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Author(s)	O'Dowd, Emily; Lydon, Sinéad; O'Connor, Paul; Madden, Caoimhe; Byrne, Dara
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**A Systematic review of 7 years of research on Entrustable Professional Activities in
Graduate Medical Education, 2011-2018.**

O'Dowd E, Lydon S, O'Connor P, Madden C, & Byrne D, 2019

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Abstract

Purpose: This review aimed to synthesize some of the extant work on the use of Entrustable Professional Activities (EPAs) for postgraduate physicians, to assess the quality of the work, and provide direction for future research and practice.

Method: Systematic searches were conducted within five electronic databases (Medline, Scopus, Web of Science, PsycINFO, and CINAHL) in February 2018. Reference lists, Google Scholar and Google were also searched. Methodological quality was assessed using the Quality Assessment Tool for Studies of Diverse Designs (QATSDD).

Results: In total, 49 studies were included, classified as *Development of EPAs* ($n=37$; 76% of total included), *Implementation and/or assessment of EPAs* ($n=10$; 20%), or both ($n=2$; 4%). EPAs were described for numerous specialties, including internal medicine ($n=17$, 35%), paediatrics ($n=9$, 18%), and psychiatry ($n=5$, 10%). Of the development studies, 92% utilized more than one method to generate EPAs. The two most commonly used methods were developing initial EPAs in a working group, ($n=27$, 69%), and revising through deliberation ($n=21$, 54%). Development papers were of variable quality (Mean QATSDD score=20, range 6-41). Implementation/assessment studies utilised methods including observing trainee performance ($n=6$, 50%), and enrolling trainees in competency-based curricula, which included EPAs ($n=4$, 33%). The methodological quality of these implementation studies varied (Mean QATSDD score= 19.5, range= 6-32).

Conclusions: This review highlighted a need for: a) consideration of best practice guidelines for EPA development, b) focus on the methodological quality of research on EPA

development, and of EPAs, and c) further work investigating the implementation of EPAs in the curriculum.

Introduction

The abilities of newly graduated trainee physicians upon entering practice often fall below the expectations of senior colleagues¹⁻³. This disparity between the expectations and realities of physician competence is regarded as a patient safety issue⁴ and has led to increased interest in competency-based medical education (CBME). CBME is concerned with outcomes of the education experience, independent of time spent in education⁵. Although CBME has been generally well-received⁶, there remains debate surrounding its use. One alternative to traditional CBME may be the use of Entrustable Professional Activities (EPAs).

EPAs are an effort to bridge the gap between the theory of competencies and practical clinical work⁷. An EPA is an essential unit of work incorporating one or more core competencies, is observable, and can be entrusted to trainees at different levels, ranging from not being entrusted, to being entrusted to supervise others in the activity⁸. The entrustment of an EPA applies only to that activity, in that context, and eliminates uncertainty on the part of the learner and the supervisor regarding supervision requirements⁹. The EPA framework allows supervisors to make evidence-based decisions regarding the ability of a trainee to conduct an activity safely and competently, and simplifies CBME by integrating competencies into the assessment of EPAs¹⁰. Moving from a focus on the “person-descriptors” of competencies to the “work-descriptors” of EPAs enables a more systematic implementation of CBME¹⁰. EPAs formalize a framework of entrustment and in turn impact patient safety^{11, 12}.

EPAs are becoming increasingly common¹³⁻¹⁵, with the Netherlands, Canada, and Australia among countries adopting EPA frameworks in graduate medical education (GME). However, as of yet, there have been few efforts to examine the current state of research on

the development and implementation of GME EPAs internationally. Pilot studies in Undergraduate Medical Education (UME) are ongoing¹⁴. However, there remains a need to consider the research evidence and data surrounding GME EPAs¹⁶.

The aim of the current systematic review was to synthesize some of the extant research and knowledge on the development and use of EPAs in GME, to assess the methodological quality of the identified studies, and to provide direction for future research and work on EPAs. Conducting a systematic review on EPAs in GME at this point will be of value in guiding future research, and for those in clinical practice developing or using EPAs.

Method

Design

A systematic review was conducted. Systematic reviews, which collate data from multiple studies in a research area, are advocated as an efficient way of keeping up to date with literature, particularly in health research¹⁷, a more objective method of reviewing and synthesising evidence than other review types¹⁸, and as the “best evidence” in the hierarchy of evidence¹⁹. As per best practice for systematic reviews, this review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidelines²⁰.

Search strategy

We conducted searches using five electronic databases; Medline, CINAHL, Scopus, PsycINFO and Web of Science. Searches were conducted in September 2018. “Entrustable professional activit* OR Entrustability” was searched across databases altered as necessary to meet the entry formatting required (for further detail, see Supplemental Digital Appendix 1). To increase the likelihood of identifying grey literature, Google and Google Scholar were

also searched. The terms “entrustable professional activities” and “entrustability” were entered and the first 1,000 returns were screened for each of these search engines. Finally, the reference lists of all included studies were screened.

Study selection

Inclusion criteria. To meet our inclusion criteria, papers or documents were required to explicitly report a focus on “entrustable professional activities”. Beyond this, papers had to: a) be written in English; b) describe the development or expansion of one or more EPAs, or report on the implementation outcomes of one or more EPAs and; c) report specifically on EPAs for postgraduate trainees (i.e., a physician who has completed their undergraduate medical degree and is pursuing further training). Both peer-reviewed and grey literature documents were eligible for inclusion.

Exclusion criteria. We excluded papers if the EPAs were intended for use with undergraduates, or for the evaluation of newly graduated students entering GME. Similarly, papers describing EPAs for other professions were excluded (e.g., physician assistants, nurses, pharmacists). Other reasons for exclusion were: a) a focus on related concepts within GME including competencies, capabilities, or milestones but not on EPAs; b) the availability of an abstract only; c) an absence of original data regarding the development or implementation of, or trainee assessment using EPAs, and; d) the use of EPAs by trainees to assess their own capabilities or the application of EPAs in assessing hypothetical trainees.

Screening process

Titles and abstracts returned during the search process were screened by one author (EOD), and papers that did not meet the criteria for inclusion were excluded. If these provided insufficient information to make a decision, the full-text was accessed, and a

decision regarding inclusion was made. If any uncertainties arose at this point, a decision was made in consultation with another author (SL).

Categorization of studies

Included papers were assigned to one of two categories by one author (EOD). The first category was concerned with the *development of EPAs*, and studies that reported on the development, or expansion, of one or more EPAs for postgraduate physicians were assigned to this category. The second category was related to the *implementation of and/or assessment of trainees using EPAs*, and comprised of studies that reported on how EPAs were implemented within clinical settings and/or used in practice to assess trainee physicians. In some cases it was deemed appropriate to assign studies to both of these categories.

Data extraction

There were minor differences in the data extraction process for the categories. For the *development of EPAs* category, data were extracted on: year of publication; country of study; medical specialty; number of EPAs developed; content of EPAs; grade of physician; method of development of EPAs; and methodological quality. As studies provided great detail regarding their method of development, it was necessary to code the methods to facilitate synthesis. Two researchers developed codes to capture development methods employed across these studies. This was an iterative process, reducing variation to produce a discrete list of codes (for more information, see Supplemental Digital Appendix 2), while retaining all information provided by studies. For example, “committees”, “working groups” and/or “panels” were all considered sufficiently similar to be coded as “working groups”.

For the *implementation and/or assessment of EPAs* category, data were extracted on: year of publication; country of study; method of implementation and/or assessment; medical specialty and number of EPAs; number and grade of trainees included; outcomes of

implementation/assessment; and methodological quality. The methods of implementation and assessment described within the papers were coded as above.

Data extraction and coding were carried out independently by two researchers (EOD and CM). Agreement between these researchers was found to be 98.04% across this process, with any disagreements resolved through discussion between the two researchers until consensus was achieved.

Quality assessment and data synthesis

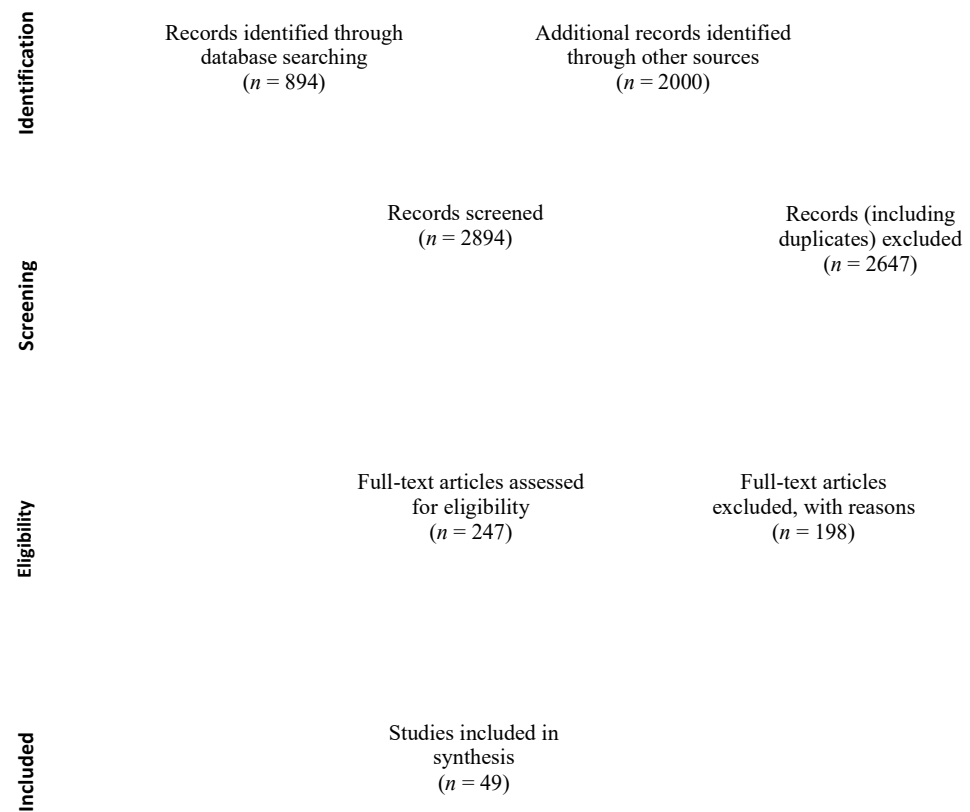
The methodological quality of included papers was assessed using the Quality Assessment Tool for Studies with Diverse Designs (QATSDD)²¹. The QATSDD is intended for use in the assessment of the methodological quality of studies with varying research designs. It is a 16-item tool, developed for use by health services researchers. Items are rated on a four-point scale (0-3), with a higher score indicating greater methodological rigor. Scores on the QATSDD can range from 0 to 42 (qualitative and quantitative studies) or 48 (mixed methods studies). This assessment tool has been shown to produce good agreement²¹ and has been used in a number of different reviews pertaining to health services and medical education research²²⁻²⁴. The QATSDD was applied to studies within both categories by two researchers independently and any disagreements were resolved through discussion.

Results

A total of 2,894 records were screened, with 49 articles²⁵⁻⁷³ deemed eligible for inclusion (for PRISMA diagram, see Figure 1). Of these, 37 papers (76%) were assigned to the *development of EPAs* category alone, and 10 (20%) were assigned to the *implementation and/or assessment of EPAs* category alone. Two studies (4%)^{25, 46} were assigned to both categories, as they each described both the development and assessment of at least one EPA.

The number of studies published in the area increased year upon year (for a graph presenting this, see Figure 2)

Figure 1. PRISMA flow diagram



FiFigur

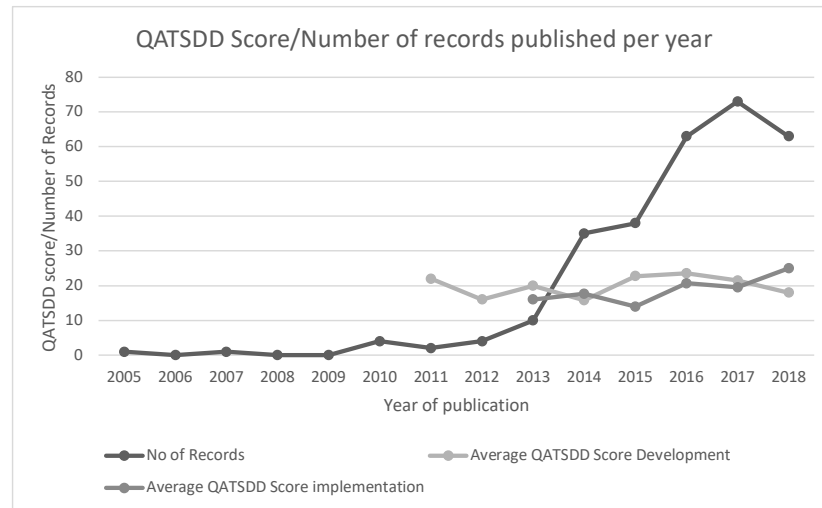


Figure 2. Web of Science Results for “Entrustable Professional Activit OR entrustability” and the Average QATSDD scores of included Development and Implementation papers by year of publication.*

Note: First included Development study was published in 2011, and first included implementation/assessment paper was published in 2013.

Papers describing the development of EPAs

Key characteristics of these papers are summarized in Table 1 (for detail on individual studies, see Supplemental Digital Appendix 3).

Table 1. Key Characteristics of included studies.

Characteristics	No and % of Development Studies	No & % of Implementation/Assessment studies
Study location:		
USA	23 (59%)	5 (42%)
Canada	6 (15%)	3 (25%)
Australia/New Zealand	5 (13%)	1 (8%)
The Netherlands	2 (5%)	1 (8%)
Germany	2 (5%)	0 (0%)
India	1 (3%)	1 (8%)
Singapore	0 (0%)	1 (8%)
Specialty*:		
Internal Medicine (Total)	14 (36%)	3(25%)
- Unspecified	8 (21%)	2 (17%)
- Rheumatology	2 (5%)	0 (0%)
- Gastroenterology	2 (5%)	0 (0%)
- Pulmonary/critical care	1 (3%)	0 (0%)
- Geriatrics	1 (3%)	0 (0%)
- Nephrology	0 (0%)	1(8%)
Paediatrics (Total)	8 (21%)	1 (8%)
- Unspecified	5 (13%)	1 (8%)
- Neonatology	1 (3%)	0 (0%)
- Paediatric emergency medicine	1 (3%)	0 (0%)
- Developmental-behavioural	1(3%)	0 (%)
Psychiatry	4 (10%)	1 (8%)
Emergency Medicine	3 (8%)	0 (0%)
Family medicine/Primary care	3 (8%)	2 (17%)
Radiology	2 (5%)	0 (0%)
Anaesthesiology	2 (5%)	0 (0%)
General Surgery	2 (5%)	1 (8%)
Hospice and Palliative medicine	2 (5%)	0 (0%)
Pathology (Total)	2 (5%)	1 (8%)
- Unspecified	1 (3%)	0 (0%)
- Histopathology and/or Cytopathology	1 (8%)	1 (8%)
Obstetrics/Gynaecology	1 (3%)	1 (8%)
Physical Medicine and Rehabilitation	1 (3%)	0 (0%)
Haematology/oncology	1 (3%)	0 (0%)
Public health/ preventative medicine	1 (3%)	0 (0%)
Orthopaedics	0 (0%)	1 (8%)
Multiple specialties (unspecified)	1 (3%)	1(8%)
Grade of physician:		
Residents	17 (44%)	7 (59%)
Fellows	7 (18%)	3 (25%)
Interns	3 (8%)	1 (8%)
Not specified	13 (33%)	0 (0%)
Attendings	0 (0%)	1 (8%)
No of methods used to develop EPAs:		NA
1	3 (8%)	-
2	16 (41%)	-

3	15 (38%)	-
4 or more	5 (13%)	-
Type of paper:	NA	
Implementation and assessment	-	6 (50%)
Assessment only	-	5 (42%)
Implementation only	-	1 (8%)

*Percentages do not total to 100% as several papers reported on EPAs relating to more than one specialty.

Characteristics of included studies. Most studies were conducted in the USA ($n=23$; 59%).

The next most commonly reported study location was Canada ($n=6$; 15%). EPAs were developed across a range of specialties (see Table 1). The most common specialties in which EPAs were developed were Internal medicine ($n=14$; 36%), Paediatrics ($n=8$; 21%), and Psychiatry ($n=4$; 10%). Papers reported the development of EPAs for graduate learners in different postgraduate years; most were described by authors as having been developed for “Residents” ($n=17$; 44%).

As can be seen in Table 1, the majority of papers ($n=36$; 92%) applied multiple distinct methods in the development of EPAs reported (Median=3, range=1-5). Table 2 provides information on the definitions, frequency, and examples, of the various methods that authors reporting using during EPA development processes. Prior to drafting an initial list of EPAs, 12 papers (31%) conducted a literature search to gain insight into the specialty. Most, but not all, papers that conducted a literature review explicitly used this review of the literature to inform the development of their Draft EPAs ($n=10$; 26%). Other methods employed to develop initial draft EPAs included working groups ($n=27$; 69%), and interviews/focus groups ($n=6$; 15%). After the EPAs were drafted, most research teams then revised or refined them iteratively ($n=31$; 79%), using methods detailed in Table 2.

T Table 2. Codes, frequencies, and examples from included studies.

Development Process	Description of Process	Papers using method (n; % of development papers)	Example from included studies
<i>Literature review</i>	A review of related research literature was conducted prior to developing draft EPAs. Authors do not explicitly state that the EPAs developed were developed from this review	12(31%)	Literature review performed to identify papers related to physician handoffs ²⁵ .
<u><i>Initial EPAs drafted</i></u>	<u>Discrete list of EPAs drafted.</u>	<u>37 (95%)</u>	
- <i>From literature review</i>	-Authors explicitly state that EPAs were drafted based on review extant literature	10 (26%)	-List of paediatric EPAs identified using literature review ²⁸
- <i>By working group</i>	-EPAs were drafted iteratively by a working group	27 (69%)	- Set of EPAs identified by curriculum committee ²⁶
- <i>From interviews/focus groups</i>	-EPAs were drafted using qualitative methodologies	6(15%)	-Findings from interview and focus group study used to produce EPAs ³³
<u><i>EPAs revised and refined</i></u>	<u>List of EPAs edited and streamlined.</u>	<u>31 (79%)</u>	
- <i>Delphi Method</i>	-A Delphi process with stakeholders was used to revise and refine initial EPAs	10 (26%)	-Multi-round Delphi panel validates and refines EPAs ⁵²
- <i>Survey</i>	-An online or offline questionnaire was sent to stakeholders and used to refine EPAs	8 (21%)	-Paediatric residents completed an online survey ³⁷
- <i>Stakeholder deliberation</i>	-An iterative, unstructured discussion by stakeholders/working group was used to refine EPAs	20 (51%)	- Authors presented the draft list to a steering committee of internal medicine stakeholders ²⁹
<i>EPAs mapped to milestones/competencies</i>	The concordance between EPAs and other, related CBME frameworks was examined after the development of EPAs	11 (28%)	15 relevant milestones mapped to EPA ³⁰
<i>Curriculum Objectives developed</i>	The desired outcomes of the CBME/EPA curriculum were established as EPAs were developed	2 (5%)	Ensured the EPAs developed covered the skills residents needed by end of training ⁵⁵
<i>EPAs grouped by specialty</i>	The EPAs were reviewed and grouped by specific specialties, when developed for more than one specialty	1 (3%)	The EPAs were pooled according to specialty, as multiple specialty EPAs were developed ³⁶

<i>Steps recommended by Ten Cate for EPA development¹¹ consulted</i>	The steps recommended by Ten Cate ¹¹ for EPA development were consulted to ensure EPA(s) fit criteria	4 (10%)	Process of EPA development was based on steps outlined by Ten Cate and Young ⁴⁹
<i>EPAs tested for completeness in clinical setting</i>	The draft EPAs were applied within clinical setting to identify any gaps or flaws	1 (3%)	The EPAs were tested for completeness in an outpatient centre for 18 months ⁵⁷
<i>EPAs merged with previously developed sets of EPAs</i>	The EPAs that were developed are then merged with existing EPAs	1 (3%)	Two lists of EPAs reconciled into a single set ⁴⁸
<i>EPAs benchmarked with other sets of EPAs</i>	The scope of each EPA was compared to other sets of EPAs	1 (3%)	Benchmarked with other specialties' EPAs to define aims and processes for EPA development ⁴²
Implementation/Assessment Codes	Description of Codes	No of papers (% of implementation papers)	Example from included studies.
Implementation			
<i>Teaching sessions</i>	The EPAs were explained and taught to trainees in the context of teaching sessions	2 (17%)	Teaching sessions delivered on how to write discharge summaries and the EPA framework ⁶⁶
<i>Observation of faculty on the ward</i>	The EPAs were introduced by having trainees observe faculty performing the EPA	2 (17%)	Trainees observe faculty conducting EPA "chairing multidisciplinary rounds" on three occasions ⁶⁴
<i>Enrolment in competency-based curriculum</i>	The trainees were enrolled in a wholly competency-based programme of learning, which included EPAs	4 (33%)	To assess trainee competencies, summative EPAs were introduced into the curriculum which was already focused on developing competency ⁶⁷
<i>Peer feedback</i>	Trainees' performance on EPAs was discussed in groups and feedback from peers was given on performance	1 (8%)	Interactive session for interns to review peers' discharge summaries and give feedback ⁶⁶
<i>EPA performance recorded by trainee in portfolio</i>	A trainee records and reflects on their performance on an EPA in a portfolio.	2 (17%)	Authors incorporated the 36 EPAs for family medicine into existing generic field notes ⁷⁰
Assessment (Methods)			
<i>EPA observed and assessed in practice by senior faculty</i>	Trainees' performance of EPAs was assessed in clinical practice by staff observing them	6 (50%)	Trainee encounters with patients reviewed and evaluated by senior staff while the patient was in the clinic ⁷³
<i>Non-clinical performance</i>	Trainees were assessed on their performance of an EPA in a simulated setting.	4 (33%)	EPAs assessed using OSCEs/Sawbone model ⁶⁵
<i>Portfolio Review</i>	Trainees' records of their performance on specific EPAs were assessed by faculty	2 (17%)	Program director reviews portfolio on request of trainee for entrustment ⁷²
<i>Chart-based audit</i>	Teaching faculty conducted an audit of trainees charts to assess their performance on an EPA.	2 (17%)	Descriptive, retrospective, chart-based audit conducted to assess performance of fine-needle aspiration biopsy EPA ⁶⁸

<i>Comparison with control group</i>	Trainees were assessed on performance, and compared on their results to a control group not using EPAs	1 (8%)	The mean global rating score on each EPA was compared between the two groups ⁶⁵
<i>Written Exam</i>	Trainees' learning of EPAs was assessed via a written/multiple choice exam	1(8%)	Content knowledge was assessed using a multiple choice exam ⁷¹
<i>Assessment (Tools/Measures)</i>			
<i>Assessment form</i>	Non-standardized assessment form was used by study to measure trainee performance on EPAs	2 (17%)	Levels of entrustment on new scale were assigned to fellows by teaching faculty ⁶⁹
<i>Standardized rubric</i>	A standardized rubric was used in the study to measure performance of trainees on EPAs	1 (8%)	Attending assesses entrustability based on a standardized rubric ⁶⁶
<i>Global entrustment scale</i>	The ten Cate global entrustment scale was used to assess trainee entrustment level on an EPA	3 (25%)	Assessed at baseline, 3 and 6 months ⁶⁴
<i>Number of errors</i>	The number of trainee errors in a chart was used to establish their level of entrustment on an EPA	1 (8%)	No of deficiencies assessed every 6 months ⁷³
<i>Time to competency</i>	The time it took trainees to reach a suitable level of performance was assessed.	1 (8%)	Time taken to achieve adequacy rate of 85% assessed ⁶⁸

Note: Percentages do not sum to 100, as more than one code could be assigned to an individual study. CBME: Competency Based Medical Education, EPA: Entrustable Professional Activities

Methodological Quality. Development papers had a mean QATSDD score of 20 out of a possible 48 ($SD=7.6$; range= 6-41). The included studies scored well on items relating to the use of a particular theoretical framework, providing clear and explicit aims in the report, and by describing in detail the procedure for collecting data. Studies scored poorly on other items, such as those relating to justifying selection of a method of analysis, demonstrating evidence that sample size was considered in terms of the analysis, and reasoning why a particular data collection method was used. Supplemental Digital Appendix 4 provides a detailed table of how development papers scored on various aspects of the QATSDD. The QATSDD scores per year can be seen presented in a graph in Figure 2.

Papers describing the implementation outcomes and/or assessment of EPAs

Key characteristics of these papers are summarized in Table 1 (for detail on individual studies, see Supplemental Digital Appendix 5). Studies described the implementation of EPAs only ($n=1$; 8%), assessment of trainees using an EPA framework only ($n=5$; 42%), or both ($n=6$; 50%).

Characteristics of included studies. Papers emerged most frequently from the USA ($n=5$; 42%), followed by Canada ($n=3$; 25%). The remaining papers ($n=4$; 33%) came from four different countries/regions (see Table 1). Studies within this category reported EPAs across eight different specialties. Only Internal medicine and Family medicine were the focus of more than one study. The grade of physicians that were the focus of the implementation and/or assessment efforts varied across studies (see Table 1). “Residents” and “Fellows” were how participants were most often described ($n=7$; 59%, and $n=3$; 25% respectively). Table 2 provides specific information on the definitions, frequency, and examples, of the various methods used during EPA implementation and assessment.

The implementation of EPAs was discussed by 50% of papers ($n=6$). As can be seen in Table 2, implementation of EPAs frequently took the form of enrolling trainees in new or existing competency-based curricula to support the EPAs ($n=4$; 33%) or trainees observing faculty or more senior clinical staff on the ward during the early stages of entrustment ($n=2$; 17%), along with a number of other methods.

The vast majority ($n=11$; 92%) of papers in this category described assessment of trainees using EPAs, which took the form of discussing either the methods of assessment, or the specific assessment tools used. The most common method of assessment was through observation of the trainees performing the EPA in practice ($n=7$; 58%). A variety of tools were used to assess the trainees' performance on an EPA, including the global entrustment scale devised by ten Cate and Scheele¹⁰ ($n=3$; 25%), and number of errors per chart, when the EPA involved writing a chart ($n=1$; 8%).

Methodological Quality. QATSDD scores for implementation and assessment papers varied substantially. Mean score on the QATSDD was 19.5 out of a potential 48 ($SD=6.36$; range=6-32), and a graph visualising QATSDD scores per year can be found in Figure 2. Studies scored well on items relating to the discussion of strengths and limitations, stating their aims clearly in the report, and describing the setting in which the study was conducted. Studies scored poorly on items relating to sample size consideration, information on participant recruitment, and involving users or stakeholders in the study design. For more detail on the scores of individual studies on aspects of the QATSDD, see Supplemental Digital Appendix 4.

Discussion

The use of EPAs in medical education has become increasingly widespread. This systematic review aimed to clarify the current state of knowledge relating to the development

and implementation of EPAs in GME. We synthesized the evidence from 49 papers (published 2011 to 2018). Key findings include the range of methods used to develop EPAs, and importantly the variability in the quality, rigor, and scope of studies describing the development of EPAs. The knowledge gained regarding development of EPAs from this review has implications for educators and researchers who wish to develop new EPAs that are valid for assessing trainees. Regarding the implementation and assessment of EPAs in clinical practice, this review highlighted a lack of studies to date. However, from the small number of implementation studies identified, it is clear that implementation offers the opportunity to determine whether EPAs are a valid form of assessment.

The review found substantial variation in the EPA development process. It is clear from the included studies that a standardised approach to the development of EPAs has not emerged. Methods used to develop EPAs included Delphi groups, literature reviews, and focus groups^{25-45, 47-52, 54-58, 60-63}. While no apparent “best” method could be determined, this systematic review is nonetheless an important overview of the various processes which can contribute to EPA development in the future. The use of standardized guidelines may also be a means of improving the development process; the suggested template for developing EPAs follows three steps; initial development, expansion, and validation¹¹. However, only four studies included in our review reported adhering to this guideline. Future research should explore how this template may impact on the overall quality and validity of the EPAs developed. Another development guideline⁹ suggests a maximum of 20-30 EPAs for GME curricula. Many included papers far exceeded this number, as detailed in the results section (range= 1 to 76). Often, the papers which exceeded this recommended maximum, developed EPAs which were specific, with a narrow scope. This approach to EPA development risks re-introducing the issues with CBME. (e.g. too much paperwork for educators)⁷⁴. Broad EPAs which in turn link to multiple competencies and reduce the complexity of the curriculum

enable a holistic view of the learner, and therefore lend themselves better to implementation^{7,75}. The information collated in this review on development methods may inform the content of guidelines for developing EPAs in a standardized manner. A systematic development process will be key to successful implementation of these frameworks⁷⁶. Establishing a set of standards for the development of EPAs, and ensuring that the development is informed by these standards, will potentially increase the likelihood of EPAs being a valid and effective assessment of trainees in clinical practice.

The variability in the quality scores of the development studies are interesting. While it can be difficult to balance methodological quality and practical success⁷⁷, it is important that researchers developing EPAs give consideration to the quality of their approach. Since the current review includes studies which were published over the space of seven years, this may account for some of the variability in quality. While a comparison of papers published across these seven years may be somewhat inappropriate, with more recent work learning from and potentially improving, on earlier publications (e.g., ten Cate building his definition of EPAs a few years after proposing them¹¹), this review learned lessons from examining the overall body of literature on EPAs in GME, new and old. Also, while publication date may have played a role, other reviews in medical education have identified similar variability in quality^{23,78}. This variability may indicate a need to broadly examine methods in medical education research, or to develop methodological quality assessment tools better suited to the field of research. Variable developmental quality may impact on the quality of resulting EPAs, and in turn their implementation. However, this issue has been infrequently examined; most of the included studies did not assess the quality of their EPAs. Researchers have recognized the importance of producing high quality EPAs, with two tools for measuring EPA quality available^{79,80}. Linking scores on these tools to the methods used could provide

more insight into the preferred methods for development, and in turn, the case for implementing EPAs will be strengthened if greater consideration is given to quality.

The current review has demonstrated that the implementation and assessment of EPAs has been reported infrequently. Further, the implementation studies that were found varied considerably in methods used. These studies used multiple tools (e.g., global rating scale⁶⁴, peer feedback⁶⁶) to implement and assess EPAs, perhaps highlighting the lack of knowledge on best practice for implementation. However, the implementation papers to date do give some insight into the potential of various assessment methods which could be explored further. The role of simulation in the assessment of EPAs warrants further exploration, given its successful use in a number of the included studies^{46,65}. Similarly, the use of a portfolio to track trainee progress on EPAs prior to a summative entrustment decision being made shows some promise. The portfolio could potentially be accessed by supervisors at critical moments to provide an empirical, basis for entrusting a learner with a task in practice⁶⁶. Recent discussion in the literature on entrustability scales, such as that by Rekman and colleagues⁸¹, could be integrated with future implementation studies to help ground decisions for supervisors of residents, and ensure the validity of assessments. Pilot studies in GME to date have been on a small scale with existing data on implementing EPAs limited to the included studies. At this point in the work on EPAs, implementation is the most crucial aspect. Further data on validity, feasibility, and utility of EPAs in GME is necessary, which could be collected by comparing and correlating performance on EPAs to other variables such as patient outcomes. It is essential that going forward, studies do not just develop EPAs, but also report on these aspects. Failure to do so will inhibit the progression of the field, and our understanding of whether or not EPAs improve on existing CBME principles in GME will not be clear.

Limitations

This review has several limitations. First, the search process required studies to explicitly state a focus on EPAs. This excluded by default the United Kingdom (UK) construct of “foundation professional capabilities”⁸². This decision to exclude “foundation professional capabilities” was considered defensible as while it may be conceptually similar, the capabilities fall outside of Ten Cate’s definition of an EPA⁸. There is also recognised difficulty in the language used in CBME⁸³, and stringent inclusion criteria for this review was intended to reduce this difficulty. Second, due to resource limitations, only papers published in English were included. However, there is some evidence to show that restricting to one language does not inherently bias a review⁸⁴. Third, the grey literature search was limited to the first 1,000 results on Google and Google Scholar, out of a total of 59,000 and 3,510 results respectively (based on searches on 4th September). However, previous research has recommended that the first 200-300 results on Google Scholar are used for grey literature searches for systematic reviews⁸⁵, which this paper exceeded. Previous research has also critiqued the lack of best practice guidelines for identifying grey literature relevant to systematic reviews⁸⁶. Next, the review focused only on GME. This decision was made because, at this level, a lack of competence in the clinical environment can seriously impact on patient safety⁷. Junior doctor rotations can also vary substantially⁸⁷, and are often less structured in their curriculum than undergraduate teaching. Future research could explore whether including the full continuum from UME to GME would improve our understanding of EPAs in general. Finally, the highly dynamic nature of research and development work on EPAs may be considered a limitation of a systematic review conducted at this point in time. With new publications emerging rapidly and increasing year upon year (see Figure 2), a systematic review conducted in a year or thereafter could produce different conclusions. However, systematic reviews contribute importantly to the advancement of a field¹⁹, and this

review offers an important overview of much of the work to-date along with indicating where future research and work must progress.

Recommendations/future research

Our synthesis suggests several recommendations for future research relating to EPAs. First, the resources required for implementing EPAs must be considered in terms of the benefits. Although economic assessment is widely applied in healthcare, it is uncommon in medical education⁸⁸. However, the cost of an educational intervention is an important consideration. Accurate estimations of the costs of introducing EPAs could determine their value. The issue of increased paperwork upon introduction of EPAs has been raised in existing implementation studies⁷³ and must be examined further, to ensure the benefits of EPAs would outweigh the difficulties. An assessment of the impact of EPA introduction on workload of both trainees and assessors¹⁴, is essential to clarify the practicalities of introducing EPAs.

Secondly, there is potential for the use of EPA quality assessment tools to determine the best method of development for EPAs in GME, and for establishing the validity of EPAs. While this review found that studies which scored highly on the QATSDD often used more than one method of development for their EPAs, it could not answer the question as to what methods are the most effective for developing high-quality EPAs. To answer this question, it is necessary to assess the quality of EPAs which are developed, and this would be an interesting and important area for future research, providing insight into what methods should be prioritised, and included in a potential standardised template for developing EPAs. Future researchers could use the EQual⁸⁰ or the QEPA⁷⁹ tools to determine the quality of EPAs, in tandem with the QATSDD²¹ measure of methodological quality to explore the relationship between these variables. In turn, the validity of EPAs could be assessed by looking at the data

from quality assessment tools such as those previously mentioned, and linking the score on the tool with the number and type of methods used to develop the EPAs.

Finally, the studies included in this review come from multiple specialties and countries. However, some specialties had more than one set of EPAs developed across different countries^{26,60}. This raises a question for future research into EPAs internationally; should specialties develop one overarching set of international EPAs? Several alternate viewpoints on this have been presented within the research literature^{89,90}. For example, each country may have unique requirements for a particular issue. This would justify developing independent EPAs. However, others have noted that physician migration is common⁹⁰, which could cause challenges. One potential solution is to have flexible international, core EPAs for each specialty, which can be added to, as appropriate, in local contexts.

Conclusion

This review comprises the first attempt to synthesize some of the research pertaining to EPAs within GME. Research has focused on the development of EPAs, with considerably less attention devoted to the implementation of EPAs. There is a clear need for: (a) establishment of some consistency in the EPA development process, consideration of how this process is related to EPA quality, and whether development methods should differ depending on the healthcare context; (b) increased consideration of the methodological quality of research reporting the development of EPAs, (c) a focus on measuring the quality of EPAs using tools such as QEPA or EQual; and (d) more research investigating the implementation of EPAs in clinical settings, the validity of EPAs in practice and the tools used to do assess trainees. This review, through synthesising the research to date on EPAs within GME and identifying the gaps in the field will enable the advancement of EPA research and ensure that this field of research progresses fruitfully. It also provides a rationale

for future work to focus on ascertaining the feasibility, validity and utility of EPA frameworks in GME by synthesising efforts to implement EPAs to date.

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None

Contributorship

EOD searched the databases, led the data extraction, coding, quality analysis, and synthesis, and wrote the initial draft of the manuscript. SL planned the study, contributed to data extraction, and assisted with writing the manuscript. POC planned the study and contributed to writing and redrafting the manuscript. CM contributed to data extraction and coding, and

to redrafting manuscript. DB planned the study and drafting and redrafting the manuscript.

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Supplemental Digital Appendix 1

Table 1A. Search terms, dates, and number of results by database.

Datab ase	Medline	CINAHL	SCOPUS	PSYCIN FO	Web of Science	Google	Google Scholar
Search term	Entrustab le adj1 professio nal adj1 activit*.ti, ab. OR Entrustab ility	Entrustab le professio nal activit* OR entrustabi lity	Entrustab le professio nal activit* OR entrustabi lity	Entrustab le professio nal activit* OR entrustabi lity	Entrustab le professio nal activit* (topic OR title) OR entrustabi lity (topic OR title)	Entrusta ble professio nal activities	Entrusta ble professio nal activities
Search Date	3/09/18	3/09/18	3/09/18	3/09/18	3/9/18	4/09/18	4/09/18
No of Result s	168	123	259	52	292	1000	1000

Supplemental Digital Appendix 2

Table 2A. List of Codes devised for Development papers

Development process
<ul style="list-style-type: none"> - Literature review - Initial EPAs drafted <ul style="list-style-type: none"> o From literature review o By working group o From interviews/focus groups - EPAs revised and refined <ul style="list-style-type: none"> o Delphi Method o Survey o Stakeholder deliberation - EPAs mapped to milestones/competencies - Curriculum Objectives developed - EPAs grouped by specialty - Ten Cate template consulted - EPAs tested for completeness in clinical setting - EPAs merged with previously developed sets of EPAs - EPAs benchmarked with other sets of EPAs

Table B. List of Codes Devised for Implementation/Assessment papers

Implementation/Assessment codes
<p data-bbox="248 348 454 380">Implementation</p> <ul style="list-style-type: none"> <li data-bbox="305 401 574 432">- Teaching Sessions <li data-bbox="305 453 769 485">- Observation of faculty on the ward <li data-bbox="305 506 878 537">- Enrolment in competency-based curriculum <li data-bbox="305 558 521 590">- Peer feedback <li data-bbox="305 611 948 642">- EPA performance recorded by trainee in portfolio <p data-bbox="248 663 537 695">Assessment (Methods)</p> <ul style="list-style-type: none"> <li data-bbox="305 716 1024 747">- EPA observed and assessed in practice by senior faculty <li data-bbox="305 768 659 800">- Non-clinical performance <li data-bbox="305 821 545 852">- Portfolio review <li data-bbox="305 873 561 905">- Chart-based audit <li data-bbox="305 926 724 957">- Comparison with control group <li data-bbox="305 978 521 1010">- Written Exam <p data-bbox="248 1031 618 1062">Assessment (Tools/Measures)</p> <ul style="list-style-type: none"> <li data-bbox="305 1083 561 1115">- Assessment form <li data-bbox="305 1136 586 1167">- Standardized rubric <li data-bbox="305 1188 651 1220">- Global entrustment scale <li data-bbox="305 1241 561 1272">- Number of errors <li data-bbox="305 1293 594 1325">- Time to entrustment

Supplemental Digital Appendix 3
Table 3A. Development Papers Data extraction

Author and Country of study	Specialty developed in & Grade of physician	Number of EPAs & Content or Title of EPAs	Method of development	Refined Codes	Quality assessment
Aylward et al, 2014. USA	Internal medicine and combined internal-pediatrics. Interns.	1 EPA Resident Handoff	<ul style="list-style-type: none"> -Literature review performed to identify papers related to physician handoffs. -Resulting articles informed subsequent discussion with educational leadership and hospitalist educators, resulting in the identification of 8 domains. -Development of assessment tool. -Iterative process used to describe the expected learner behaviors at each level of entrustment for each domain. Behavioral descriptors refined over several meetings with education and hospitalist groups. Resulting draft was reviewed, refined, and approved by education leadership. -Behavioral descriptors mapped to the ABP and ABIM reporting milestones. This process was done iteratively and was reviewed by the educational leadership. -Before implementation, educational leadership met with the hospitalist division and the internal medicine chief residents to discuss and finalize the observation and assessment process. 	<ul style="list-style-type: none"> -Literature Review -Initial EPAs drafted by working group -EPAs revised and refined - Stakeholder deliberation -EPAs mapped to milestones/competencies. 	23
Boyce et al, 2011. Australia/New Zealand	Psychiatry. Stage 1/year 1 of psychiatry training.	Four EPAs <ol style="list-style-type: none"> 1. Completing a discharge summary; 2. Initiating antipsychotic medication in a patient with schizophrenia; 3. Leading the multidisciplinary team discussion regarding the care of a patient; 	<ul style="list-style-type: none"> -Set of activities identified (by curriculum committee) that trainees would be expected to carry out in the early stages of training with varying levels of supervision. - Fellows completed online survey rating the importance of competence in the proposed areas and any suggestions for potential EPAs were also collected. 	<ul style="list-style-type: none"> -Initial EPAs drafted-by working group. -EPAs revised and refined – Survey. 	22

		4. Carrying out a diagnostic explanation to a family about a young adult's psychiatric illness.			
Brown et al, 2016. USA	Rheumatology. Rheumatology trainees.	<p>14 EPAs</p> <ol style="list-style-type: none"> 1. Manage the care of patients with acute and chronic, common and complex rheumatologic diseases across multiple care settings. 2. Demonstrate expertise in the performance and interpretation of the musculoskeletal examination. 3. Demonstrate expertise in the indications for and interpretation of diagnostic tests and imaging studies relevant to the evaluation of patients with suspected or established rheumatic and musculoskeletal diseases. 4. Prescribe and manage immunomodulatory therapy. 5. Perform procedures including arthrocentesis and injections, compensated polarised microscopy, and interpretation of synovial fluid analysis. 6. Provide rheumatology consultation to other specialties and providers. 7. Demonstrate professional, compassionate, and ethical behaviour. 8. Effectively communicate and manage transitions of care with other health care providers. 9. Collaborate and work effectively as a member or leader of the interprofessional health care teams. 	<p>-Rheumatology working group created.</p> <p>-The group proposed an initial list of EPAs modelled on those advanced by internal medicine as well as those defined by pediatric rheumatology.</p> <p>-Through an iterative process the working group gathered input from key stakeholders to further revise the EPAs. In total, 3 meetings and numerous conference calls and webinars were held to establish and refine EPAs.</p> <p>-EPAs approved by board of directors.</p>	<p>-Initial EPAs drafted - by working group.</p> <p>-EPAs refined and revised - Stakeholder deliberation.</p>	16

		<p>10. Facilitate the learning of patients, families, and members of the interprofessional team.</p> <p>11. Enhance and promote patient safety and the quality of health care at both the individual and systems level.</p> <p>12. Advocate for individual patients.</p> <p>13. Contribute to the fiscally sound and ethical management of a practice.</p> <p>14. Engage in lifelong learning.</p>			
<p>Carraccio et al, 2017.</p> <p>USA</p>	<p>Pediatrics.</p> <p>Pediatric residents and fellows.</p>	<p>17 general pediatrics EPAs:</p> <ol style="list-style-type: none"> 1. Facilitate handovers to another health care provider, either within or across settings. 2. Resuscitate, initiate stabilization of the patient, and then triage to align care with severity of illness. 3. Lead an interprofessional health care team. 4. Demonstrate competence in performing the common procedures of the general paediatrician. 5. Apply public health principles and quality improvement methods to improve care and safety for populations, communities, and systems. 6. Provide recommended paediatric health screening. 7. Provide a medical home for well children of all ages. 8. Provide a medical home for patients with complex, chronic, or special health care needs. 9. Recognize, provide initial management, and refer patients presenting with surgical problems. 	<p>-A potential list of EPAs for the general pediatrician was identified.</p> <p>-Through an online survey, the initial list was vetted by program directors.</p> <p>-In response to their feedback, the list was revised, and a second survey was sent asking for additional refinements. Other members of the community were also communicated with to ask for their input.</p> <p>-To identify subspecialty EPAs, a workshop for education leaders from each subspecialty was held.</p> <p>- The specialists reviewed the general pediatrics EPAs and adopted five that spanned the generalist to subspecialist role and that applied to all subspecialties.</p> <p>-Through a consensus process, the group identified two additional common subspecialty EPAs.</p> <p>- Each subspecialty community then identified between three and six specific EPAs to add to the seven common subspecialty EPAs.</p>	<p>-Initial EPAs drafted-from literature.</p> <p>-EPAs revised and refined - survey, stakeholder deliberation.</p>	18

		<p>10. Assess and manage patients with common behaviour/mental health problems.</p> <p>11. Provide consultation to other health care providers caring for children.</p> <p>12. Refer patients who require consultation.</p> <p>13. Manage patients with acute, common diagnoses in an ambulatory, emergency, or inpatient setting.</p> <p>14. Care for the well new-born.</p> <p>15. Facilitate the transition from paediatric to adult care.</p> <p>16. Manage information from a variety of sources for both learning and application to patient care.</p> <p>17. Contribute to the fiscally sound and ethical management of a practice (e.g., coding billing, scheduling, and record keeping).</p> <p>17 pediatric fellowship EPAs:</p> <p>1. Facilitate handovers to another healthcare provider, either within or across settings.</p> <p>2. Diagnose, initially manage, and refer children with advanced or end-stage heart failure and/or pulmonary hypertension to experts for medical therapy, ECMO, ventricular assist device, and/or cardiac transplantation.</p> <p>3. Lead an inter-professional healthcare team.</p> <p>4. Lead within the profession.</p> <p>5. Demonstrate competence in performing the common procedures of the paediatric pulmonary subspecialist.</p>			
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		<p>6. Apply public health principles and quality improvement methods to improve care and safety for populations, communities, and systems.</p> <p>7. Provide preventive healthcare that includes conditions specific to the adolescent and young adult population.</p> <p>8. Manage health patients with paediatric infectious diseases.</p> <p>9. Provide a medical home for patients with hematologic oncologic or stem-cell transplant needs.</p> <p>10. Provide care to patients in the neonatal intensive care unit with surgical problems in collaboration with paediatric and subspecialty surgeons.</p> <p>11. Recognise and longitudinally manage behavioural variations, problems, and disorders in typically developing children and children with developmental disabilities.</p> <p>12. Provide for and obtain consultation from other healthcare providers caring for children.</p> <p>13. Manage patients with acute complex respiratory disease in an ambulatory emergency or inpatient setting.</p> <p>14. Manage neonates with acute common single system diseases in an inpatient setting.</p> <p>15. Facilitate the transition of patients with endocrine disorders from paediatric to adult healthcare.</p> <p>16. Engage in scholarly activities through the discovery, application and dissemination of new knowledge.</p>			
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		17. Contribute to the fiscally sound and ethical management of a practice (e.g. coding billing, scheduling, and record keeping).			
Caverzagie et al, 2015. USA	Internal medicine. Residents.	<p>16 EPAs</p> <ol style="list-style-type: none"> 1. Manage care of patients with acute common diseases across multiple care settings. 2. Manage care of patients with acute complex diseases across multiple care settings. 3. Manage care of patients with chronic diseases across multiple care settings. 4. Provide age-appropriate screening and preventative care. 5. Resuscitate, stabilize, and care for unstable or critically ill patients. 6. Provide perioperative assessment and care. 7. Provide general internal medicine consultation to nonmedical specialties. 8. Manage transitions of care. 9. Facilitate family meetings. 10. Lead and work within interprofessional health care teams. 11. Facilitate the learning of patients, families, and members of the interdisciplinary team. 12. Enhance patient safety. 13. Improve the quality of health care at both the individual and systems level. 14. Advocate for individual patients. 15. Demonstrate personal habits of lifelong learning. 	<ul style="list-style-type: none"> -Reviewed existing literature. -Held consultations with leading experts in field of evaluation and assessment in internal medicine. - Used an iterative process to develop a draft list of EPAs. -Feedback on EPAs provided from multiple sources, including program directors, training institutions, medical organizations, and specialty societies. -Revisions made. -Further stakeholders were asked for feedback at a conference. -Authors presented the draft list to a steering committee of internal medicine stakeholders -They discussed and debated the EPAs and gave verbal feedback to authors. -In total the authors received feedback from 18 different sources and made extensive revisions to the draft list of EPAs based on this. 	<ul style="list-style-type: none"> -Literature Review -Initial EPAs drafted - by working group. -EPAs revised and refined - Stakeholder deliberation. 	23

		16. Demonstrate professional behaviour.			
Chan et al, 2014. USA	Internal medicine. Internal medicine residents.	1 EPA. Managing transitions of care.	<ul style="list-style-type: none"> -Work group established. - EPA was defined by first narrowing the competencies and milestones to those pertinent to it. - Using an iterative consensus-based approach appropriate milestone was selected. -Independent rank-ordering process and iterative process used to gain consensus and cull an initial list of 142 developmental milestones to 15 most relevant. -These milestones then mapped onto and described the EPA. 	<ul style="list-style-type: none"> -Initial EPAs drafted - by working group. -EPAs revised and refined - stakeholder deliberation. -EPAs mapped to milestones/competencies. 	22
Chang et al, 2012. USA	Primary care. Internal medicine residents.	<p>25 EPAs.</p> <p>Enhance Access and continuity.</p> <ol style="list-style-type: none"> 1. Provide care for patients in non-traditional ways within and between office visits (e.g. telephone, email, remote access HER, group visits). 2. Identify, accommodate and customize care for patients with language, cognitive, functional, or cultural barriers. 3. Lead an interprofessional health care team, including aligning responsibilities with members' expertise and level of training. 4. Facilitate team huddle or more formal team meeting. 5. Assess and refine office systems based on workflow analysis, patient experience, and performance data to enhance access and continuity and improve performance. 6. Advocate for ongoing healthcare reform that facilitates further 	<ul style="list-style-type: none"> -Work group established. -Review of published literature. -Each work group member identified EPAs from daily clinical tasks within their practice and consulting with team members representing multiple disciplines. -Task analysis, practice profiling, and narrative writing used to develop initial set of EPAs. -Refined list through review of published descriptions of PCMH. - EPAs categorized using the 2011 National Committee for Quality Assurance (NCQA) PCMH standards. -The resulting EPAs were circulated in a summit, where participants generated a list of high priority EPAs. - After the summit the competency work group revised EPAs based on input. -EPAs presented at a PCMH symposium and refined the EPAs again from feedback from the audience. -Finally, each member solicited reviews from senior general medicine clinician, educator and administrator colleagues, to reach the final 25 EPAs. 	<ul style="list-style-type: none"> -Literature review. -Initial EPAs drafted - by working group. -EPAs revised and refined - stakeholder deliberation. 	16

		<p>realisation of the goals and values of the PCMH.</p> <p>Identify and manage patient populations.</p> <p>7. Interrogate a registry and utilise risk stratification tools to determine the health status and health care needs of entire practice.</p> <p>8. Identify and proactively intervene to promote the health of vulnerable populations (e.g. functional impairment, cognitive impairment, multiple or high-risk medications, multiple chronic diseases, substance abuse)</p> <p>Plan and manage care.</p> <p>9. Access, document, and share patient medical information via an electronic health record.</p> <p>10. Devise, follow, review, and adjust a longitudinal care plan to meet patients' health care needs, including acute care, chronic disease management, modification of high risk behaviours, and preventive care.</p> <p>11. Care for acute illness, chronic disease, and health care maintenance needs using evidence-based guidelines and other forms of decision support.</p> <p>12. Perform comprehensive medication review and reconciliation utilising an HER that allows electronic prescribing.</p>			
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		<p>Provide self-care and community support.</p> <p>13. Counsel and support a patient in her self-management of a chronic disease.</p> <p>14. Facilitate a patient's participation in a health care decision using informed decision-making (or using formal decision-aid).</p> <p>15. Engage a patient in advanced care planning.</p> <p>16. Use motivational interviewing to help a patient change her health-related behaviours.</p> <p>17. Activate and orchestrate community resources to meet a patient's or a population's needs.</p> <p>Track and coordinate care.</p> <p>18. Safely transition patients among PCMH team members, including giving and receiving sign outs.</p> <p>19. Safely transition patients between settings, including giving and receiving sign outs.</p> <p>20. Track and coordinate care during inter-visit periods, ensuring follow up on messages, tests, consults, and care at other facilities.</p> <p>21. Engage patient as care team member in tracking and coordinating care.</p> <p>Measure and improve performance.</p> <p>22. Access and interpret performance data.</p>			
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		<p>23. Improve care via Plan-Do-Study-Act cycles using outcome, process, and balancing measures (including measures of patient satisfaction).</p> <p>24. Utilize EHR and other electronic systems to detect and prevent medical errors.</p> <p>25. Perform a root cause analysis and reflect upon critical incidents (including a medical error, near miss, preventable emergency room visit or re-admission, or patient complaint).</p>			
<p>Deitte et al, 2016.</p> <p>USA</p>	<p>Radiology. Practicing radiologists.</p>	<p>10 EPAs.</p> <ol style="list-style-type: none"> 1. Collaborates as a member of an inter-professional team. 2. Triage/ protocols exams. 3. Interprets exams and prioritises a differential diagnosis. 4. Communicates results of exams. 5. Recommends appropriate next steps. 6. Obtains informed consent and performs procedures. 7. Manages patients after imaging and procedures. 8. Formulates clinical questions and retrieves evidence to advance patient care. 9. Behaves professionally. 10. Identifies system failures and contributes to a culture of safety and improvement. 	<p>-A multi-institutional work group convened to discuss radiology EPAs.</p> <p>-The EPAs initially developed by the ACGME Radiology milestone formed a basis for this discussion.</p> <p>-The result was suggested lists and vignettes for further discussion of EPA-Rs. The list serves as a starting point for EPA development rather than an exhaustive list of professional activities of radiologists.</p>	<p>-Initial EPAs drafted - by working group.</p>	10
<p>El-Haddad et al, 2017.</p> <p>Australia</p>	<p>Rheumatology. Rheumatology fellows.</p>	<p>1 EPA.</p> <p>Management of acute low back pain.</p>	<p>- Conducted a qualitative interview and focus group study at a large hospital.</p> <p>-Patients presenting with acute lower back pain participated in semi-structured interviews exploring their illness experience and expectations of doctors.</p>	<p>-Initial EPAs drafted - from interviews/focus groups.</p>	37

			<ul style="list-style-type: none"> -Clinicians representing multiple disciplines participated in a focus group to discuss components of EPA design, and what they expected of a competent specialist trainee in rheumatology when caring for patients with acute lower back pain (LBP). -The Framework Method was used to analyze data, identifying and developing themes, similarities, and differences between patient and clinician input. -Findings were used to develop the EPA. -Beginning with a blank EPA template, the authors reviewed Stage 1 results to determine how patient and clinician input could inform each EPA descriptor. - Interview and focus group findings used to map the EPA to relevant competencies. 	-EPAs mapped to milestones/competencies.	
Fehr et al, 2017. Germany	Pediatric trainees.	<p>12 EPAs:</p> <ol style="list-style-type: none"> 1. Presentation of a previously healthy child with a common acute symptom. 2. Presentation of a child with a complex acute disease. 3. Ongoing care of a child with a chronic disease. 4. Guide to and/or liaison between other medical fields. 5. Prevention. 6. Recognition of and assistance for children displaying abnormal behaviour and/or abnormal development. 7. Children as victims of abuse, sexual abuse, or neglect. 8. Social networks. 9. Adolescent healthcare. 10. Emergency medical care for children. 11. Children with injuries, burns, or ingested substances. 	<ul style="list-style-type: none"> -EPAs for use in pediatrics were explored. -authentic EPAs identified based on work of ten Cate and Young & number and scope of EPAs decided. -multi-step Delphi process applied whereby pediatricians were surveyed online regarding post-graduate education. Items with the highest level of agreement were defined as core content. - Sub-competencies were listed as part of the EPAs. 	<ul style="list-style-type: none"> -Literature review. -Initial EPAs drafted - from literature. -Ten Cate template consulted. -EPAs revised and refined - Delphi Method. -EPAs mapped to milestones/competencies. 	16

		12. Quality management, error management, practice management, patient safety.			
Fessler et al, 2014. USA	Pulmonary and critical care medicine. Fellows in pulmonary and critical care medicine training programs.	<p>18 pulmonary EPAs. 13 critical care EPAs, 20 combined.</p> <p>Pulmonary:</p> <ol style="list-style-type: none"> 1. Manage care of patients with acute common pulmonary diseases across multiple care settings. 2. Manage care of patients with acute complex pulmonary diseases across multiple care settings. 3. Manage care of patients with chronic, advanced, or end-stage pulmonary diseases across multiple care settings. 4. Resuscitate, stabilize, and care for unstable or critically ill patients. 5. Provide perioperative pulmonary assessment and care. 6. Provide pulmonary medicine consultation to other medical and nonmedical specialties in both inpatient and outpatient settings. 7. Lead a multidisciplinary critical care medicine team. 8. Manage transitions of care across multiple health-care settings. 9. Advocate for individual patients. 10. Facilitate the learning of patients, families, and members of the interdisciplinary team. 11. Facilitate family meetings including advanced directive and end-of-life decisions. 	<p>-Working group established.</p> <p>-Conference calls and in-person meeting held.</p> <p>-They decided to develop separate but overlapping EPAs for pulmonary medicine and critical care medicine.</p> <p>-Deliberations based on foundational documents.</p> <p>-Delphi process used to achieve consensus. Lists of potential milestones for each EPA were compiled and reviewed individually by the committee members. They were discussed via conference calls and then voted on anonymously online. Any indeterminate items were discussed on the following conference call, undergoing one or more subsequent rounds of voting until consensus to retain all remaining items was reached. -After consensus was reached, the document was revised with input from the sponsoring societies and program directors.</p>	<p>-Initial EPAs drafted - by working group.</p> <p>-EPAs revised and refined - Delphi method, stakeholder deliberation.</p> <p>-EPAs mapped to milestones/competencies.</p>	17

		<p>12. Provide palliative care to patients and their families.</p> <p>13. Safely and effectively perform common pulmonary and critical care procedures, including bronchoscopy, thoracentesis, central venous catheter placement, and ultrasound.</p> <p>14. Provide appropriate screening and preventive care.</p> <p>15. Interpret pulmonary function and cardiopulmonary exercise tests.</p> <p>16. Practice personal habits of lifelong learning.</p> <p>17. Demonstrate professional behaviour.</p> <p>18. Improve the quality and safety of health care at both the individual and systems levels.</p> <p>Critical care:</p> <p>1. Manages patients with acute complex medical and surgical disorders in the ICU setting.</p> <p>2. Resuscitate, stabilise, and care for unstable or critically ill patients.</p> <p>3. Provide critical care consultation to other medical and nonmedical specialties.</p> <p>4. Lead a multidisciplinary critical care medicine team.</p> <p>5. Promote optimal critical care outcomes by managing ICU triage, appropriate use of ICU resources, and transitions of care.</p> <p>6. Advocate for individual patients.</p> <p>7. Facilitate the learning of patients, families, and members of the interdisciplinary team.</p>			
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		<p>8. Facilitate family meetings including advanced directive and end-of-life decisions.</p> <p>9. Provide palliative care to patients and their families.</p> <p>10. Safely and efficiently perform common critical care procedures, including bronchoscopy, thoracentesis, central venous catheter placement, and ultrasound.</p> <p>11. Practice personal habits of lifelong learning.</p> <p>12. Demonstrate professional behaviour.</p> <p>13. Improve the quality and safety of health care at both the individual and systems levels.</p> <p>Combined Pulmonary and Critical Care:</p> <p>1. Manage care of patients with acute common pulmonary diseases across multiple care settings.</p> <p>2. Manage care of patients with acute complex pulmonary diseases across multiple care settings.</p> <p>3. Manage care of patients with chronic, advanced, or end-stage pulmonary diseases across multiple care settings.</p> <p>4. Manage patients with acute complex medical and surgical disorders in the ICU setting.</p> <p>5. Resuscitate, stabilise, and care for unstable or critically ill patients.</p> <p>6. Provide perioperative pulmonary assessment and care.</p> <p>7. Provide pulmonary medicine and critical care consultation to other</p>			
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		<p>medical and nonmedical specialties in both inpatient and outpatient settings.</p> <p>8. Lead a multidisciplinary critical care medicine team.</p> <p>9. Promote optimal critical care outcomes by managing ICU triage, appropriate use of ICU resources, and transitions of care.</p> <p>10. Manage transitions of care across multiple health-care settings.</p> <p>11. Advocate for individual patients.</p> <p>12. Facilitate the learning of patients, families, and members of the interdisciplinary team.</p> <p>13. Facilitate family meetings including advanced directive and end-of-life decisions.</p> <p>14. Provide palliative care to patients and their families.</p> <p>15. Safely and efficiently perform common pulmonary and critical care procedures, including bronchoscopy, thoracentesis, central venous catheter placement, and ultrasound.</p> <p>16. Provide appropriate screening and preventive care.</p> <p>17. Interpret pulmonary function and cardiopulmonary exercise tests.</p> <p>18. Practice personal habits of lifelong learning.</p> <p>19. Demonstrate professional behaviour.</p> <p>20. Improve the quality and safety of health care at both individual and systems levels.</p>			
Graafland et al, 2015.	Anesthesiology, emergency medicine, gastroenterology,	<p>66 EPAs</p> <p>Anaesthesiology:</p>	<p>-Delphi expert panel formed for each specialty.</p> <p>-Filled out a two-round Delphi survey, aimed at identifying the most valuable EPAs in their respective curricula. The first Delphi round identified important</p>	-Initial EPAs drafted - by working group.	29

The Netherlands	general surgery, gynecology, psychiatry, radiology.	<ol style="list-style-type: none"> 1. Assessment of vital signs during surgery. 2. Airway management. 3. Induction of anaesthesia. 4. Preoperative assessment. 5. Cardiopulmonary resuscitation. 6. Insert IV line. 7. Emergence from anaesthesia. 8. Fibre-optic intubation. 9. Management of trauma patient (ATLS principles). 10. Placement of CV line. 11. Placement of epidural catheter. 12. Ultrasound-guided puncture. 13. Arterial puncture. 14. Massive transfusion. 15. Application of regional anaesthesia. 16. Placement of epidural catheter (children). 17. Perform bronchoscopy. <p>Emergency medicine:</p> <ol style="list-style-type: none"> 1. Resuscitation of emergency patient (general, ABCDE principle). 2. Cardiopulmonary resuscitation. 3. Sedation and analgesia. <p>Gastroenterology:</p> <ol style="list-style-type: none"> 1. Perform gastroscopy. 2. Perform colonoscopy. 3. Perform ERCP. 4. Perform endo-ultrasound. 5. Pneumodilatation of lower oesophageal sphincter. <p>General surgery:</p> <ol style="list-style-type: none"> 1. Management of trauma patient (ATLS patient). 2. Placement of chest tube. 	<p>clinical activities performed by specialists; specialists asked to name the most highly valued EPA in their area and that had to be mastered by residents before participating in clinical rotations.</p> <p>-In the second round, the generated responses were presented and ranked according to priority by the medical specialists.</p> <p>-The EPAs were pooled according to specialty, any that did not meet the EPA definition were excluded.</p>	<p>-EPAs revised and refined - Delphi method.</p> <p>-EPAs grouped by specialty.</p>	
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		<ol style="list-style-type: none"> 3. Laparoscopic cholecystectomy. 4. Trocar insertion. 5. Preoperative dialogue with patient. 6. Lay bowel anastomosis. 7. Management of acute aortic aneurism. 8. Preside over multidisciplinary meeting. 9. Crash laparotomy. 10. Lay vascular anastomosis. 11. Laparoscopic colectomy. 12. Emergency thoracotomy. 13. Endovascular stent placement. <p>Gynaecology:</p> <ol style="list-style-type: none"> 1. Management of postnatal bleeding. 2. Management of shoulder dystocia. 3. Manual removal of placenta. 4. Management of breech delivery. 5. Diagnostic laparoscopy. 6. Ultrasound (pregnant patient). 7. Ultrasound (nonpregnant patient). 8. Perform caesarean section. 9. Bad news conversation. 10. Curettage. 11. Ultrasound (at 20 weeks pregnancy). 12. Ultrasound-guided puncture. <p>Psychiatry:</p> <ol style="list-style-type: none"> 1. Conduct suicide risk assessment. 2. Conduct psychiatric assessment. 3. Conduct aggression risk assessment. 4. Take biographic history. 5. Indicate compulsory treatment. 6. Conduct family education session (system conversation). 7. Patient advisory conversation. 8. Apply deep brain stimulation. 			
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		Radiology: 1. Ultrasound-guided mammarian puncture. 2. Ultrasound-guided biopsy. 3. Ultrasound-guided intraabdominal abscess drainage. 4. Management of trauma patient (ATLS principles). 5. Assessment of chest X-ray. 6. Angiographic intervention radiology. 7. Arthrography. 8. Ultrasonography (diagnostic). 9. Lead multidisciplinary planning of intervention.			
Hamburger et al, 2015. USA	Pediatrics. Pediatric residents.	1 EPA. Referral and Consultation EPA.	-Literature review performed. -Focus groups conducted with families, primary care pediatricians and subspecialist pediatric providers to understand their experience with referral and consultation process. -Pediatric residents completed an online survey about referral and consultation, which was informed by literature review and focus groups. Used to identify gaps in their mastery of the components of the EPA. -Specific measurable objectives of the curriculum were developed that reflect the requisite knowledge, skills, and attitudes that must be acquired for entrustment in the referral and consultation EPA.	-Literature review. -Initial EPAs drafted from interviews/focus groups. -EPAs revised and refined – Survey. -Curriculum objectives developed.	22
Hauer, Kohlwes, Cornett et al, 2013. USA	Internal medicine. Internal medicine residents.	30 EPAs. 1. Evaluate and manage a new problem in a continuity ambulatory patient requiring coordination of care between providers and across settings. 2. Admit and manage a medical inpatient with a new acute problem on a medical floor.	-Modified Delphi approach used to conduct 2-step cross-sectional survey of IM educators and residents at a 3-hospital IM residency program. Consensus on IM EPAs was reached from this. -30 potential EPAs drafted from a literature review. - 2 half-day retreats: Round 1: Participants independently rated each EPA for importance, and the year of training that an IM resident should be competent to conduct it. Participants could suggest	-Literature review. -Initial EPAs drafted - from literature. -EPAs revised and refined - Delphi method.	16

		<p>3. Admit and manage a medical inpatient with an acute exacerbation of a chronic problem on a medical floor.</p> <p>4. Lead a family meeting to discuss serious or sensitive news with patient and/or family and other health providers.</p> <p>5. Perform initial H&P, develop problem list, and plan for new ambulatory patient in continuity practice.</p> <p>6. Provide continuity care, conducting interval visits, for primary care patients with multiple chronic conditions.</p> <p>7. Develop and implement a safe discharge plan for a patient from the acute care setting.</p> <p>8. Discuss serious news with a patient and/or family (bad news, end-of-life care planning).</p> <p>9. Provide continuity care, conducting interval visits, for primary care patients.</p> <p>10. Triage medically ill patients to an appropriate level of care.</p> <p>11. Access medical information to provide evidence-based care for adult patients.</p> <p>12. Identify and manage acute, emergent problems.</p> <p>13. Provide urgent and emergent cross-coverage care to medicine inpatients.</p> <p>14. Lead a team in managing multiple inpatients.</p> <p>15. Recognise and diagnose common non-internal medicine (surgical, neurological, dermatologic, etc) problems and appropriately refer to subspecialty care.</p>	<p>additional EPAs. Round 2: Participants received the same rating sheet and their individual and group round 1 ratings. Participants independently rerated importance and year for each EPA.</p>		
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		<p>16. Diagnose conditions for and co-manage patients with complex problems needing subspecialty care (inpatient or outpatient).</p> <p>17. Manage information and knowledge for personal learning to improve care delivery and to educate others (journal club, etc.)</p> <p>18. Institute palliative care appropriately in collaboration with palliative care specialists.</p> <p>19. Perform behavioural counselling with a patient.</p> <p>20. Provide medical consultation for patients receiving nonmedical services.</p> <p>21. Admit and manage a medical ICU patient.</p> <p>22. Identify and address a quality improvement need in a clinical setting.</p> <p>23. Provide telephone management of an acute problem for an ambulatory patient.</p> <p>24. Provide care to an inpatient or outpatient non-English speaking patient, using appropriate translator services.</p> <p>25. Develop and implement an action plan based on review of performance data for one's ambulatory patient panel.</p> <p>26. Provide inpatient and outpatient care for patients with challenges in access to care that inappropriately address those challenges.</p> <p>27. Conduct or participate in a scholarly project (research, QI, education, other).</p> <p>28. Participate and believe an inpatient cardiopulmonary resuscitation.</p>			
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		<p>29. Provide initial management and contribute to postoperative care for patients presenting with surgical problems.</p> <p>30. Perform common procedures in internal medicine (LP, thoracentesis, central line, arthrocentesis).</p>			
<p>Hsu et al, 2016.</p> <p>USA</p>	<p>Pediatric emergency medicine.</p> <p>Fellows.</p>	<p>13 EPAs</p> <p>EPAs that cross the generalist to specialist role:</p> <ol style="list-style-type: none"> 1. Provide for and obtain consultation from other health care providers caring for children. 2. Contribute to the fiscally sound and ethical management of a practice (e.g. through billing, scheduling, coding, and record keeping practices). 3. Apply public health principles and improvement methodology to improve care for publications, communities and systems. 4. Lead an inter-professional health care team. 5. Facilitate handovers to another health care provider. <p>EPAs that are common to all paediatric subspecialties:</p> <ol style="list-style-type: none"> 1. Engage in scholarly activities through the discovery, application, and dissemination of new knowledge. 2. Lead within the subspecialty profession. <p>EPAs specific to paediatric emergency medicine:</p> <ol style="list-style-type: none"> 1. Recognise and provide care for acutely ill and/or injured paediatric patients presenting to the emergency department. 	<p>-working group of stakeholders formed.</p> <p>-identification or potential PEM EPAs: workgroup members individually identified up to 25 activities associated with the practice of PEM. Themes emerged from the activities identified, which were used later as the basis for PEM EPA development.</p> <p>-Another working group of physicians from all pediatric sub-specialties identified EPAs that cross the generalist to specialist role and develop EPAs common to all pediatric subspecialties.</p> <p>-Each subspecialty then asked to identify and develop subspecialty-specific EPAs.</p> <p>-development of PEM-specific EPAs: at an annual meeting, workgroup created and developed 5 PEM-specific EPAs.</p> <p>- 5 PEM EPAs were submitted for stakeholder review and approval, a 6th was requested and subsequently developed and submitted.</p> <p>-Validation of and mapping of competencies to PEM EPAs was carried out.</p> <p>-PEM EPAs and mapped competencies/milestones submitted for review.</p> <p>-PEM milestones accepted.</p> <p>-PEM EPAs published.</p>	<p>-Initial EPAs drafted - by working group.</p> <p>-EPAs revised and refined - stakeholder deliberation.</p> <p>-EPAs mapped to milestones/competencies.</p>	18

		<p>2. Recognise and provide care for medically and technologically complex paediatric patients in the ED.</p> <p>3. Demonstrate competence in performing common procedures associated with the practice of paediatric emergency medicine.</p> <p>4. Provide patient triage, resuscitation, and stabilisation; align care provided with severity of illness.</p> <p>5. Emergency department management: manage the ED to optimise patient care.</p> <p>6. Provide supervision for emergency personnel to enhance patient care quality and assure patient safety.</p>			
Klein et al, 2014. USA	Pediatrics. Pediatric learners.	<p>1 EPA.</p> <p>Assessing and managing the social determinants of health (SDH).</p>	Steps based on those outlined by ten Cate. 9 competencies mapped to the EPA.	<p>-Ten Cate template consulted.</p> <p>-EPA mapped to milestones/competencies.</p>	6
Kwan et al, 2016. Australia	Emergency medicine. PGY1s.	<p>Two EPAs.</p> <p>1. Managing adult patients with acute chest pain.</p> <p>2. Managing elderly patients following a fall.</p>	<p>1. The EPA topics were selected based on recommendations about EPA design in the literature.</p> <p>2. To develop EPA content, data was collected via focus groups and telephone interviews from emergency medicine physicians with experience in supervising PGY1s.</p> <p>3. The EPAs were drafted based on thematic analysis of collected data to populate domains in accepted EPA formats.</p> <p>4. To ensure the EPAs adequately reflected the participants' insights, written feedback on the draft EPAs was sought from participants and other stakeholders as a form of member checking.</p> <p>5. Feedback data on the draft EPAs from participants, PGY1s and students was collated and incorporated into the two final specialty-specific EPAs.</p>	<p>-Literature review.</p> <p>-Initial EPAs drafted - from interviews/focus groups.</p> <p>-EPAs revised and refined - Stakeholder deliberation.</p>	35

Landzaat et al, 2017. USA	Hospice and palliative medicine (HPM). Fellows.	<p>17 EPAs:</p> <ol style="list-style-type: none"> 1. Provide comprehensive pain assessment and management for patients with serious illness. 2. Provide comprehensive non-pain symptom assessment and management for patients with serious illness. 3. Manage palliative care emergencies. 4. Estimate and communicate prognosis to aid medical decision. 5. Establish goals of care based on patient/family values and specific medical circumstances. 6. Participate as a member or leader of an interdisciplinary team. 7. Prevent and mediate conflict and distress over complex medical decisions. 8. Manage withdrawal of advanced life sustaining therapies. 9. Care for the imminently dying patient and their family. 10. Manage requests for hastened death. 11. Support patient and family in the psychosocial domain. 12. Support patient and family in the spiritual and existential domain. 13. Provide self-care and resilience. 14. Facilitate transitions across the HPM continuum of care. 15. Fulfil the role of a hospice medical director. 	<ul style="list-style-type: none"> -Workgroup formed. -Benchmarked with other specialties' EPAs to define aims and processes for HPM EPA development. -Working group initially identified 18 EPAs. -Through an iterative consensus-based process, each workgroup member fully reviewed and revised each individual EPA for content and fit in the set at least twice. After two rounds of review and revision, 16 EPAs remained. -A sample of 15 recent fellowship graduates were asked to review a preliminary set of EPAs for any omissions. Feedback was examined but resulted in no additions. -Fellowship leaders and educators took part in an EPA vetting session. Review of comments resulted in addition of a new 17th EPA and revisions. -Vetting with electronic survey sent to physician members to achieve consensus. Review of feedback, revisions. -Final 17 EPAs released. 	<ul style="list-style-type: none"> -Initial EPAs drafted - by working group. -EPAs benchmarked with others. -EPAs revised and refined - Stakeholder deliberation, survey. 	28

		<p>16. Provide hospice and palliative medicine consultation and team support.</p> <p>17. Advocate for and teach palliative care.</p>			
<p>Leipzig et al, 2014.</p> <p>USA</p>	<p>Geriatrics.</p> <p>Trainees (end-of-training).</p>	<p>12 EPAs.</p> <ol style="list-style-type: none"> 1. Provide patient-centred care that optimises function and/or well-being. 2. Prioritise and manage the care of older patients by integrating the patient's goals and values, comorbidities, and prognosis into the practice of evidence-based medicine. 3. Assist patients and families in clarifying goals of care and making care decisions. 4. Prevent, diagnose, and manage geriatric syndromes. 5. Provide comprehensive medication review to maximise benefit and minimise number of medications and adverse events. 6. Provide palliative and end-of-life care for older adults. 7. Coordinate health care and healthcare transitions for older adults with multiple chronic conditions and multiple providers. 8. Provide geriatrics consultation and co-management. 9. Skilfully facilitate a family meeting. 10. Collaborate and work effectively as a leader or member of an interpersonal healthcare team. 11. Teach the principles of geriatrics care and aging-related healthcare issues to professionals, patients, families, 	<p>-An EPA working group was formed.</p> <p>-Initial list of EPAs drafted and iterative process used to garner input from educators.</p> <p>-Plenary session held, in which participants worked in small groups to review and comment on the draft EPAs.</p> <p>-Working group considered and incorporated these and other comments into a revised draft of the EPAs and met in person.</p> <p>-At meeting one year later, participants broke into small groups to review the updated draft EPAs. Each group was also assigned one EPA and asked to describe the tasks a trainee would need to perform to demonstrate competence.</p> <p>-Comments were incorporated, and a draft list of 11 EPAs was emailed to stakeholders, seeking a final round of comments.</p> <p>-Comments reviewed and considered, and a final list of 12 EPAs were posted</p>	<p>-Initial EPAs drafted - by working group.</p> <p>-EPAs revised and refined - stakeholder deliberation.</p>	14

		<p>healthcare providers, and others in the community.</p> <p>12. Collaborate and work effectively in quality improvement and other systems-based initiatives to assure patient safety and improve outcomes for older adults.</p>			
<p>Mallow et al, 2017.</p> <p>USA</p>	<p>Physical medicine and rehabilitation (PM&R). Residents.</p>	<p>19 EPAs:</p> <ol style="list-style-type: none"> 1. Evaluating and managing patients with spasticity. 2. Managing the rehabilitation needs of patients with disabling palsy conditions of childhood onset such as cerebral palsy and spina bifida. 3. Evaluating and managing patients with musculoskeletal syndromes including arthritis, tendinopathies, and other soft tissue injuries. 4. Evaluating and managing patients with spinal disorders and axial pain. 5. Evaluating and managing the rehabilitation needs of patients with neuromuscular disorders such as myopathy, motor neuron disease, peripheral demyelinating diseases (GBS, CIDP), NMJ disorders, focal neuropathy, radiculopathy, or plexopathy. 6. Performing an electrodiagnostic consultation and examination. 7. Evaluating and managing patients with congenital and acquired limb deficiencies including secondary conditions and complications. 8. Evaluating and managing patients the rehabilitation needs of patients following stroke including secondary conditions and complications. 	<p>-Subcommittee formed.</p> <p>-Review of literature to assist development.</p> <p>-EPAs were developed using a modified Delphi process.</p> <p>-Initial set of 34 EPAs developed, and were rated on a scale of 1-5. EPAs rated less than 2 were retained and those rated greater than 4 were rejected. EPAs rate between 2 and 4 were further discussed and edited, resulting in a list of 20 EPAs.</p> <p>-The proposed EPAs were shared for validation with program directors via e-mail. The same Delphi process was applied to rate each of the EPAs via an online response system. Comments were also collected.</p> <p>-After the first round of validation, the working group revised EPAs as per scores and comments and submitted the revised list for a second round of validation.</p> <p>-After the second round, 19 EPAs remained.</p>	<p>-Literature review.</p> <p>-Initial EPAs drafted - by working group.</p> <p>-EPAs revised and refined - Delphi Method.</p>	21

		<p>9. Evaluating and managing patients with brain disorders including traumatic brain injury and sports-related concussion including secondary conditions and complications.</p> <p>10. Evaluating and managing patients with spinal cord injury and other spinal cord disorders including secondary conditions and complications.</p> <p>11. Evaluating and managing the rehabilitation needs of patients with progressive neurologic disorders such as multiple sclerosis, post-polio syndrome, Parkinson disease, and ALS.</p> <p>12. Evaluating and managing the rehabilitation needs of a patient with cancer and related complications.</p> <p>13. Leading an interdisciplinary rehabilitation team and crafting a comprehensive interdisciplinary rehabilitation plan.</p> <p>14. Coordinating medical management in the inpatient rehabilitation setting for co-morbidities, secondary conditions, and complications of medical care.</p> <p>15. Revised: managing functional impairment and disability resulting from medical conditions.</p> <p>16. Coordinating care and managing transitions across all levels of inpatient, outpatient, and community rehabilitation.</p> <p>17. Providing rehabilitation consultation in various healthcare settings including acute inpatient, outpatient, and community rehabilitation.</p>			
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<p>McCloskey et al, 2017.</p> <p>USA</p>	<p>Pathology. Residents.</p>	<p>19 EPAs.</p> <ol style="list-style-type: none"> 1. Perform gross dissection of simple and complex specimens. 2. Compose a diagnostic report for surgical pathology specimens. 3. Perform intraoperative consultations and frozen sections. 4. Compose a diagnostic report for cytology specimens. 5. Perform adequacy assessment/rapid interpretation for cytology specimens. 6. Perform fine needle aspiration. 7. Perform a medical autopsy. 8. Compose a diagnostic report for clinical laboratory testing requiring pathologist interpretation. 9. Evaluate and report adverse events involving the transfusion of blood components. 10. Evaluate and report critical values in the clinical laboratory. 11. Perform other procedures, for example, bone marrow aspiration and biopsy, apheresis. 12. Provide guidance for the resolution of pre-analytical testing issues. 13. Provide pathology support for interdisciplinary conferences. 14. Provide patient care consultations. 15. Optimize test utilization. 16. Improve quality and patient safety. 17. Evaluate and choose a new test or instrument. 	<p>-Graduate Medical Education Committee (GMEC) met over approx. 2 years to explore the concepts set forth in CMBE.</p> <p>-They narrowed their focus to EPAs based on a literature review.</p> <p>-After a subset of committee members drafted an initial list of EPAs for pathology, the full committee evaluated and refined preliminary list.</p> <p>-Members were assigned to develop content related to each EPA based on the 'guidelines for full EPA descriptions' and the 'components of a fully described EPA' described by ten Cate and colleagues and Caverzagie et al.</p> <p>-EPAs were then edited and refined in three subsequent meetings.</p>	<p>-Literature review.</p> <p>-Initial EPAs drafted - by working group.</p> <p>-EPAs revised and refined - stakeholder deliberation.</p>	15

		<p>18. Implement a new assay or test system.</p> <p>19. Perform a laboratory accreditation inspection.</p>			
McMurray et al, 2017 Canada	<p>Multiple specialties</p> <p>PGY1 residents</p>	<p>1 EPA</p> <p>Nightmares course EPA - Recognize, assess, and manage the acutely unwell inpatient when alone, on call, or in the hospital overnight.</p>	<p>-An EPA common to several specialty training programs was defined with expert consensus input from 2 physicians with expertise in resuscitation.</p>	<p>-Initial EPAs drafted – working group.</p>	21
Meade et al, 2016. USA	<p>Internal medicine. Trainee.</p>	<p>1 EPA.</p> <p>Safe and effective discharge of a patient from hospital.</p>	<p>-Working group established (E-ROC).</p> <p>-E-ROC faculty collaborated on a monthly conference call and in person biannually to develop and pilot the discharge EPA tool.</p> <p>-Assembled interprofessional groups, including patients, family members, and different health professionals, to expand the definition of the discharge EPA. A qualitative approach was used to identify behaviors expected of physicians competent in this EPA.</p> <p>-Discussions facilitated the development and prioritization of behaviors.</p> <p>-A total of 182 behaviors were collected from all discussion groups.</p> <p>-The behaviors were grouped by theme and ranked. An iterative process was used to reduce these behaviors to six components. These descriptors were then used to develop an assessment tool for direct observation of the EPA.</p> <p>-The tool was distributed to the 11 participating IM programs and adjustments were made based on feedback from educators.</p>	<p>-Initial EPAs drafted - by working group, from interviews/focus groups.</p> <p>-EPAs revised and refined - Stakeholder deliberation.</p>	21

<p>Moloughney et al, 2017.</p> <p>Canada</p>	<p>Public health and preventative medicine.</p> <p>Public health and preventative medicine residents.</p>	<p>20 EPAs.</p> <p>Domain: Monitor and assess the health of the public.</p> <ol style="list-style-type: none"> 1. Conduct a population health status assessment. 2. Conduct a health needs assessment. 3. Design and manage health surveillance systems. 4. Conduct a health impact assessment. 5. Conduct an environmental health risk assessment. <p>Domain: Public health leadership & management.</p> <ol style="list-style-type: none"> 6. Act as spokesperson to communicate about public health issues the public, their elected representatives, inter-sectoral partners, and the health system. 7. Lead and manage strategic planning. 8. Lead and manage the operational planning and evaluation of a public health program. 9. Lead and manage a team and organisation. 10. Lead and manage change within an organisation. 11. Lead and manage a quality improvement initiative. <p>Domain: Protect the public's health.</p> <ol style="list-style-type: none"> 12. Manage communicable diseases of public health importance. 13. Manage a communicable disease outbreak. 14. Manage environmental health risks, exposures and incidents of public health importance. 	<p>-Ontario-based programs developed draft set of EPA titles, which were shared with PHPM programs nationally.</p> <p>-Became known that University of Calgary program had developed a set of EPAs also (n=28).</p> <p>-Decided to reconcile both into a single set and seek feedback on it from all PHMP programs.</p> <p>-Queen's University hosted a two-day workshop. Working with the combined total of 59 EPA titles, workshop participants consolidated them into 20 final EPAs, including 6 new EPAs. Descriptions and milestones for new EPAs were developed.</p> <p>-Online survey carried out of all PHPM program directors across Canada. Their level of agreement with each of the EPA titles and descriptions was assessed. Additional comments or suggestions for improvements were also sought for each item.</p> <p>-Survey results discussed by group and minor revisions were made to the EPA titles and descriptions.</p> <p>-Milestones assigned to accompany EPAs.</p>	<p>-Initial EPAs drafted - by working group.</p> <p>-EPAs combined with previously developed sets.</p> <p>-EPAs revised and refined - Survey, Stakeholder deliberation.</p> <p>-EPAs mapped to milestones/competencies.</p>	<p>20</p>
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<p>Moore et al, 2017.</p> <p>Australia</p>	<p>Surgery.</p> <p>Surgical trainees.</p>	<p>7 EPAs for each level of trainee (3 levels)</p> <p>EPAs for senior resident medical officer-level surgical trainee:</p> <ol style="list-style-type: none"> 1. Manage deteriorating patient. 2. Review colorectal surgery consultation. 3. Submit operating theatre list. 4. Arrange transfer of patient. 5. Drain perianal abscess. 6. Laparoscopic appendectomy. 7. Umbilical hernia. <p>EPAs for surgical education and training-level surgical trainee:</p> <ol style="list-style-type: none"> 1. Manage deteriorating patient. 2. Review colorectal surgery consultation. 3. Organise monthly M & M (morbidity and mortality meeting) audit. 	<p>-Key steps in curriculum design were the identification of suitable EPAs, followed by elaboration, including a full description of each task, definition of supervision levels, and a description of the assessment process.</p> <p>- Authors adapted ten Cate and colleagues' criteria, to emphasize EPAs that are important for patient safety.</p> <p>-Used adapted criteria to narrow the focus to EPAs relevant to the requirements of the colorectal surgery department.</p> <p>-Seven EPAs for each level of trainee were chosen by consensus between two consultants.</p> <p>-Each EPA was described using a template adapted from the work of ten Cate & Young.</p>	<p>-Initial EPAs drafted - from literature.</p> <p>-Ten Cate template consulted.</p>	19

		<p>4. Lead ward round. 5. Laparoscopic appendectomy. 6. Open inguinal hernia. 7. Laparotomy for small bowel obstruction.</p> <p>EPAs for fellow-level surgical trainee:</p> <p>1. Manage deteriorating patient. 2. Review colorectal surgery consultation. 3. Organise monthly M & M audit. 4. Lead MDT (multi-disciplinary team meeting). 5. Open inguinal hernia. 6. Laparotomy for small bowel obstruction. 7. Hartmann's procedure.</p>			
Myers et al, 2015. Canada	Palliative medicine. Palliative medicine residents.	<p>12 EPAs.</p> <p>1. Complete a palliative medicine consultation. 2. Manage the care of a dying patient in the last days, and final hours. 3. Conduct a family conference or meeting. 4. Address difficult to manage symptoms through pharmacological and non-pharmacological modalities appropriate for the palliative medicine setting. 5. Collaborate as a palliative medicine physician with referring health care teams. 6. Educate about 'palliative care' as an approach or philosophy. 7. Integrate into an inter-professional specialised palliative care team.</p>	<p>-A working group was formed. -Meeting of working group to identify an initial draft set of EPAs. Through task analysis of palliative medicine physicians' routine professional work, working group members were to identify a maximum of 15 EPAs. -The set was revised, refined, and synthesized over the course of a number of months until consensus was reached. -Each EPA expanded and further developed and mapped onto the CanMEDS competency framework. - Preliminary input was obtained through a series of focus groups and validation was then sought through a national survey of palliative medicine physicians. -The final set of EPAs comprised 12 individual activities.</p>	<p>-Initial EPAs drafted - by working group. -EPAs revised and refined - stakeholder deliberation, survey.</p>	41

		8. Manage the palliative care of a patient in the community setting. 9. Maintain resiliency in practice as a palliative medicine physician. 10. Provide palliative medicine telephone advice and management. 11. Serve as Most Responsible Physician for a patient admitted to a designated palliative care bed. 12. Describe an approach to managing a controversial palliative medicine ethical issue for a patient.			
O’Keeffe, 2014. Australia	Developmental-behavioral pediatrics. Pediatric trainees.	14 EPAs. 1. Assessment in DBP (developmental-behavioural paediatrics). 2. Diagnostic formulation. 3. Management plan. 4. Providing feedback to parents and child. 5. Written communication. 6. Case co-ordination- chronic disorder model. 7. Building resilience. 8. Provides access to information and resources. 9. Use of psychotropic medications in DBP. 10. Office-based counselling in DBP. 11. Communication with other agencies. 12. Advocacy. 13. Teamwork. 14. Teaching in DBP.	*Development process suggested by author. -Development of the key EPAs involves an analysis of activities that are central to the specialty. -Decisions need to be made on the number and scope of EPAs. -A list of 10-20 items is suggested as a sensible initial target. -Individual EPAs are then described in more detail. The title of the EPA will usually contain a verb, emphasizing performance. Content and scope, including required knowledge, and skills, is then summarized. TLAs are recommended. Assessment methods (e.g. WBA tools) appropriate for each EPA are identified, with an assessment ‘blueprint’ devised that will adequately cover the range of EPAs.	-Initial EPAs drafted - from literature.	7
Parker et al, 2017. USA	Neonatology.	13 EPAs.	-Delphi panel formed. -Two independently generated sets of EPAs were combined (5 EPAs & 14 EPAs). - Delphi process used to derive a single validated list.	-Initial EPAs drafted- by working group.	23

		<ol style="list-style-type: none"> 1. Provide antenatal counselling, resuscitation, and stabilisation of critically ill new-born. 2. Cares for early preterm infants (24-26 weeks gestation). 3. Cares for late preterm infants (34-37 weeks gestation). 4. Cares for infants with cardiorespiratory failure. 5. Cares for infants with life-threatening infection. 6. Cares for the brain-injured new-born. 7. Manages nutritional needs of critically ill new-borns. 8. Provide care to patients in the NICU with surgical problems in collaboration with paediatric and subspecialty surgeons. 9. Manage patients with acute common single system disease in an inpatient setting. 10. Cares for infants with bronchopulmonary dysplasia. 11. Leads difficult care conferences (including discontinuation of life support). 12. Manages transition of care (routine sign-out, change of service, discharge). 13. Coordinates transport of critically ill new-borns. 	<p>-Consensus was sought as to importance and scope of each EPA. Criteria for consensus was defined as >75% of participants agreeing to its importance ('very important' or 'essential') of each EPA.</p> <p>-In the first Delphi round, participants were asked to indicate 'how important is it that a fellow be entrusted to complete each activity without supervision by the time they complete the program'. Participants were also asked rate the scope of each EPA by considering whether it 'describes a sufficiently discrete set of knowledge and skills that can be observed and evaluated'.</p> <p>-Participants had the option to suggest wording changes to improve any EPA and to recommend additional EPAs.</p> <p>-Based on the results from the first round, questions were developed for a second round which focused on EPAs that were judged to be overly broad. After clarifying the meaning of each, panelists were asked to reconsider importance and scope. Panelists were also asked to evaluate two additional EPAs that were proposed in round 1.</p>	-EPAs revised and refined - Delphi method.	
Pugh et al, 2017 Canada	Internal Medicine. Internal Medicine Residents.	<p>7 EPAs for bedside procedures.</p> <ol style="list-style-type: none"> 1. Central venous catheter insertion. 2. Lumbar puncture. 3. Peripheral arterial catheter insertion. 4. Paracentesis. 5. Endotracheal intubation. 6. Thoracentesis. 	<p>Phase 1. Defining EPA components.</p> <p>-Subject matter experts recruited for focus groups.</p> <p>-7 Focus groups asked to define components for procedural EPAs, using nominal group technique to identify skills required for each EPA.</p> <p>-Three iterations used to achieve consensus on list of EPAs.</p>	-Initial EPAs drafted – from interviews/focus group -EPAs revised and refined - Survey	19

		7. Knee arthrocentesis.	Phase 2. National Survey. -Web based survey completed by experts, comprising of list of EPA components developed in phase 1. Response and consensus percentages rates calculated.		
Rose et al, 2014. USA	Gastroenterology. Gastroenterology fellows.	13 EPAs. 1. Manage common acid peptic-related problems. 2. Manage common functional GI disorders. 3. Manage common GO motility disorders. 4. Manage liver diseases. 5. Manage complications of cirrhosis. 6. Perform upper and lower endoscopic procedures for the evaluation of the luminal GI tract for screening, diagnosis, and intervention. 7. Perform endoscopic procedures for the evaluation and management of GI bleeding. 8. Manage biliary disorders. 9. Manage pancreatic diseases. 10. Manage common GI infections in nonimmune-suppressed and immunocompromised populations. 11. Identify and manage patients with non-infectious GI luminal disease. 12. Manage common GI and liver malignancies and associated extra intestinal cancers. 13. Assess nutritional status and develop and implement nutritional therapies in health and disease.	-A workgroup was established to develop EPAs. -They worked in groups to prepare EPAs and milestones, in a combination of independent work and follow-up conference calls. -The initial drafts of EPAs were refined, reviewed, and approved by the societies. -13 EPAs for gastroenterology were developed.	-Initial EPAs drafted - by working group. -EPAs revised and refined - stakeholder deliberation.	13
Schultz et al, 2015. Canada	Family medicine. Family medicine residents.	35 EPAs. 1. Care of a prenatal patient. 2. care of an intrapartum patient. 3. Care of a postpartum patient.	-Firstly, authors searched the literature and considered needs of residents and society to confirm that the existing curriculum covered the skills they wanted residents to have at end of training.	-Literature review. -Curriculum objectives defined.	19

		<p>4. Care of a new-born.</p> <p>5. Care of a well baby and child.</p> <p>6. Care of children and adolescents with common conditions.</p> <p>7. Care of children and adolescents with acute serious conditions.</p> <p>8. Care of an adolescent patient.</p> <p>9. Care of an adult for a periodic health exam.</p> <p>10. Care of an adult with a minor episodic problem.</p> <p>11. Care of an adult with a chronic condition.</p> <p>12. Care of an adult with multiple medical problems.</p> <p>13. Care of an adult with an acute serious presentation.</p> <p>14. Care of an elderly patient for a periodic health exam.</p> <p>15. Care of an elderly patient with a minor episodic problem.</p> <p>16. Care of an elderly patient with a chronic condition.</p> <p>17. Care of an elderly patient with multiple medical problems.</p> <p>18. Care of an elderly patient with an acute serious presentation.</p> <p>19. Symptom control care for a palliative patient.</p> <p>20. Carrying out a goals-of-care family meeting.</p> <p>21. Carrying out a home visit.</p> <p>22. Breaking bad news.</p> <p>23. Providing lifestyle counselling/behavioural modification.</p> <p>24. Care of a patient with a psychiatric disorder.</p> <p>25. Care of a patient from another culture.</p>	<p>-Existing objectives reworded with competency-based language.</p> <p>-An expert panel was formed from family physician and medical education experts.</p> <p>-Expert panel met in person and by teleconference six times to brainstorm what defines them as a profession.</p> <p>-Workable number of EPAs agreed on (35).</p> <p>-Generic template for EPAs designed, which were built iteratively from the literature and the expert panel.</p> <p>-The expert panel then provided feedback verbally and via email, which was incorporated into the templates.</p>	<p>-Initial EPAs drafted - by working group.</p> <p>-EPAs revised and refined - Stakeholder deliberation.</p>	
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		26. Care of a patient living in poverty. 27. Care of a patient with a developmental disability. 28. Care of a perioperative patient. 29. Performing an acute care procedure. 30. Performing a minor office procedure. 31. Performing as a professional. 32. Carrying out practice management. 33. Taking on a leadership role. 34. Taking on a teaching role. 35. Engaging in self-regulated learning			
Sharma et al, 2018 India	Pathology trainees (histopathology and cytology).	10 EPAs: Histopathology: 1. Grossing small specimens. 2. Grossing large specimens under supervision. 3. Proofreading of typed/handwritten reports. 4. Writing a good description of microscopic features without giving final diagnosis. 5. Making a biopsy diagnosis of non-malignant endometrial aspirates. Cytology: 1. Screening gynae Pap smears and correctly identifying metaplastic cells. 2. Identifying granulomas. 3. Performing fine-needle aspiration on fibroadenomas, ganglion cyst, colloid goitres. 4. Identifying trichomonas, candida, and bacterial vaginosis in gynae Pap smears. 5. Correctly identifying acid-fast bacilli.	-Questionnaire comprising 18 potential EPAs in histopathology and 12 potential EPAs in cytology circulated among the junior and senior residents of Pathology Department. -The respondents were asked to grade the EPAs on a scale of 0–4 based on how important they consider that activity for a resident to be able to perform at the end of 1st year of training. -Shortlisted EPAs were mapped to the general competencies.	-EPAs revised and refined-Survey. -EPAs mapped to milestones.	13

<p>Shaughnessy et al, 2012.</p> <p>USA</p>	<p>Family medicine. Residents.</p>	<p>76 EPAs.</p> <ol style="list-style-type: none"> 1. Conducting the well-adult visit or well-woman examination. 2. Managing the anxious patient. 3. Managing the child with a fever. 4. Conducting the child well-visit. 5. Conducting the new-born well-visit. 6. Managing the patient who needs contraception. 7. Managing the patient with a change in vision, or a painful, red, or itchy eye. 8. Managing the patient with a headache. 9. Managing the patient with a lesion/rash. 10. Managing the patient with a nicotine addiction. 11. Managing the patient with a sore throat. 12. Managing the patient with abdominal pain. 13. Managing the patient with abnormal thyroid exam or labs. 14. Managing the patient with acute urinary symptoms. 15. Managing the patient with irregular heartbeat. 16. Managing the patient with chest pain. 17. Managing the patient with chronic pain. 18. Managing the patient with diabetes. 19. Managing the patient with dizziness. 20. Managing the patient with dyspepsia. 	<p>-Initial list of activities developed by relying on model curricula, similar inventories, textbook chapter headings and lists of the most common diagnostic codes recorded by residents.</p> <p>-An iterative process was used to develop initial list, reorganizing after each discussion. This was circulated among faculty members at institution for comment.</p> <p>-Following feedback from preceptors, a list of 91 activities was developed.</p> <p>-The list was tested using a Delphi process to obtain the opinion of experts in family medicine education. The Delphi process consisted of 2 rounds of anonymous responses to surveys sent electronically using Survey Monkey.</p> <p>-The first round asked experts to rate each suggested EPA for importance on a 7-point scale, from 1 (do not include) to 7 (must include).</p> <p>-For the second round of voting, EPAs rated as 6 or 7 were ordered by popularity, and each labelled with the percentage of experts ranking it as 'must include'. During the second round, experts were asked to mark each EPA as 'must include' or 'do not include'. The final list consisted of those items ranked as 'must include' by more than two-thirds of the experts.</p>	<p>-Initial EPAs drafted - from literature, by working group.</p> <p>-EPAs tested for completeness in clinical setting.</p> <p>-EPAs revised and refined - Delphi process.</p>	<p>23</p>

		<p>21. Managing the patient with genital discharge or with possible sexually transmitted infection.</p> <p>22. Managing the patient with joint pain.</p> <p>23. Managing the patient with low back pain.</p> <p>24. Managing the patient with runny/stuffy nose.</p> <p>25. Managing the patient with shortness of breath/difficulty breathing.</p> <p>26. Managing the patient with vomiting and/or nausea.</p> <p>27. Managing the woman with abnormal vaginal bleeding.</p> <p>28. Managing the child with a cough.</p> <p>29. Managing the child with diarrhoea or emesis.</p> <p>30. Managing the obese patient.</p> <p>31. Managing the older confused patient.</p> <p>32. Managing the patient with a breast lump or discharge.</p> <p>33. Managing the patient with a cough.</p> <p>34. Managing the patient with acute pain.</p> <p>35. Managing the patient with an earache or change in hearing.</p> <p>36. Managing the patient with changes in bowel habits.</p> <p>37. Managing the patient with excessive fatigue.</p> <p>38. Managing the patient with menopause symptoms.</p> <p>39. Managing the patient with menstrual symptoms.</p> <p>40. Managing the patient with numbness, tingling, or weakness.</p>			
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		<p>41. Managing the patient with or at risk for heart disease or stroke.</p> <p>42. Managing the patient with pain/swelling in the legs.</p> <p>43. Managing the patient with sleeping problems.</p> <p>44. Managing the child with a rash.</p> <p>45. Managing the dying patient.</p> <p>46. Managing the older adult.</p> <p>47. Managing the patient with a genital rash/lesion.</p> <p>48. Managing the patient with a lump or bump.</p> <p>49. Managing the patient with a murmur.</p> <p>50. Managing the sad patient.</p> <p>51. Managing the child with enuresis or encopresis.</p> <p>52. Managing the patient with an alcohol addiction.</p> <p>53. Managing the patient with emotional distress.</p> <p>54. Managing the patient with high blood pressure.</p> <p>55. Managing patient with premenstrual symptoms.</p> <p>56. Managing the patient with urinary difficulty.</p> <p>57. Managing the patient you suspect is a victim of abuse.</p> <p>58. Managing the pregnant patient.</p> <p>59. Medication management in older patients.</p> <p>60. Managing falls in older patients.</p> <p>61. Managing the child you suspect is a victim of abuse.</p> <p>62. Managing the patient with mononucleosis.</p>			
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		63. Managing the patient with muscle pain. 64. Managing the patient with neck pain. 65. Managing the child with growth or development problems. 66. Managing the child with inattention, hyperactivity, or impulsivity. 67. Managing the patient at risk for diabetes. 68. Managing the patient with enlarged thyroid or a thyroid mass. 69. Managing the patient with liver disease. 70. Managing the patient with sexual problems. 71. Managing the patient with weight changes. 72. Managing the postpartum patient. 73. Managing the man with genital complaints. 74. Managing the patient who needs options counselling for pregnancy. 75. Managing the patient with anaphylaxis or anaphylactoid reaction. 76. Managing the patient with hypertensive urgency.			
Shumway et al, 2015. USA	Hematology/oncology. Hematology/oncology fellows.	5 EPAs. 1. Writing chemotherapy orders. 2. Performing toxicity checks. 3. Monitoring response to therapy. 4. Performing bone marrow biopsies. 5. End-of-life care.	- Program directors at 2 medical centers started phone conferences to develop and implement a milestone-based assessment tool and educate key clinical faculty on it. -2-3 key clinical faculty were engaged at each institution to develop 5 EPAs for the HO continuity	-Ten Cate template consulted. -Initial EPAs drafted - from	15

			<p>clinic using a template suggested by ten Cate and Young. The EPA templates were reviewed during the weekly phone calls.</p> <ul style="list-style-type: none"> -Once the EPAs were complete, milestone-based evaluations supporting these EPAs were built. -The ACGME template for developmental milestones was modified and edited to fit the HO subspecialty. -The new evaluation system was piloted at both institutions. -Each institutions' CCC met to deliberate formal entrustment decisions regarding EPAs. 	literature, by working group.	
<p>Taylor et al, 2018</p> <p>Canada</p>	<p>Internal Medicine. Internal medicine residents.</p>	<p>29 EPAs.</p> <p>Transition to Discipline</p> <ol style="list-style-type: none"> 1. Performing histories and physical examinations and documenting and presenting findings across clinical settings for initial and subsequent care. 2. Identifying and assessing unstable patients, providing initial management, and obtaining help. 3. Performing the basic procedures of internal medicine <p>Foundations of discipline</p> <ol style="list-style-type: none"> 4. Assessing, diagnosing, and providing initial management for patients with common acute medical presentations in acute care settings. 5. Managing patients admitted to acute care settings with common medical problems and advancing their care plans. 6. Consulting specialists and other health professionals, synthesizing recommendations, and integrating these into the care plan. 	<p>Phase 1.</p> <ul style="list-style-type: none"> -Identified candidate activities from 3 sources – a two day workshop, publications in the English-language peer reviewed literature, and the results of a similar process at 1 academic centre. -Recruited specialty committee for phase 1. -Modified Delphi Survey used to help participants reach agreement about activities. Administered online. -Participants asked to rate importance of each activity until consensus was reached. <p>Phase 2.</p> <ul style="list-style-type: none"> -5 Educational experts recruited to evaluate all activities not excluded by phase 1. -Conducted using online survey. -Results collated and presented to the group during a conference, where participants were asked to identify which activities met the definition of EPAs and revise activities that did not. 	<p>-Initial EPAs drafted – from literature review, by working group.</p> <p>-EPAs revised and refined – Delphi Method, stakeholder deliberation.</p>	14

		<p>7. Formulating, communicating, and implementing discharge plans for patients with common medical conditions from acute care settings.</p> <p>8. Assessing unstable patients and providing targeted treatment and consulting as needed.</p> <p>9. Discussing and establishing patients' goals of care.</p> <p>10. Identifying personal learning needs while caring for patients and addressing those needs.</p> <p>Core of Discipline</p> <p>11. Assessing, diagnosing, and managing patients with complex or atypical acute medical presentations.</p> <p>12. Assessing and managing patients with complex chronic conditions.</p> <p>13. Providing internal medicine consultation to other clinical services.</p> <p>14. Assessing, resuscitating and managing unstable and critically ill patients.</p> <p>15. Performing the procedures of internal medicine.</p> <p>16. Assessing capacity for medical decision making.</p> <p>17. Discussing serious and/or complex aspects of care with patients, families, and caregivers.</p> <p>18. Caring for patients who have experienced a patient safety incident (adverse event).</p> <p>19. Caring for patients at the end of life.</p> <p>20. Implementing health promotion strategies in patients with or at risk for disease.</p>			
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		<p>21. Supervising junior learners in the clinical setting.</p> <p>Transition to practice</p> <p>22. Managing an inpatient medical service.</p> <p>23. Managing longitudinal aspects of care in a medical clinic.</p> <p>24. Assessing and managing patients with uncertain diagnosis and/or treatment.</p> <p>25. Providing consultations to off-site healthcare providers.</p> <p>26. Initiating and facilitating transfers of care through the health care system.</p> <p>27. Working with other physicians and healthcare professionals to develop collaborative patient care plans.</p> <p>28. Identifying learning needs in clinical practice and addressing them with a personal learning plan.</p> <p>29. Identifying and analyzing system level safety, quality, or resource stewardship concern in health care delivery.</p>			
<p>Weiss et al, 2016.</p> <p>USA</p>	<p>Psychiatry.</p> <p>Psychiatry residents.</p>	<p>18 EPAs.</p> <p>PGY1:</p> <ol style="list-style-type: none"> 1. Resident safely and effectively prescribes and monitors mood stabilisers 2. Resident conducts a safety assessment in the emergency room setting. 3. Resident can safely and effectively prescribe and monitor both 	<p>-Milestones Committee established.</p> <p>-Using examples from the EPA handbook created by the RANZCP, and published articles, faculty members were educated and involved in the development of EPAs.</p> <p>-Each service was tasked with generating a list of 5-10 psychiatry specific activities.</p> <p>-Previous evaluation forms and objectives were reviewed to inform the development of EPA evaluation forms.</p>	<p>-Initial EPAs drafted - by working group.</p> <p>-EPAs revised and refined - stakeholder deliberation.</p> <p>-EPAs mapped to milestones/competencies.</p>	13

		<p>conventional and atypical antipsychotics in the inpatient setting.</p> <p>4. Resident determines need for hospitalization vs. discharge.</p> <p>5. Resident appropriately conducts a hand-off.</p> <p>PGY2:</p> <p>1. Resident recognises signs/symptoms of delirium and makes appropriate management recommendations.</p> <p>2. Resident develops an appropriate psychiatric formulation and treatment plan for a child and/or adolescent patient.</p> <p>3. Resident performs a psychiatric evaluation in the generic outpatient setting.</p> <p>4. Resident manages the polypharmacy of treatment resistant patients.</p> <p>5. Resident evaluates and manages opiate withdrawal symptoms.</p> <p>6. Resident conducts a thorough evaluation of decisional capacity and makes appropriate management recommendations.</p> <p>PGY3:</p> <p>1. Resident appropriately responds to acute situations including doing a risk assessment and safety plan in the outpatient setting.</p> <p>2. Resident conducts cognitive behavioural therapy with an uncomplicated patient in the outpatient setting.</p> <p>3. Resident pharmacologically manages patients in the outpatient setting.</p>	<p>-The milestones committee edited and expanded submitted list of tasks and transformed them into EPA titles with definitions.</p> <p>-The milestones committee expanded the EPA definition.</p> <p>-The initial EPA definitions were revised and mapped onto milestones and competencies.</p>		
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		<p>PGY4:</p> <ol style="list-style-type: none"> 1. Resident provides clinical instruction to junior learners, including residents and medical students, through supervisory activities and teaching in core didactics. 2. Resident participates in quality improvement activities and the analysis of adverse and sentinel events. 3. Resident conducts insight oriented psychotherapy in the outpatient setting. 4. Chief resident leads a multidisciplinary team on their clinical service. 			
<p>Wisman-Zwarter et al, 2016.</p> <p>The Netherlands</p>	Anesthesiology.	<p>45 EPAs.</p> <ol style="list-style-type: none"> 1. Cardiopulmonary resuscitation of the adult patient. 2. Cardiopulmonary resuscitation of the paediatric patient. 3. Epidural and spinal anaesthesia. 4. Interviewing the patient. 5. Management of acute pain. 6. Management of chronic pain. 7. Management of massive blood loss. 8. Management of oncological pain and palliative care. 9. Management of the difficult airway. 10. Obtain central venous access. 11. Perioperative anaesthetic care for abdominal vascular surgery. 12. Perioperative anaesthetic care for ASA I-II patients undergoing high risk surgery. 13. Perioperative anaesthetic care for ASA III patients undergoing high risk surgery. 	<p>-57 preliminary EPAs developed informed by current training program requirements, guidelines by ten Cate, and developments in the field.</p> <p>- Committee members evaluated this list for clarity and completeness.</p> <p>-Questionnaire developed and piloted.</p> <p>- Questionnaire was then distributed to the Delphi panel for the first round to indicate if the list of EPAs was comprehensive and elaborate on any EPAs that should be added.</p> <p>-For the second round, all preliminary EPAs were ranked by score. High scoring EPAs were retained.</p> <p>-In the third round, participants were asked if they agree with the full list or not and had the opportunity to elaborate on the list.</p>	<p>-Initial EPAs drafted - working group, from literature.</p> <p>-EPAs revised and refined Delphi method.</p>	32

		<p>14. Perioperative anaesthetic care for ASA I-II patients undergoing low to medium risk surgery.</p> <p>15. Perioperative anaesthetic care for ASA III patients undergoing low to medium risk surgery.</p> <p>16. Perioperative anaesthetic care for ASA IV patients undergoing low to medium risk surgery.</p> <p>17. Perioperative anaesthetic care for ASA IV-V patients undergoing high risk surgery.</p> <p>18. Perioperative anaesthetic care for caesarean section.</p> <p>19. Perioperative anaesthetic care for children between one and four years old.</p> <p>20. Perioperative anaesthetic care for children over four years of age.</p> <p>21. Perioperative anaesthetic care for coronary artery bypass grafting and valve surgery.</p> <p>22. Perioperative anaesthetic care for day care surgery.</p> <p>23. Perioperative anaesthetic care for head and neck surgery, excluding neurosurgery and vascular surgery.</p> <p>24. Perioperative anaesthetic care for infants up to the age of one year.</p> <p>25. Perioperative anaesthetic care for laparoscopic surgery in day care.</p> <p>26. Perioperative anaesthetic care for laryngotracheobronchoscopy in adults and children.</p> <p>27. Perioperative anaesthetic care for non-vascular abdominal surgery.</p> <p>28. Perioperative anaesthetic care for peripheral vascular surgery.</p>			
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		<p>29. Perioperative anaesthetic care for prosthetic and osteosynthetic surgery of the knee or hip.</p> <p>30. Perioperative anaesthetic care for pulmonary surgery.</p> <p>31. Perioperative anaesthetic care for situations of a shared airway with the surgical team.</p> <p>32. Perioperative anaesthetic care for vascular surgery of the Carotid artery.</p> <p>33. Peripartum pain management.</p> <p>34. Peripheral nerve block.</p> <p>35. Post-acute and long-term intensive care.</p> <p>36. Postoperative care during the recovery period.</p> <p>37. Postoperative intensive care after (cardiac) surgery in the post-anaesthesia care unit (PACU).</p> <p>38. Preoperative assessment.</p> <p>39. Resuscitation and admission of the adult patient in need of intensive care.</p> <p>40. Resuscitation and treatment of sepsis in the intensive care unit.</p> <p>41. Resuscitation of the acutely ill paediatric patient.</p> <p>42. Resuscitation of the adult multiple trauma patient in the Emergency Room.</p> <p>43. Science and evidence based medicine.</p> <p>44. Sedation for medical interventions and examinations.</p> <p>45. Ventilation on the intensive care unit.</p>			
Wolfel et al, 2016. Germany	Internal medicine. Physicians and nurses.	<p>1 EPA.</p> <p>Conducting an internal medicine ward round.</p>	<p>-Review of recent literature conducted to identify competencies.</p> <p>-An interview schedule was developed, piloted and adjusted accordingly.</p>	<p>-Literature review.</p> <p>-Initial EPAs drafted from</p>	30

			<ul style="list-style-type: none"> -Interviews were conducted. -For the development of a typical EPA structure the gained information was restructured and overlapping elements were summarized. Categories were included when at least 25% of participants from both professions mentioned it. -Building on this, the EPA was developed. Each competency was subdivided, and observable tasks mentioned by participants in the interviews were added. -The resulting EPA was mapped against the CanMEDS roles to determine levels of supervision. 	<ul style="list-style-type: none"> interviews/focus groups. -EPAs mapped to milestones/competencies. 	
<p>Young et al, 2017.</p> <p>USA</p>	Psychiatry trainees.	<p>10 EPAs:</p> <ol style="list-style-type: none"> 1. Manage psychiatric patients longitudinally. 2. Manage psychiatric emergencies. 3. Conduct psychiatric diagnostic evaluations. 4. Manage patient's psychiatric conditions with medications. 5. Manage involuntary commitment and treatment. 6. Assess and manage decision-making capacity. 7. Manage transitions in care. 8. Provide psychiatric consultation to other clinicians or services. 9. Provide supportive psychotherapy. 10. Lead an inter-professional health care team. 	<ul style="list-style-type: none"> -Task force members chosen and planned development process. Literature on CBME and EPAs reviewed. -Each member developed their own list of EPAs and these were compiled. List evaluated during teleconferences, iteratively modifying and reviewing the list between meetings. -Workshop held and proposed EPAs were presented to gather feedback. -EPA experts reviewed the proposed EPAs and EPAs were modified after each consultation based on consensus. -EPAs finalized in a two-round Delphi technique used to obtain consensus amongst content experts. 	<ul style="list-style-type: none"> -Literature review. -Initial EPAs drafted - literature, working group. -EPAs revised and refined-stakeholder deliberation, and Delphi method. 	27

Klein et al (2014)	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Kumar et al (2017)	2	3	3	0	1	2	1	0	0	3	0	2	0	0	0	1	18
Kwan et al (2016)	3	3	3	1	2	3	3	2	0	0	3	3	2	2	2	3	35
Landzaat et al (2017)	2	3	2	0	3	3	1	2	0	3	0	1	2	0	3	3	28
Leipzig et al (2014)	2	3	1	0	1	2	0	0	0	2	0	0	0	0	2	1	14
Mallow et al (2017)	3	3	2	0	1	3	2	0	1	3	0	0	0	0	1	2	21
McCloskey et al (2017)	3	3	0	0	3	1	0	0	0	2	0	0	0	0	2	1	15
McMurray et al (2017)	1	2	3	0	1	3	2	0	1	2	0	3	0	0	0	3	21
Meade et al (2016)	2	2	2	0	3	3	0	0	0	0	3	1	0	1	3	1	21
Mink et al (2018)	3	3	2	0	3	3	3	0	3	3	0	3	0	0	3	3	32
Moloughney et al (2017)	3	3	2	0	1	3	0	2	0	3	0	0	0	0	2	1	20
Moore et al (2017)	3	3	3	0	0	2	3	0	0	2	0	0	0	0	0	3	19
Myers et al (2015)	3	3	3	0	3	3	2	3	3	3	3	2	3	2	2	3	41
Ng & Ng Joo Ming (2014)	0	1	2	0	1	1	0	0	0	0	0	0	0	0	0	1	6
O'Keefe et al (2013)	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Parker et al (2017)	2	3	2	1	1	3	0	3	0	3	0	0	0	0	3	2	23
Pugh et al (2017)	2	3	3	0	1	2	0	2	0	3	0	2	0	0	0	1	19
Rose et al (2014)	3	3	2	0	0	0	0	0	0	0	0	0	0	0	3	2	13
Schultz & Griffiths (2016)	3	3	3	0	0	2	2	0	0	2	0	0	0	0	0	3	18
Schultz et al (2015)	3	3	2	0	1	3	0	0	0	2	0	0	0	0	3	2	19
Sharma et al (2018)	2	3	2	0	2	1	0	1	0	2	0	0	0	0	0	0	13
Shaughnessy (2013)	1	3	1	0	1	3	2	2	1	3	0	0	0	0	3	3	23
Shumway et al (2015)	1	3	3	0	1	1	0	0	0	2	0	0	0	0	3	1	15
Steiman et al (2018)	1	2	3	0	1	3	2	0	0	3	0	3	0	0	0	0	18

Taylor et al (2018)	3	2	2	0	1	2	0	0	0	2	1	0	0	0	0	1	14
Van Loon et al (2016)	2	3	3	0	2	3	0	0	0	3	0	0	0	0	0	1	17
Weiss et al (2016)	2	3	2	0	0	1	0	0	0	1	0	0	0	0	3	1	13
Wisman-Zwarter et al (2016)	3	3	3	0	2	3	3	3	0	0	3	3	0	2	3	1	32
Wolfel et al (2016)	2	3	3	0	3	3	2	1	0	0	3	3	0	2	2	3	30
Young et al (2018)	3	3	3	0	3	3	0	1	0	3	0	2	0	0	3	3	27
Yuan et al (2014)	2	3	1	0	2	1	2	0	2	3	0	2	3	0	3	0	24

Supplemental Digital Appendix 5

Table 5A: Implementation/Assessment papers Data extraction.

Author, year country	Method of implementation/assessment	Specialty and number of EPAs implemented/assessed	Number and rank of physician participants.	Outcomes of implementation/assessment	Refined codes	Quality assessment
Aylward, Nixon & Gladding, 2014. USA	-Interns were observed and assessed giving handoffs by a faculty member or chief resident at a set time and place. -The observer completing the assessment form used it to provide the immediate feedback. Forms were collected at the end of each handoff session.	1 internal medicine EPA.	25 internal medicine and medicine-pediatrics interns	-In total, 105 independent assessments of resident handoffs were made. -No interns were assessed at level 1 for the handoff EPA. Sixty percent of observations of intern handoffs (56/93) were assessed at levels 2 and 3. Thirty-nine percent (36/93) were assessed at level 4, and 1 handoff was assessed at level 5. -Of the 19 interns who were observed more than once, 13 of the interns demonstrated improvement.	Assessment (Methods) -EPA observed in practice by senior faculty. Assessment (Tools/measures) -Assessment form used.	23
Dwyer, Wadey, Archibald et al, 2016. Canada	Implementation: -Each of the PGY-1 residents was enrolled in the competency-based medical education program. -As a comparison group, nine PGY-4 residents were invited to participate; only one was enrolled in the competency-based medical education program. Assessment: -Each assessment of an EPA was 40 minutes long, divided into three parts, each performed at a different station: preoperative management (10 minutes) (OSCE), performance of technical procedure (20 minutes) (sawbone model), and postoperative management (10 minutes) (OSCE). - Assessed by 6 faculty members (surgeons and fellows) using checklists based on a modified	3 orthopedics EPAs.	18 participants: 9 PGY1, 9 PGY4 residents.	Hip fracture EPA: -PGY-4 group had a higher mean global rating scale than the PGY-1s for preoperative management, postoperative management and technical procedures. TKA activity: -PGY-4 group scored higher for postoperative management and technical procedures than the PGY-1 group, but no difference for preoperative management. Ankle fracture activity: - PGY-4 group scored higher for postoperative management and	Implementation -enrolment in competency-based curriculum Assessment (Methods) - Performance in non-clinical settings (e.g. OSCE, simulation)	27

	<p>Delphi technique with multiple surveys, global rating scale.</p> <p>-All participants underwent the three EPA assessments on the same day.</p> <p>-the mean global rating score on each of the three stations of each EPA was compared between the two groups.</p>			<p>technical procedures than the PGY-1 group.</p> <p>-No difference for preoperative management.</p> <p>Simulation can be used effectively to supplement workplace-based assessment of residents.</p>	<p>-comparison with control group</p> <p>Assessment (tools/measures)</p> <p>-Global entrustment scale</p>	
<p>Hauer, Soni, Cornett et al, 2013.</p> <p>USA</p>	<p>Implementation:</p> <p>Family meeting EPA:</p> <p>-In a 1-week mandatory palliative care rotation, PGY-1s observe a senior staff member conduct a conversation about serious illness and/or goals of care.</p> <p>Discharge EPA:</p> <p>-Teaching sessions writing discharge summaries, safe patient discharge.</p> <p>-Interactive session for interns to review peers' discharge summaries and give feedback.</p> <p>-monthly PGY-1 ward exercise orientations, includes site specific key elements of patient discharge.</p> <p>Assessment:</p> <p>Family meeting EPA:</p> <p>-PGY-1 writes a critical reflection based on observations of a family meeting and receives written feedback from faculty/fellows. Attending also assesses entrustability based on a standardized rubric.</p> <p>-PGY-2 and PGY-3s observed leading at least 3 serious illness conversations and received feedback</p> <p>Discharge EPA:</p>	2 Internal medicine EPAs.	28 Residents, 32 Attendings in Internal medicine.	<p>Family meeting EPA:</p> <p>75% of respondents endorsed that the EPA improved their attention to family meeting education; half found the critical reflection useful for learning and recommended continuing the EPA assessment.</p> <p>Discharge EPA:</p> <p>Both PGY-1s and attendings responded favorably about the EPA assessment: eight PGY-1s and five attendings felt it improved their discharge planning skills, and ten PGY-1s and nine attendings felt it facilitated useful feedback discussions.</p>	<p>Implementation:</p> <p>-Observation of faculty on the ward.</p> <p>-Teaching sessions.</p> <p>-Peer feedback.</p> <p>Assessment (Methods)</p> <p>-Portfolio review.</p> <p>-EPA observed and assessed in practice by senior faculty.</p> <p>Assessment (Tools/measures)</p> <p>- Standardized rubric.</p>	16

	-EPA rubric completed by ward attending with PGY-1. PGY-1 reflection in portfolio.					
Jurd, DeBeer, Aimer et al, 2015. Australia & NZ	Implementation: -To assess trainee competencies, summative EPAs were introduced into the curriculum. -In stage 1 Trainees must attain two mandatory adult psychiatry EPAs. -Stage 2 general psychiatry and psychotherapy EPAs may also be completed in Stage 1. -In stage 3 Trainees must attain eight EPAs (a minimum of two for each six-month rotation).	18 Psychiatry EPAs.	Postgraduate fellows in psychiatry.	No outcomes reported.	Implementation: -Enrolment in competency-based curriculum.	14
Kumar, Khan, Arora et al, 2017. India	Assessment: -A descriptive, retrospective, chart-based audit was conducted. -All the FNAB chart records documented during their 3 years of postgraduate training by a cohort of 13 postgraduate resident trainees were included in the study. -Time taken to achieve an adequacy rate of 85% was assessed.	1 cytopathology EPA.	13 PG resident trainees. Cytopathology section of department of pathology.	-3272 FNAB documented by the cohort of 13 postgraduate trainees were assessed. -Median time taken to achieve 85%, 90%, and 95% FNAB adequacy rates was 1, 3.5, and 4 months, respectively. -Eight out of 13 postgraduates achieved the acceptable adequacy rate in FNA by the end of the first month. -Adequacy rates were not consistently maintained; falling to below 85% in 21/98 trainees in subsequent months (lowest 75%).	Assessment (Methods) -Chart based audit. Assessment (Tools/Measures) -time to competency.	18
McMurray et al, 2017 Canada	Implementation: -Six four-week sessions held between July 2015 and March 2016 to train residents in Nightmares Course EPA. Assessment: -Multi station OSCE (4 simulation scenarios). -Assessed by 4 attending physician examiners from a variety of specialties.	1 EPA, common to multiple specialties.	40 PGY1 Residents	-23 out of 40 residents (58%) completed OSCE. -8 residents cored less than 3 on at least 1 station and did not meet the threshold. These 8 residents participated in the subsequent remediation sessions.	Implementation: -enrolment in competency-based curriculum Assessment (methods)	

	<ul style="list-style-type: none"> -Entrustment decisions made on a scale of 1-5. -Competency threshold set at 3 out of 5 for all stations. 				Performance in non-clinical assessment Assessment (Tools/Measures) -Global entrustment scale	
Mink et al, 2018. USA	Assessment: -Assessments of fellows in each training program were provided by the fellowship program director and the program's Clinical Competency Committee at two separate time points. -Five-point level of supervision scale, with a higher rating indicating that less supervision is required.	6 Pediatric EPAs.	Fellows (Time 1 n=1,011, Time 2 n=1,036).	Levels of entrustment were assigned to fellows. Supervision levels varied by EPA, indicating the raters were not uniformly assigning a level of entrustment. Level of supervision ratings of second year fellows were higher than first year fellows, and third year fellows higher than second year fellows.	Assessment (tools/measures) -Assessment form.	32
Ng & Ng Joo Ming, 2014. Singapore	Implementation: -6-month training curriculum using EPAs delivered. -Training was comprised of group sessions including group analysis of sample case summaries, case-based discussions, video clips and role-play. -On the ward, training was comprised of observation of faculty members chairing multidisciplinary rounds, conducting family conferences, and executing advance care planning on three occasions before physicians could perform the tasks under supervision. -EPA 1- completed discharge case summaries, received feedback from faculty staff; -EPA 2- delivered care plans formulated after presentation of newly admitted patient to faculty staff, received immediate feedback; -EPA 3, 4, 5-observation of faculty members performing on three occasions.	5 Family medicine EPAs.	10 junior physicians with 1-5 years' experience	No outcomes reported.	Implementation: -Teaching sessions. -Observation of faculty on the ward. Assessment (Methods) -EPA observed and assessed in practice by senior faculty.	6

	Assessment: -The physicians were assessed at baseline, and at 3 and 6 months using the standard EPA global entrustment levels. -Faculty members observed physicians executing EPA in groups of 2-3 and gave individual ratings. -For EPA 1, discharge summaries were rated.				Assessment (Tools/Measures) -Global entrustment scale	
Schultz and Griffiths, 2016. Canada	Implementation: Authors incorporated the 36 EPAs for family medicine into existing generic field notes (FNs). Assessment: -Direct observation with constructive feedback. Field notes used to document a resident's performance and summarize the verbal feedback given. -Assessors also consider other data (in-training evaluation reports, OSCEs, multisource feedback, and simulation course results) which triangulate and enhance assessment reliability. -If an assessor is unsure about a resident's progress, the program director is consulted.	36 family medicine EPAs.	150 family medicine residents	-Early post-CBME-implementation outcomes encouraging. -Residents are now being directly observed more often with increased documented feedback about performance based on explicit competency standards (from 2013 to 2015 authors have gathered over 24,000 data points for 150 residents). - Allows for identification of patterns of performance, red flags, and competency development trajectory. Outliers identified earlier, allowing for earlier modification of training program	Implementation: -EPA incorporated into existing field notes/EPA performance recorded by trainee in portfolio. Assessment (Methods) -EPA observed and assessed in practice by senior faculty. - Performance in non-clinical settings (e.g. OSCE, simulation).	18
Steiman et al, 2018.	Assessment:	2 Surgical EPAs	5 for each of the EPAs.	Breast SEPA:	Assessment methods:	

USA	<p>Multiple choice exam used to assess core content knowledge</p> <p>-Focused history and physical exam performed to evaluate decision making and management. Evaluated via direct observation of an attending surgeon. Validated Clinical Assessment and Management Examination-Outpatient (CAMEO) assessment form used.</p> <p>-Completion of online program. Assesses clinical reasoning and provides feedback.</p> <p>-The Operative Performance Rating System was used for assessing intraoperative performance of an elective procedure. Assessed using a rating scale, Likert scale where 1=poor and 5=excellent. Attending surgeons were also asked to rate the overall difficulty of the case and the amount of guidance provided to the resident.</p>		<p>Breast SEPA: 4 PGY3s and 1 PGY5.</p> <p>Gallbladder SEPA: 3 PGY2s, 1 PGY4, 1 PGY5.</p>	<p>-All trainees passed with the exception of 1 3rd year resident. The lowest overall average was found on the multiple choice exam at 73%.</p> <p>-Variability was noted in the results of the VSP online case, with an average score of 87% (SD=13.4).</p> <p>-Performance on the OPRS was strongest for the partial mastectomy compared to the mastectomy.</p> <p>Gallbladder SEPA:</p> <p>-Analysis of the gallbladder SEPA revealed an expected pattern based upon PGY level.</p> <p>-The CAMEO distinguished between junior and senior level residents.</p> <p>-Senior participants scored lower on the VSP online case. Both senior level residents and one of the junior level residents obtained an overall passing score of over 80%. However, the junior resident failed ORPS and thus the overall assessment, providing strong validity evidence.</p> <p>-The 1 PGY2 who obtained an overall passing score lost points in time and motion, operative flow, and degree of prompting or direction, reflecting his overall junior level.</p>	<p>-Written exam</p> <p>-EPA observed and assessed in practice by senior faculty.</p> <p>- Performance in non-clinical setting.</p>	
<p>Van Loon, Teunissen, Drissen et al, 2016.</p> <p>Netherlands</p>	<p>Implementation:</p> <p>-Training was based on the CanMEDS curriculum.</p> <p>-Portfolio used to gather information about resident's EPA performance.</p> <p>Assessment:</p> <p>-Entrustment decisions were based on data extracted from the electronic portfolio system.</p>	18 obstetrics EPAs.	375 residents	<p>-5139 entrustment requests for 375 residents were granted for the 18 obstetric EPAs.</p> <p>-Entrustment requests were granted by 90 program directors working in 46 hospitals.</p> <p>-59% of justifications were categorized into the "experience" group, 20% referred to the resident's</p>	<p>Implementation:</p> <p>-Enrolment in competency-based curriculum.</p> <p>-EPA incorporated</p>	17

	<p>-Residents indicated the EPA for which they wanted to be entrusted and the desired level and provided a brief justification for the request in the portfolio system.</p> <p>- Justification based on experience, technical performance, presence of generic competency, and training. WBAs were mini-clinical evaluation exercise (mini-CEX), OSCE and played a prominent role in justifications for entrustment-only listed frequency, not quality or outcome.</p> <p>-This information was sent to the program director, who decides whether the entrustment request is warranted. The program director fills out a short response to the resident's justification.</p>			<p>technical performance, 9% focused on the training a resident had attended, and only 0.5% mentioned the presence of a generic competency.</p> <p>-Approximately 25% of records did not provide any justification related to the entrustment decision.</p>	<p>into existing field notes/EPA performance recorded by trainee in portfolio.</p> <p>Assessment (methods)</p> <p>-Portfolio review.</p>	
<p>Yuan, Prince, Zwettler et al, 2014.</p> <p>USA</p>	<p>Assessment:</p> <p>-Retrospective cohort study of fellow chart audits as an assessment tool.</p> <p>-All fellow outpatient clinic encounters were reviewed and signed by staff nephrologists.</p> <p>-During the first training year, encounters were reviewed by the staff nephrologist while the patient was in the clinic, followed by 100% audit of the written chart.</p> <p>-During the second training year, fellows had the option of reviewing the encounter with the staff nephrologist within 24 hours.</p> <p>-Deficiencies were discussed personally or by secure e-mail shortly after audit.</p> <p>-The process was completed within 1 week of patient encounter. -The proportion of deficiencies was assessed every 6 months at the time of formative evaluation.</p>	1 Nephrology EPA.	18 fellows	<p>-Auditors detected significantly fewer deficiencies in the second 6-month audit period of the training year compared to the first.</p> <p>-Auditors surveyed estimated that each chart audit took approximately 20 hours per year.</p> <p>-During the first year of fellowship, 92.3% of deficiencies were errors of omission, and 7.7%, errors of commission.</p> <p>-During the second year of fellowship, 83.7% of deficiencies were omission errors and 16.3% were commission errors.</p>	<p>Assessment (Methods)</p> <p>-EPA observed and assessed in practice by senior faculty.</p> <p>-Chart based audit conducted.</p> <p>Assessment (tools/measures)</p> <p>-Number of errors.</p>	24