* – learning is promoted when learners integrate their new skills into their everyday life. A curriculum focused on EPAs with the prospect of acquiring the permission to execute these with no or indirect supervision follows just that strategy.

A general framework for the workplace curriculum

Workplace curriculum building begins with mapping the expected time of entrustment decisions during training in a way that can be adapted for individual trainees if necessary. In Figure 3, five EPAs of a programme show how trainees are expected to increase (in darker shades) in competence until they have reached a moment at which they should be trusted to perform this activity unsupervised, or, in undergraduate medical education, to act with indirect supervision. The stars represent the Statements of Awarded Responsibility, following formal summative entrustment decisions (ten Cate & Scheele 2007; ten Cate et al. in press). Entrustment for EPAs A, C and E is expected to be reached later than for EPAs B and D. An individualised sequence should be agreed upon with the trainee and can be viewed as a learning contract with mutual committed efforts from the supervisor and trainee.

Individual workplace curriculum	PGY 1		PGY 2		PGY 3		PGY 4	
EPA A		1	2	2	3	★	4	5
EPA B	1	2	3	3	★	4	4	5
EPA C		1	1	2	3	3	★	4
EPA D	2	2	2	3	★	5	5	5
EPA E	1	1	2	3	3	★	4	4

Figure 3. An individualised workplace curriculum framework with expected supervision levels.

Supervision levels related to entrustment decisions

Entrustment decisions require a specification of exactly what has been decided. Trust relates to the acceptance that the trustee is permitted to act in circumstances where risks are present but can be managed. Trainees may be trusted and licensed to drive a car unsupervised when adequate driving skill and relevant knowledge has been demonstrated. Their competence has reached a threshold that permits them to

Level 1 - Be present and observe
Level 2 - Act with direct, pro-active supervision, i.e. with a supervisor physically present in the room
Level 3 - Act with indirect, re-active supervision, i.e. readily available on request
Level 4 - Act with supervision not readily available, but with distant supervision and oversight
Level 5 - Provide supervision to junior trainees

Figure 4. General framework of permissions, related to supervision levels.

Table 5. Strategies described in the literature to validate EPAs among experts.

Strategy	Explanation	References to examples
Expert meetings, national or international	Meetings of experts during conferences or gathered for this purpose are used to build consensus about EPAs	Chang et al. (2013), Fessler et al. (2014a,b), Chen et al. (in press), Hauer et al. (2013) and Caverzagie et al. (2015)
Surveys	Asking an expert populations to score the validity of EPAs for a designated purpose	Boyce et al. (2011)
Delphi procedure (Jones & Hunter 1995)	Carefully selected experts are surveyed with a list of EPAs to score their validity on a scale; aggregated results are presented to the subjects to refine their original score. If needed, a third round is conducted	Fessler et al. (2014a,b), Hauer et al. (2013). In preparation: Wisman-Zwarter et al., Duijn et al. and Peters et al.
Nominal group technique (Jones & Hunter 1995)	Establish a listing of potential EPAs among an expert group until no new EPAs can be thought of. Then refine the list by grouping and prioritizing to finalize with a best consensus list	Touchie et al. (2014)
Interviews	Programme directors can be interviewed asking ''what activities would you expect incoming residents be able to do without direct supervision'' or hospital department heads about which EPAs newly hired specialists should be able to do autonomously	Westerveld et al. (2004) and Spenkelink-Schut et al. (2008)

do this. The risk of accidents is now considered low and manageable.

For trainees in the health care domain, a more subtle transition between full supervision and unsupervised practice aligns better with heath care practice. The five levels of decreasing supervision, most used when applying EPAs, are described in Figure 4 (ten Cate & Scheele 2007; ten Cate et al. 2010; ten Cate 2013).

This supervision framework aligns with the standards of the US Accreditation Council for Graduate Medical Education (ACGME). Level 2 equates with ACGME's ''direct supervision'', Level 3 with ''indirect supervision'' and Level 4 with ''Oversight'' (Whalen & Wendel 2011), Level 1 may equate with a white-coat or oath ceremony. Is also resembles the Zwisch scale of supervision in surgery (DaRosa et al. 2012; George et al. 2014).

An individual curriculum can be built, showing not only the moment at which the major level 4 decision is expected to be made but also the other levels of supervision (Figure 4). Such agreement can give direction to expectations for trainees and supervisors. However, it should not lead to the *right* to work unsupervised if the expected competence has not yet been demonstrated. Flexibility to adapt moments of entrustment decisions is needed to realise true competency-based education. Both trainees and individuals in the workplace environment, such as nurses, should know at any moment at which level a trainee is qualified to act for any given EPA. This does not preclude supervisors from granting *ad hoc* permissions at the next level, to allow trainees to start acting with less supervision, for educational purposes.

Figure 3 only shows a very schematic version of the timeframe. In this example, EPA E could be practiced at level 2 from the beginning of the first semester of programme year 2. But gradually, say after a few weeks, EPA E could be practiced ad hoc at level 3, with frequent close observation, to make sure that by the end of that semester a formal and summative entrustment decision can be taken that allows for working at level 3 from the beginning of the second semester forwards. At the start of a new clinical rotation, there may be a verification of the level for which the trainee's portfolio indicates s/he has been certified. Next, a supervisor may allow the trainee to take more ad hoc responsibility to enable monitoring whether s/he can be ready to be entrusted with a higher level of autonomy and to advise a programme director or the trainee to opt for more autonomy at a next progress review. For undergraduate training, Chen et al. (2015b) have recently recommended a more granular framework of supervision levels as depicted in Table 6.

Task-based instructional strategy

To prepare trainees for professional tasks, EPAs may lead to mini-curricula, derived from their description (see Table 3). While the professional context may not be altered for

Table 6. General framework of permissions, elaborated for undergraduate medical education.

Standard entrustment and supervision framework	Granular sub-levels proposed for undergraduate medical education (Chen et al. 2015b)
1. Be present and observe	
2. Act with direct, pro-active supervision, i.e. with a supervisor physically present in the room	a. Act in co-activity with supervision b. Act alone, but with a supervisor in room ready to step in if needed
3. Act with indirect, re-active supervision, i.e. readily available on request	a. Act with supervisor immediately available, all findings being double-checked b. Act with supervisor immediately available, key findings only being double-checked c. Act with supervisor distantly available (e.g. by phone), findings being reviewed
4. Act with supervision not readily available; there may be distant supervision and oversight	
5. Provide supervision to junior trainees	

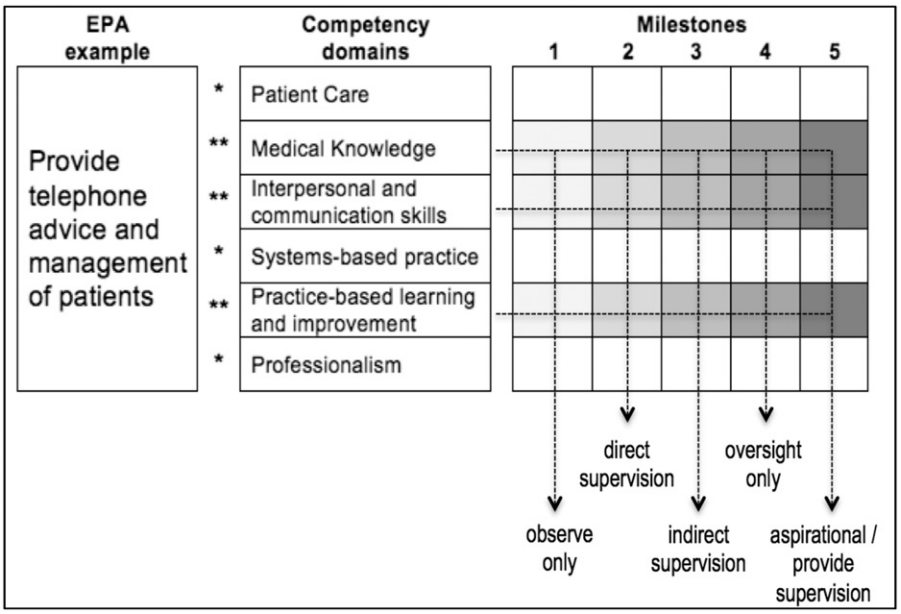

Figure 5. Connecting EPAs and competencies with milestones and supervision levels.

educational purposes, experiences of trainees can be influenced by selecting and sequencing of activities (Chen et al. 2015a). Complex EPAs may require preceding practice in a simulated environment or self-directed study effort (Cohen et al. 2013) shortly before entering the workplace. In the workplace, regular coaching, role modelling, instruction for specific EPAs and practice opportunities with frequent, specific feedback are conducive to learning.

The most important strategy is regular, on-going contact with a clinical teacher for coaching and the provision of feedback. Indeed, time is needed to build the trust that is necessary for entrustment decisions (Hirsh et al. 2013; Hauer et al. 2014).

Connecting EPAs and competencies with milestones and supervision levels

Milestones are behavioural descriptions on a scale that indicates a developmental trajectory and are mandated for residency programmes in the United States (Swing et al. 2013). Figure 5 shows how EPAs can connect with milestones. The milestones next to the competency domains show shades of grey, describing trainee behaviour development toward competence and proficiency. The arrows show how trainees must align with multiple behaviour descriptions to be allowed to conduct this EPA under direct supervision, under indirect supervision or with oversight only. Readers interested to see milestone behaviour descriptions are referred to two supplements of the Journal of Graduate Medical Education (March 2013 and March 2014) for postgraduate programmes and to Englander et al. (2014) for undergraduate medical education. The descriptions can be a great help for educators to develop an understanding of how trainees impress at various stages of development.

Core, specific and elective EPAs

Core EPAs should be those to be mastered at a specified level ("unsupervised practice" for residents, "indirect supervision" for medical students) by *all* trainees in the programme; there

should be no possibility of graduating and finishing the programme if any of these is not mastered at the required level, compliant with the fundamental philosophy of competency-based medical education (Carraccio et al. 2002; Englander et al. 2014; ten Cate 2014c). Non-core EPAs may also exist. In residency training, non-core EPAs may pertain to focused areas of interest. For example, the proposed EPA-based new national curriculum in Radiology & Nuclear Medicine in the Netherlands expects every graduate to choose one or two focus areas (e.g. cardio-thoracic radiology, paediatric radiology, intervention radiology), to supplement the core EPAs in radiology (van Schaik & Bennink 2015). They allow for flexibility of competency-based training, as some residents will end training being certified for two focus areas and others with only one focus area. Likewise, Chen et al. (2015b) have proposed elective EPAs next to core and specialty-specific EPAs in undergraduate medical education.

Assessing trainees using entrustment decisions for EPAs

The final step in consolidating an EPA-based competency curriculum is making sure that the decisions to entrust trainees with professional tasks are well founded, serve as landmarks to guide trainees in their learning activities and are the focus of feedback and monitoring.

Instead of using neutral value statements such as numbers or labels on a scale (1–10, A–E, fail to outstanding) the focus with EPAs shifts to statements about required supervision. By doing this, educational objectives are linked to health care and patient safety objectives (Kogan et al. 2014). Supervisors may ask themselves: Can I leave the room? Do I need to return to check? Can the trainee finish without me? Can the trainee manage the admission of a patient without proactive assistance? Can the trainee now do this procedure, manage the case, work the apparatus, chair the meeting, hand over the patient et cetera without support? Assessing competencies has proven troublesome (Albanese 2000; Govaerts et al. 2007; Lurie et al. 2009, 2011) and it is likely that reliability and validity increases when professionals can focus on activities and required supervision (ten Cate 2006; George et al. 2014; Weller et al. 2014).

Ad-hoc and summative entrustment decisions

While a traditional assessment reflects how a trainee has performed when observed, an entrustment decision looks into the future and represents a calculated risk, anticipating that the trainee will do well when there is no supervision. It combines evaluation with an estimation of risk.

Entrustment decisions may be distinguished in (i) *ad hoc entrustment decisions* that happen every day, usually taken by individual supervisors and pertaining to immediate permission for the trainee to act, and (ii) *summative entrustment decisions* that are grounded in more systematic observation, leading to lasting permission to act under a specified level of supervision, comparable with the driver's license that formalises permission to drive unsupervised from that point onwards (ten Cate et al. in press).

Ad hoc entrustment is without long-term consequences. They are affected by many variables, and it is not useful to try to arrive at reliability. They are bound by context and by the nature of the task ("I trust you to do *this* procedure with *this* patient, *this* afternoon, knowing that my colleague *John* is around who is familiar with the patient and with the procedure. If you do well, I might ask you to do it tomorrow too, when John is not available. But let's first evaluate this evening, and I'll probe you with case-based *what-if* questions before deciding that you can be left alone"). That sounds like a complex entrustment decision, but it reflects the reality of the workplace and may in fact be a rapid reflection, sufficient to trust the trainee *in this case*. Ad hoc entrustment may stimulate development and evaluation of trainee readiness for summative decisions.

Conversely, a summative entrustment decision is a general statement that must be documented, awards a higher level of responsibility for future actions and should be recognisable by third parties. Both are important in EPA-based curricula. The ad hoc decision experiences of a supervisor may be documented in the trainee's portfolio (was this a justified decision? If not, why not?). Summative decisions may be informed by multiple ad hoc decisions supplemented with information gathered through other channels (multi-source feedback, knowledge assessment and skills assessment). Summative entrustment decisions should be multi-source decisions based on the summation of smaller elements of information.

Trainee features that allow supervisors to entrust them with a critical task

Ad hoc entrustment decision literature shows influence of trainee features, supervisor features, the nature of the task and the circumstances, supplemented by the trainee–supervisor relationship (Hauer et al. 2014) and patient or family preference (Tiyyagura et al. 2014). Each of these groups includes several variables that affect the decision. Trusting a consulting colleague involves expertise, interaction style with the patient and collegial interaction (Choudhry et al. 2014). The 10 most important trainee features for entrustment identified from the literature are summarised in Table 7 (Kennedy et al. 2008; Choo et al. 2014; Sterkenburg et al. 2010; Wijnen-Meijer et al. 2013a,b; Hauer et al. 2014; ten Cate et al. in press).

This clustering of qualities is merely based on existing medical education literature. Other domains, such as organizational and occupational psychology (Mayer et al. 1995), have yielded still other factors.

Arriving at entrustment decisions

The features of Table 7 weigh into the decision to trust a trainee with care for patients at a particular moment. As ad hoc entrustment decisions are usually taken without much time to carefully deliberate, they are often based on "gut feelings" and limited information. This does not necessarily make such decisions inaccurate. Not everything that grounds an entrustment decision can be captured in numbers, scales or even words. We sometimes "feel" we can trust a trainee or not. Presumptive trust based on prior credentials, combined with

Table 7. Qualities in trainees that enable trust.

Foundational qualities, primarily based on Kennedy et al. (2008)	
Competence and clinical reasoning	This pertains to knowledge, skills, and specific competencies needed to execute the EPA
Conscientiousness and reliability	Conscientiousness and reliability reflect a thoroughness and consistency in actions, e.g. when trainees do what they say they will do and show a thoroughness that is predictable across occasions
Truthfulness or honesty	Truthfulness and honesty imply that trainees, if asked, tell what they observed, what they did, and why. It includes admitting what they should have done and did not
Discernment of limitations and inclination to ask for help if truly needed	Crucial is a discernment of one's own limitations and knowing when to refrain from procedures and ask for help. Knowing is the cognitive component; willingness to ask for help is just as important but may not always align with the knowing. An adequate balance between proactive behaviour and asking help when really needed is important
Supplementary qualities summarised from the literature (Sterkenburg et al. 2010; Wijnen-Meijer et al. 2013a,b; Hauer et al. 2014)	
Empathy, openness and receptiveness toward patients	Actively listening to patients and reacting verbally and nonverbally in a way that encourages the sharing of information by the patients and that confirms involvement with the patient
Skill in collegial and interprofessional communication and collaboration	Adequate communication about patients exemplifies mastery of the situation needed for general supervision at levels 3 and 4 (''indirect supervision'' and ''unsupervised'') and for specific situations such as patient handovers
Self-confidence and feeling safe to act	Being self-confident and feeling safe to act enables action, but overconfidence can be dangerous. An adequate balance is necessary
Habits of on-going self-evaluation, reflection, and development	A habit of self-evaluation, reflection and development are established qualities of well-functioning professionals. Seeking feedback to improve is part of that habit
Sense of responsibility	A responsible trainee makes sure patients are cared for when he or she is gone, picks up perceived lapses of care caused by others and accordingly initiates action, or acts upon urgent needs of care when others are not available
Adequately dealing with mistakes of self and others	As patient safety comes to the forefront of thinking about quality in health care, acknowledging errors and mistakes of oneself and others has become a crucial habit to acquire

initial trust derived from a short observation, may be sufficient to make ad-hoc entrustment decisions. Summative entrustment decisions, leading to permission to act unsupervised from a specified moment forwards, should be grounded in more systematic exploration and weighing of these qualities of the trainee. Table 8 lists suggested sources of information that may inform such decisions.

Collecting valid information to evaluate trainees on their readiness to advance to a next level of responsibility or autonomy requires the systematic use of instruments and methods. While many workplace assessment instruments have been described (Kogan et al. 2009; Wisman-Zwarter et al. in preparation), they can be categorised within a limited number of approaches:

Written or electronic knowledge testing

This does not need further explanation.

Simulation testing

Skills testing in a simulated and standardised environment involve OSCEs and similar examinations with low or high fidelity equipment or with standardised patients.

Case-based discussion

A case-based discussion (CBD) is a short oral discussion with the trainee on knowledge and clinical reasoning (10–15 min) after a clinical encounter (Setna et al. 2010), prompted with two types of questions (1) What was your reasoning during the encounter? and (2) What would you have done differently if this patient had shown X, Y or Z? This second question is particularly relevant for entrustment decisions, as it captures situations that are less common and provides insight into how a trainee might approach a similar or related problem in a future encounter.

Short practice observation

A short practice observation usually takes 5–15 min is focused on work in practice (e.g. a patient consultation with history or physical examination, execution of a procedure, a case presentation) is documented with a judgment, includes feedback afterwards and is meant to be conducted multiple times (Norcini & Burch 2007; Kogan et al. 2009; ten Cate & Fluit 2011). For EPAs, the rating scale relates to supervision level, i.e. readiness for direct, indirect or distant supervision. Practice observations are samples of work, preferably not solicited or planned, can be rated via live presence or video recording observed real-time elsewhere or rated post hoc. Short practice observation forms may be tailored to specific EPAs, preferably on mobile devices.

Long practice observation

Long practice observations pertain to observed behaviour over a longer period, and focus on behaviour other than

Table 8. Suggested sources of information to support entrustment decisions.

Factors that affect entrustment decisions Potential information sources	Competence and clinical reasoning	Conscientiousness and reliability	Truthfulness and honesty	Discernment of limitations and inclination to ask for help	Empathy, openness and receptiveness toward patients	Collegial and interprofessional communication and collaboration	Self-confidence and feeling of safety	Habits of ongoing self-evaluation, reflection, and development	Sense of responsibility	Knowing how to deal with mistakes of oneself and others
• Knowledge exams and skills exams	X									
• Direct observations by supervisors, related to specific EPAs	X				X					
• Narrative observation-based feedback from patients and peers (e.g. MSF)	X	X	X	X	X	X	X	X		
• Audit of practice, incl. patient handovers and electronic medical record	X	X								
• Observing trainee teaching techniques (including 1-min preceptor)	X					X				
• Prior credentials and reputation reported by trusted colleagues	X	X								
• Sampled checks on accuracy of information reported			X	X						
• Patient presentations with cross-checks at morning rounds and handoffs			X			X				
• Review of events during night shifts	X	X		X						
• Post hoc case-based discussions, including ''what if'' scenarios	X			X						X
• Guided self-reflection exercises and self-report (e.g. in a portfolio)				X			X	X		X
• Significant event audit, root cause analysis and gap analysis	X			X			X			X
• Multi-source feedback on interprofessional skills						X				
• Self-initiated clinical or research projects							X	X		
• Signs of preparedness, initiative, and follow-through despite sacrifices									X	
• Assigning a deliberate patient safety task that can be evaluated										X

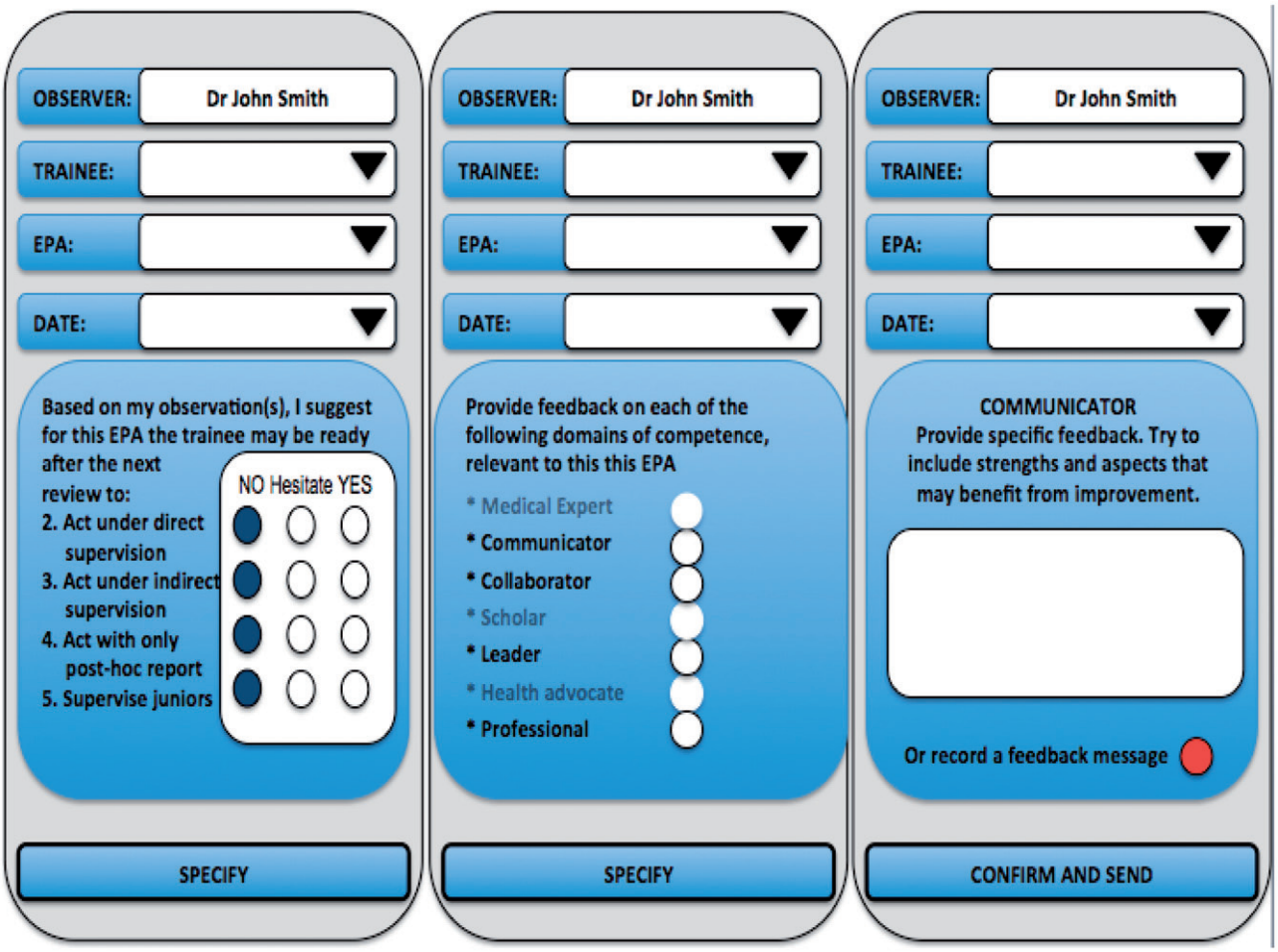

Figure 6. Representation of a potential EPA evaluation on a mobile device.

medical expertise. Observers are asked in advance to observe over a specified period to time, allowing them to be alert when they see the trainee. This can be an on-call weekend service, but is usually weeks to months. An example is multi-source feedback (MSF) or 360° evaluation information, collected from colleagues (staff, peers and junior trainees, other health professionals such as nursing and patients) usually contrasted with self-assessment. MSF is particularly useful to evaluate attitudinal components of professional behaviour, communication, collaboration and aspects of trustworthiness. Patients may evaluate directly after an encounter, which in fact is a short observation, unless there are multiple encounters with the same doctor.

Product evaluation

Products may include discharge summaries and letters, medication prescriptions and other entries into the electronic health record, presentations and case-reports. Practice-related products may be used to evaluate patient-related outcomes of training, i.e. pertaining to actual patients or happenings. Practice-unrelated products follow either from assignments for the purpose of assessment or are generalised products such as clinical protocols and critically appraised topics extractions from the literature.

The mode of reporting short observations and CBDs for EPAs is the simple question that any observer may be asked: "Based on my observation today, I suggest for this EPA this trainee may be ready after the next upcoming review to (1) only observe, (2) act under direct supervision, (3) act under indirect supervision, (4) act with distant supervision, (5) supervise juniors, possibly with further qualifications such as No, Hesitate, Yes, and with narrative comments. Usually clinicians will observe and report. For particular EPAs, nursing or other non-physician co-workers could also provide a report. These observations may be regarded as formative evaluations. The sum of many formative reports may inform summative entrustment decisions. This concords with what has been called "programmatic assessment" (van der Vleuten & Schuwirth 2005) and "assessment for learning" (Stiggins 2002; Schuwirth & van der Vleuten 2011).

Context, expiration and reconfirmation of summative entrustment decisions

Summative entrustment decisions for an EPA at level 4 should be regarded as certification or a license to practice for that particular unit of professional practice. A portfolio of entrusted EPAs may thus define a physician's qualification. Two limitations of this reasoning are important to note.

Table 9. Learning analytics applied to EPAs, following Greller & Drachsler (2012).

Dimensions of learning analytics	Values as suggested for EPA-based competency curricula
Stakeholders	• Trainees (students/residents) • Programme directors/supervisors/examiners/clinical competency committees
Purpose	• Feedback to trainees related to EPAs • Support for summative entrustment decisions for EPAs
Data	• All relevant individual data on observed performance, supplemented with data on tests • Aggregated data across (sets of) individuals
Instruments	• Mobile devices, learners supplied information, multi-source feedback information • Future options: patient provided health care outcome data, electronic medical record data
Output	• Visualised graphical representations of progress of individuals compared with individual objectives, development plan and past progress and with relevant groups
External limitations	• Storage of data and access to data must be limited according to ethical rules
Internal limitations	• Both trainees and teaching staff must be trained to understand and interpret data that are provided in the visualised output

One is the context-dependencies of competence. Medical competence is predominantly general or canonical, in the sense that applicability should extend across different settings and conditions, but to some extent competence depends on context (ten Cate et al. 2010; ten Cate & Billett 2014; Cianciolo & Kegg 2013). For that reason, trainees moving from one rotation or hospital to another may have to be briefly observed to reconfirm the validity of the entrustment decision for an EPA, depending on the risk level of the EPA.

The other limitation is that many skills decrease when not practiced, similar to the decrease of knowledge which is not applied (Custers & ten Cate 2011). Entrustment decisions should, therefore, have an expiration date that invalidates the decision if no or too little practice has occurred. It is important to note that entrustment decisions are not considered the conclusion of a training period, but the beginning of a practice period. Expiration dates for EPAs after graduation are also suitable for recertification and maintenance of competence procedures. If certification for an EPA after graduation, as default, would expire after five years of inactivity and lead to a stricter level of supervision, the physician may choose to revalidate or restrict the scope of practice to a limited number of EPAs. This way, maintenance of competence regulations can be based on EPAs and may become more meaningful than current procedures that focus on full recertification of a specialty license. Of note, however, is that dates should relate to the nature of the EPA and the experience built after the first entrustment decision.

Technology to support feedback and entrustment decision-making

In busy clinical environments, both trainees and supervisors may be supported by electronic means to optimise information about trainee progress. For trainees, this feedback information should serve to inform next actions and next behaviour (rehearse knowledge and skill, actively select next experiences) to proceed to readiness for a next entrustment decision about an EPA. For supervisors, the multitude of potential pieces of information about a trainee must be collected and aggregated to support summative entrustment decisions and inform supervisors in the workplace. This is an ambitious enterprise that should be supported by electronic means.

With the ubiquitous presence of mobile devices such as smartphones and tablets, every trainee and clinical educator can use these for the benefit of education and evaluation (George et al. 2014). Electronic portfolios are becoming common in clinical training (Dannefer & Henson 2007; van Tartwijk & Driessen 2009; Dannefer et al. 2012) and documentation of EPA-based progress monitoring should use both. Figure 6 shows an impression of what the procedure could look like on a mobile device with three consecutive screens.

A global evaluation shown in the first frame of this figure is expanded, based on the EPAs-competencies matrix as elaborated early in this Guide (Figure 1). That is, the suggested readiness for a supervision level can be backed-up by information about the competencies that have been identified as critical for a particular EPA. Depending on the preferences of the observer, feedback can be provided either in writing or orally. The required dialogue of a short practice observation can be recorded to maximise efficiency. A similar procedure can be applied for case-based discussions and case presentations, while the forms and frames used may be somewhat different.

Collecting information by electronic means requires its storage in a personal electronic portfolio of the trainee. The portfolio repository should serve to inform trainees with aggregated, up-to-date information about their progress and to inform programme directors with specific information to support summative entrustment decisions. Clearly this involves large amounts of data. Analysing big data for educational purposes has been called *learning analytics*, i.e. the measurement, collection, analysis and reporting of data about trainees and their contexts, for the purpose of understanding and optimizing learning and the utilizing of environments in which it occurs (www.solaresearch.org). Greller and Drachsler (2012) have identified five dimensions of learning analytics that may be operationalised for EPA-based competency curricula as in Table 9.

The e-portfolio functions should provide (1) easy input via mobile devices or computers by observers, learners, and educational administrators with formal progress results (tests, scheduling of rotations and assigned mentor), (2) clear visualisation of tailored output for distinct groups of learners,

programme directors, mentors and external stakeholders such as hospital staff who require information about certified EPAs, (3) adequate access permission conditions, and (4) an upload facility for various documents.

Discussion

This paper was written as a multi-purpose Guide for competency-based workplace curriculum development with EPAs. The Guide should assist educators interested in building such curricula and serve developers of electronic solutions to support workplace-based feedback and entrustment decision-making. It summarises the literature and expands the knowledge about workplace curriculum development using EPAs. Acknowledging that the EPA concept is less than a decade old, it has only begun to be used as a framework for workplace curriculum development. We expect that many aspects will continue to be clarified, added to or refined over the coming years, based on research and examples from practice.

The potential of EPAs is broad. Defining professional competence in term of EPAs opens the possibility to cross-traditional boundaries between phases in the medical education continuum. This is currently being explored in paediatrics (Powell et al. 2011) as well as in the "dedicated transitional year" experiments between undergraduate and postgraduate education in The Netherlands (http://www.nfu.nl/actueel/dedicated-schakeljaar-in-ontwikkeling). Boundaries between postgraduate training and continuing professional development as well as between specialties may also be crossed using EPAs (Knape & ten Cate 2010). Consider surgeons or rheumatologists mastering radiology EPAs, or family physicians mastering small surgical EPAs. Finally, even boundaries between professions may be crossed for very specific EPAs, such as between physicians and physician assistants (Mulder et al. 2010). EPA-based portfolios may grow into dynamic repositories that truly represent the actual competencies of health care workers, extending the concept of competency-based medical education to competency-based medical practice.

This Guide has limitations. As there is not yet evidence from fully developed EPA-based workplace curricula, our recommendations for curriculum development with EPAs have been derived from various literature sources and deliberations among expert educators. Research will be necessary to build evidence to further ground the proposed approaches. Tools to collect information to support entrustment decisions with technology and learning analytics may be expected to substantially facilitate the richness of feedback and the quality of such decisions. Also the more conceptual and theory-based understanding of entrustment decision-making should be elucidated by further research. Another necessary domain of progress will be faculty development and the valuing of efforts to supervise trainees. As adequate supervision is key in EPA-based curricula, the effort to guide, train and supervise, provide feedback and contribute to entrustment decisions should be valued and rewarded. One possible way to do this is to monitor the efforts of clinical faculty related to electronically provided feedback and reward their efforts with continuing professional development credits.

We hope that the many groups active in these developments will benefit from the thoughts shared in this Guide.

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