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REVIEWS

A Scoping Review of the Application of Entrustable Professional Activities in the Undergraduate Medical Education Curriculum

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Abstract

Purpose: Most developed countries have adopted entrustable professional activities in their graduate and undergraduate medical education curricula. This scoping review evaluates the evidence regarding the development, implementation, and assessment of entrustable professional activities -based curricula, particularly in undergraduate medical education, in the context of developing countries.

Method: We identified 17 articles published between January, 2010, and December, 2022, from the MEDLINE/PubMed database and via Google search to evaluate entrustable professional activities application status in the undergraduate medical education. PRISMA guidelines were followed, and the population, intervention, comparison, and outcome (PICO) strategy was used for constructing the research question. Data were collected, tabulated, and analyzed in MS Excel.

Results: Of the 17 articles, most (n = 14) were from America and Europe, 2 were from India, and 1 was from Mexico; 8 of them were perspective studies. Six of these studies addressed the development of entrustable professional activities, 4 studied their assessment, and 3 studied the implementation of entrustable professional activities; 3 studies addressed both the development and implementation of entrustable professional activities, whereas 1 study addressed the development and assessment. Heterogeneity was observed in the methods of development, implementation, and assessment of entrustable professional activities in these studies.

Conclusion: Entrustable professional activities have not been given considerable attention in developing countries yet. Given the lack of consensus on its development, implementation, and assessment, this review highlights the need for a well-defined, specialty-specific entrustable professional activities framework for undergraduate medical education closely aligned to that for GME. This would help students gain competence from the entry level. Moreover, effective implementation of entrustable professional activities requires a shared glossary to avoid confusions among medical students and educators in the interpretation of terms owing to cultural differences worldwide and thus prevent ambiguity in entrustable professional activities application globally.

Keywords: Clinical competence, Curriculum, Undergraduate, Medical education, Entrustable professional activities

1. Introduction

The primary goal of medical education is to enable physicians to competently address health of communities. Competency is defined as the measure of the ability of an individual to perform the tasks as one has been trained to

perform [1]. The current system of medical education primarily focuses on knowledge rather than attitude and skills as a measure of competency [2]. Thus, a gap has been observed between the intended outcome and the enacted curriculum worldwide. Graduates with sufficient knowledge may lack the basic clinical skills, communication skills, and

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professionalism required in clinical practice [3]. Moreover, the evaluation of skills is mostly summative, with limited opportunity for feedback [3]. Thus, a curriculum that integrates didactic knowledge with experiential learning is required [4]. Competency-based medical education (CBME) has been suggested to address these gaps in medical education. Although some developed countries have widely adopted entrustable professional activities (EPAs) in their medical education curriculum, the application and acceptability of the same in developing nations have not been sufficiently documented in the literature, warranting further investigation in this regard.

CBME is required to be designed retrospectively, starting from defining the desired outcome or competency domains to designing the curriculum around these domains [2,5]. To address these objectives, entrustable professional activities (EPAs) were developed by Olle ten Cate in 2005 [2,6]. EPAs are defined as a unit of professional practice that can be fully entrusted to a trainee as soon as he/she has demonstrated the necessary competence to execute a particular activity independently [7]. The EPAs are observable, time-bound, measurable, and conducive to focused entrustment decisions [7]. EPAs have been implemented globally in graduate medical education (GME) [8]. However, clinical knowledge and skills are also required before residency. Thus, medical educators are exploring methods for implementing EPAs in undergraduate medical education (UME) [9].

The end of postgraduate training reflects a decrease in the supervision level and an increase in the level of independence among medical students. The 8-point, fully-elaborated and refined framework for CBME (AMEE guide 140) was proposed to promote EPAs implementation by curriculum developers [10]. This framework provided a clearer understanding of the EPAs compared with the previous frameworks; however, whether this framework would be applicable to the UME curriculum remains ambiguous. UME-specific EPAs were proposed by Chen and colleagues [11], with the expansion of entrustment scales. Although the proposed framework for UME seems closely aligned to that for GME, they differ in some aspects. Compared with the proposed GME entrustment and supervision scale comprising 5 levels by Ten Cate and Taylor [10], the UME entrustment and supervision scale proposed by Chen and colleagues [11] comprises 4 additional levels with further gradation of levels 1, 2, and 3. Level 1 UME entrustment and supervision scale comprised 2 sublevels (levels 1a and 1b), which stipulated that only student with adequate knowledge and skills

can progress from Level 1a to Level 1b. Similarly, under proactive, full supervision Level 2, the learner first needs to practice along with the supervisor as a coactivity (Level 2a) and then practice independently with the supervisor in the room (Level 2b). Under reactive/on-demand supervision Level 3, the supervisor would double-check students' all findings (Level 3a), and, in the next stage, only key findings (Level 3b), and would be immediately availability; however, for advanced learners (Level 3c), the supervisor would be available distantly and only review students' findings. UME students cannot be fully entrusted for unsupervised works; however, these supervision level gradations can be beneficial for students to gain competence from entry level and rapidly progress from working under supervision to working independently and asking for help only when needed. This would also facilitate rapid translation of EPAs into clinical practice. In a similar attempt, the UMC Utrecht Curriculum Committee, the Netherlands, developed an EPAs-based UME curriculum, wherein the undergraduate students were trained to be entrusted for work under indirect supervision before graduation in five broad EPAs, namely clinical consultation; general medical procedures; informing, advising, and guiding patients and families; communicating and collaborating with colleagues; and extraordinary patient care [12]. The proposed framework also considered the application of a supervision level scale, covering all relevant clinical content without labeling each of the various small tasks as a separate EPA. The supervision and entrustment scale aligned well with that proposed by Chen and colleagues [11]; however, it did not include levels 4 and 5 (trainee allowed to practice unsupervised and supervise juniors, respectively).

The aforementioned discussion suggests that although several studies have focused on the development, implementation, and assessment of EPAs in UME, no consensus has been reached on the methods employed for the same [1,3,13]. A scoping review has already been by Bramley and McKenna conducted on EPAs in entry-level health professional education; however, it did not consider the articles published in other languages other than English [14]. The present scoping review considers an article published in Spanish language and other articles emphasizing the usefulness of a standard vocabulary of commonly used terms related to the "entrustment" concept, thus shedding light on the role of linguistic barriers in preventing standardization of EPA application worldwide. Furthermore, to the best of our knowledge, no studies on EPAs have been performed in the Middle East, and previous scoping reviews on this

topic have focused mainly on EPAs application in American and European countries [9,15]. Moreover, a scoping review by Shorey and his colleagues was conducted on EPAs application in health care education, although it did not focus specifically on UME [16]. To address this gap in literature, the present scoping review evaluates the evidence regarding the development, implementation, and assessment of EPAs in UME in the context of developing countries.

2. Method

2.1. Overview

The PRISMA protocol was used to ensure a high methodological quality of the study [17]. The population, intervention, comparison, and outcome (PICO) strategy was used for constructing the research questions [18]. Undergraduate medical students were considered as the study population. EPAs were considered as intervention, whereas no comparison was considered because randomized control trials on EPAs have not been conducted. CBME was considered as the outcome.

2.2. Procedure

A broad electronic search of the MEDLINE/PubMed database and Google search were performed to extract relevant studies published between January, 2012, and December, 2022. The search strategy used both medical MeSH terms and free-text words. The search was performed using the following terms: ‘EPAs in undergraduate medical curriculum’ (using the P and I parameters), ‘competency after EPAs in undergraduate medical curriculum’ (using P, I, and O parameters), and ‘EPAs application in medical curriculum.’ Duplicates were eliminated by going through the abstracts. The final selected studies were then read in detail.

2.3. Exclusion and inclusion criteria

We included 17 articles to evaluate the general concept of EPAs application in the UME curriculum. Perspective studies, opinion pieces, and prospective studies performed on EPAs in the medical curriculum were included. Individual or short series case reports, literature reviews, studies considering EPAs for teacher training, and those considering EPAs for postgraduate studies were excluded.

2.4. Analysis

The demographic and topical characteristics of the final 17 studies were tabulated in MS Excel. Then,

specific parameters such as the type of study, country of origin, and study population were identified and compared. All analyses were performed in MS Excel.

3. Results

3.1. Study selection

The search terms “EPAs in undergraduate medical curriculum,” “competency after EPAs in undergraduate medical curriculum,” and “EPAs application in medical curriculum” garnered total of 1179 records. After duplicates were discarded, the sample consisted of 741 articles. Of these articles, 36 articles whose title and abstract matched the inclusion and exclusion criteria were read in detail, and 19 articles were excluded. Of the excluded articles, 12 were literature reviews, 4 were studies for teacher training, 2 studies evaluated EPAs application in GME, rather than focusing specifically on UME, and 1 was newsletter. The remaining 17 studies were finally selected for qualitative and quantitative analyses. The selection procedure for studies is illustrated in Fig. 1.

3.2. Study characteristics

Most of the studies were performed in American and European countries ($n = 14$) [11,12,19–30], whereas 2 originated from India [1,3] and 1 from Mexico [31]. Most of the studies considered EPAs for the curriculum of UME. Although 1 study considered GME and another considered the curriculum for physician's assistant, both studies could be applied to the UME curriculum [1,24]. Of the 17 studies, 8 were perspective studies [1,3,11,12,20,23,24,26]. Additionally, 6 of the included studies addressed the development of EPAs [11,20,22,23,25,31], 4 studied their assessment [19,21,29,30], whereas 3 studied the implementation of EPAs [3,12,28]. Both the development and implementation of EPAs were addressed in 3 studies [1,12,24], whereas development and assessment were addressed in 1 study [26]. Although a specific specialty was not considered in most of the studies, 1 study focused on pharmacology [3]; 1 focused on surgery, gynecology, and family medicine [31]; and 1 focused on global health [22]. The characteristics of the included studies are presented in Table 1.

3.3. EPAs development in UME curriculum

Of the 17 studies, 9 addressed the development of EPAs. Although all these studies were applicable for

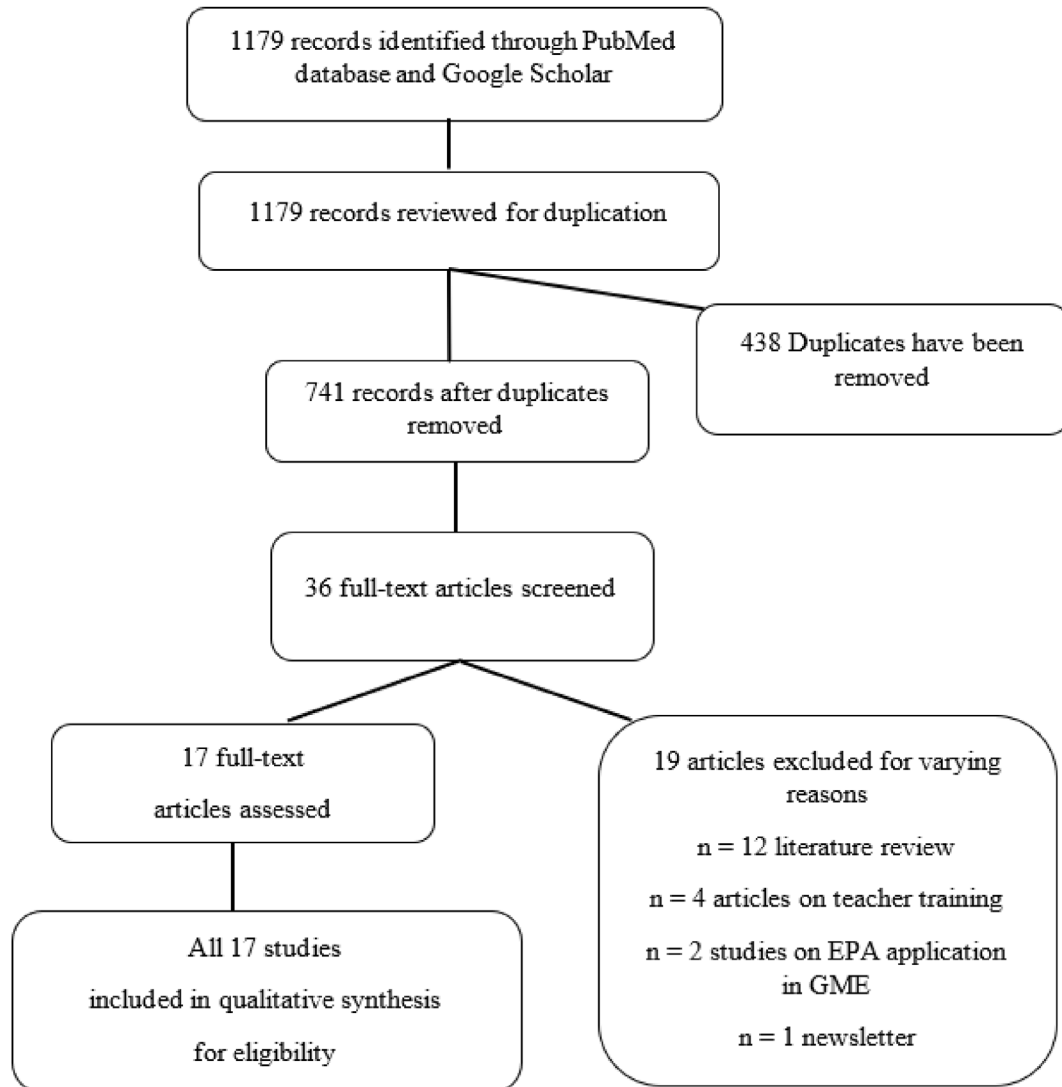


Fig. 1. Representation of methodology.

the development of the EPAs-based curriculum for UME, the steps in EPAs development, the theories considered (e.g., Bloom's taxonomy, Miller's Pyramid), and the validation of the same (e.g., the Delphi method) varied. The literature was not consistent in terms of the steps involved in EPAs development. For example, a few studies recommended considering the concept of milestones when designing EPAs [1,3,20], whereas one recommended expert consultations and the establishment of committees for EPAs refinement [25]. Although most studies detailed the development of EPAs for the UME curriculum in general, a few studies addressed the EPAs development in specific areas such as pharmacology; surgery, gynecology, and family medicine; pediatrics; and global health [1,3,22,31].

3.4. EPAs implementation in UME curriculum

Of the 17 studies, 6 addressed EPAs implementation. Inconsistencies were observed in literature here, too. The acceptable levels of supervision varied, too. Of all the studies, one recommended EPAs implementation till Level 5 (trainee ready to supervise) [1], whereas 2 recommended the implementation till Level 3 (requires active supervision) [12,25]. Yet, another study recommended further gradation of Level 3 but implementation till Level 5¹¹. One study did not explicitly state the acceptable supervision level for EPAs implementation in the UME curriculum and sought to determine the challenges and benefits of EPAs implementation [27].

Table 1. Characteristics of the included studies.

Country of origin	
Netherlands	6
America	5
India	2
Switzerland	1
Mexico	1
Canada	1
Germany	1
Study population	
Undergraduate students	12
Postgraduate students	2
Undergraduates and supervisors	1
Physicians' assistants	1
Students, graduates, and supervisors	1
Type of study	
Perspective	8
Qualitative study	2
Survey (Evaluation study)	7
Focus	
Development	6
Assessment	4
Implementation	3
Development and implementation	3
Development and assessment	1

3.5. EPAs assessment in UME curriculum

Of the 17 studies, 6 addressed the assessment of EPAs in clinical rotations in UME. We observed a wide range of methods, tools, and measures to assess EPAs or their aspects. Of these 4 studies, 2 were perspective studies [3,26], whereas 4 others were evaluation studies [19,21,29,30]. Among these, the study by Bremer evaluated the effect of an EPAs-based curriculum on the professional identity formation of undergraduate medical students [29]. Yet, another study by Duggan and his colleagues evaluated the use of mobile technology in EPAs assessment in UME [30].

3.6. EPAs acceptability

Although most of the included studies portrayed EPAs as a positive change in the curriculum (n = 15), a few studies highlighted their limitations and implementation-related challenges [3,26]. Thus, EPAs were not unanimously accepted in these studies.

3.7. Summary of evidence

The present scoping review clearly shows the lack of consensus on the development, implementation, and assessment of EPAs-based curricula in medical education, which has led to heterogeneities in their application worldwide. Our literature search also

showed that relatively less studies have been conducted in this field in developing countries compared with that in developed countries, which shows that the concept is more popular and has been widely adopted in developed countries than in developing countries that have probably not paid much attention to the development and implementation of EPAs-based curricula particularly in UME. This review provides evidence for the positive role of the EPAs-based curricula in improving medical training for effective translation of knowledge and theories into practice, as most studies included in this review have recommended the positive effect of such curricula on medical students. Furthermore, this review highlights the need for a standard procedure for the application of EPAs-based curricula worldwide.

4. Discussion

EPAs are being increasingly used in UME for bridging the gap between expected and actual outcomes. In the present study, we performed a scoping review to evaluate the evidence regarding using EPAs in UME.

Most of the studies were performed in American and European countries where EPAs and CBME have been widely accepted and incorporated in the medical curriculum. However, we also included 2 studies from India [1,3]. This indicates the increasing acceptance of this concept in developing countries like India as well. However, a large difference in the number of studies conducted in developed and developing countries highlight the fact that the developing countries need to pay more attention on the concept of EPAs to implement EPAs-based curricula in their medical education programs. The Medical Council of India has suggested incorporating CBME in all medical colleges through an appropriately designed curriculum [32]. Another study included in our review was performed in Mexico, wherein the EPAs were called APROCs (Actividades Profesionales Confiables) [31]. This demonstrates the acceptability of EPAs not only in developed countries but also in developing countries, in addition to highlighting differences in the terminologies used for describing EPAs across different countries. Overcoming these linguistic barriers is crucial to promote homogenous EPAs implementation globally.

The present review exhibited differences in the methods employed and the theories considered for EPAs development. Most studies have considered the mapping of milestones to EPAs [1,3,20,25], whereas the study by Mulder and his colleagues did

not consider the same [24]. Chen and his colleagues further recommended expert consultations and the establishment of committees for EPAs refinement [25]. Milestones are defined by ten Cate and Sklar as observable and measurable steps taken by the trainees as their level of expertise increases [5,33,34]. Competency is a stepwise process and is achieved gradually by completing simple and essential tasks initially before progressing to complex tasks. Thus, the milestones should be chosen carefully and tailored to specific programs to encourage trainees to progress toward appropriate competency levels.

Furthermore, no consensus was observed in the methods recommended for implementation. Dhaliwal et al. recommended the attainment of competency Level 5 (trainee able to supervise juniors). On the other hand, most studies recommended the attainment of competency Level 3 (ability to perform under reactive supervision). This leads to ambiguity where the degree of supervision that can be termed as reactive is unclear. Therefore, Chen and his colleagues recommended including additional levels within the prescribed levels, resulting in a gradual decrease in supervision [11].

Although most studies accept EPAs as a positive change in the curriculum, a few studies specified their limitations and implementation-related challenges. Some authors (Desai and Krupat); have suggested studying the procurement of additional resources such as infrastructure and workforce that may be required before CBME implementation [1,3,26]. Additionally, they expressed concerns regarding the management of learners progressing at a varying pace as CBME de-emphasizes time-based training [1]. The heterogeneity of EPAs development, measurement, and assessment was discussed by Desai and his colleagues and Krupat [3,26]. We have similar concerns regarding EPAs incorporation in the medical education curriculum [26]. The study by Bremer provided evidence in favor of an EPAs-based curriculum, which indicated a positive role of such curricula in the profession identity formation of medical students in the Netherlands [29]. They asserted that the EPAs-based curricula can be valuable in the context of working and learning as it promotes students' participation and encourages feedback-seeking behavior. However, the study was conducted at a single center whose curriculum may be different from those of medical colleges in other countries, and whether the findings are applicable to medical students in developing countries, especially for UME, remains uncertain.

In addition to heterogeneities in the development, implementation, assessment of EPAs, the linguistic

and cultural differences also prevent the standardization and formation of consensus on the application of EPAs, particularly in the decision-making to entrust EPAs to learners, in different countries. The effects of cultural and linguistic differences on EPAs application have not been paid much attention in the past; however, based on expert consensus, a standardized translation of EPAs-related terminologies in Spanish and Portuguese languages was proposed to facilitate better adoption of CBME and EPAs in Spanish- and Portuguese-speaking countries [35]. Additionally, Schumacher and his colleagues asserted that a shared understanding of terminologies surrounding “entrustment” is crucial to bridge the gap between training and practice in different stages of medical education, viz. undergraduate, postgraduate, and residency programs [36]. Likewise, Englander and his colleagues proposed the need for a shared language for the dissemination of CBME and collaboration among the medical community worldwide, and they presented the International CBME collaborator's glossary of CBME terms to address the problem [37].

We believe that the lack of common definitions of terms and concepts related to “entrustment” has prevented the standardization of EPAs in the UME as well as GME curriculum in different countries so far. Therefore, consistent with the aforementioned studies, we strongly recommend the use of a common glossary of EPAs- and CBME-related terms by curriculum developers, as well as by teachers, health professionals, and residents assessing medical students and residents in higher education institutions worldwide. This can facilitate the rapid adoption of EPAs in developing countries, which have not yet been able to effectively implement the EPAs-based curriculum in their UME and GME programs.

Despite the increasing number of studies on EPAs application and acceptability, a consensus on the same is lacking, and this lack of consensus is the main motivation behind the present scoping review. Furthermore, previously published scoping reviews emphasized on the implementation of EPAs in general [9,15]; however, they did not include studies conducted in developing countries, and therefore, they could not provide evidence for EPAs application in these countries. Moreover, a scoping review on the similar topic was conducted in a broader context, covering all relevant studies on EPAs in health care education, rather than focusing specifically on UME [16], which provided evidence for the lack of effective development and implementation of EPAs for undergraduate students and staff in Asian and African countries. The present scoping

review is unique in that it offers evidence for EPAs application in UME in the context of developing countries, thus contributing to the literature on medical education in developing countries.

The present review suggests that EPA application offers clear benefits and has the potential to improve quality of CBME; however, it also suggests the lack of homogeneity in EPAs development, implementation, and assessment. If no standardized procedure is put forward for the same, EPAs would end up being a bureaucratic burden rather than a much-needed step for improving the quality of clinical training.

5. Study limitations

The present study has certain limitations. The small sample size of studies prevented the generalization of findings. Additionally, the heterogeneity of parameters prevented the application of meta-analysis. As EPAs are a novel concept that are being recently incorporated in the curriculum, no comparison studies are available to support them. Future prospective studies with a larger study sample and homogenous parameters should further strengthen the findings of this study.

6. Conclusion

CBME and EPAs are advantageous for the UME curriculum. However, a standardized method for the development, implementation, and assessment of EPAs in UME curriculum is lacking, leading to ambiguities in their application. Therefore, a well-defined, specialty-specific EPA framework for UME closely aligned to that for GME is required, which can help students gain competence from the entry level. Furthermore, effective implementation of EPAs in both developed and developing countries requires a standard nomenclature of EPAs-related terms to avoid confusions among medical students and educators in the interpretation of terms surrounding “entrustment” owing to cultural differences across countries, as well to prevent ambiguities in EPAs application globally.

Ethical approval

None.

Other disclosure

None.

Conflicts of interest

None declared.

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