DOI: https://doi.org/10.4038/seajme.v19i2.670 **Original Research Paper**

Entrustable Professional Activity based Curriculum in Indonesian Post-graduate Neurology Education

Mawuntu, A.H.P., Retnaningsih, R., Ar-Rochmah, M., Husna, M., Bintang, A.K., Hamidi, B.L., Khairunnisa, Syahrul

Abstract

Introduction: The Indonesian Postgraduate Neurology Education Curriculum Guide was last updated in 2015 and required review. The Entrustable Professional Activity (EPA) model, which emphasizes the mastery of professional activities that include a set of competency domains, can be applied in curriculum updates because it remains relevant to current competency-based medical education. The EPA model we aimed to update the 2015 Indonesian Postgraduate Neurology Education Curriculum Guide by implementing EPAs.

Methods: An action research approach was used to allow the research to be carried out concurrently with the curriculum guide development. The update process followed six systematic steps of curriculum development and were enacted in a dynamic, iterative manner rather than strictly linear.

Results: The updating process produced the 2024 Indonesian Postgraduate Neurology Education Curriculum Guide. Nine competency areas with 53 sub-competencies were determined, each of which has its milestones. The competency areas and milestones were then linked to professional activities using a matrix method to produce 32 EPAs spread across four stages of the Competence by Design training model, namely Transition to Discipline, Foundation of Discipline, Core Discipline, and Transition to Practice. Workplace-based assessments relevant to the EPAs were identified for all EPAs to facilitate evaluation of trainee entrustment levels.

Conclusion: The 2024 Indonesian Postgraduate Neurology Education Curriculum Guide was created to bridge competency milestones with EPAs. The action research process enabled stakeholder engagement and iterative refinement. Ongoing efforts will focus on implementing these EPAs in training and evaluating their impact at the program level.

Keywords: Curriculum development, Competency-based medical education, Entrustable professional activities, Milestones, Action research, Neurology, Indonesia

Introduction

Medical education worldwide is undergoing a paradigm shift from process-based training to competency-based medical education/CBME (Horak *et al.,* 2018).

Doctorate Program in Medical Science Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia

Corresponding author: Dr. Arthur H.P. Mawuntu
Email: arthurmawuntu@unsrat.ac.id

The concept of Entrustable Professional Activities (EPAs) has gained traction as a means to operationalize competencies in clinical training. EPAs are defined as units of professional practice that can be fully entrusted to a trainee once they have demonstrated sufficient competence to perform them unsupervised (Horak *et al.,* 2018). EPAs are observable and measurable activities that integrate multiple competency domains necessary to execute the task (Horak *et al.,* 2018, ten Cate & Scheele, 2007).

Internationally, EPA-based training has been adopted or piloted in various forms. The Association of American Medical Colleges (AAMC) defined 13 core EPAs for entering residency in order to ensure all new graduates can perform essential tasks (Horak *et al.,* 2018; AAMC, 2014). In postgraduate training, the Royal College of Physicians and Surgeons of Canada has implemented a national Competence by Design (CBD), which explicitly uses EPAs linked to milestones at different stages of residency (Royal College of Physicians and Surgeons of Canada, 2015).

Indonesia's neurology specialist training curriculum is part of this global movement toward CBME. The prior Indonesian Postgraduate Neurology Education Curriculum Guide was last updated in 2015. The Neurology Collegium of Indonesia identified that the 2015 curriculum guide needed to be modernized to ensure graduates are equipped for the increasingly complex demands of neurological practice. One key innovation embraced in the new curriculum is the incorporation of an EPA-based structure (Kolegium Neurologi Indonesia, 2015; Kolegium Neurologi Indonesia, 2024). While EPAs have seen widespread adoption in other countries, they had rarely been explicitly applied in Indonesian specialist training prior to this effort. The Internal Medicine Specialist Training Program, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia has begun to develop EPA for its curriculum by identifying and validating 28 EPA items (Rinaldi *et al.,* 2021). Initial research to develop an application-based e-portfolio in the medical education study program based on the EPA framework have also been conducted recently at the Faculty of Medicine, Universitas Indonesia (Findyartini *et al.,* 2021).

Here, we report on the development of an EPA-based curriculum guide for post-graduate neurology education in Indonesia. We present the process of updating the curriculum and the outcomes in terms of the new framework of competencies, milestones, and EPAs.

Methods

Study Design

To concurrently develop the curriculum and study the process, we employed an action research design. Action research is a participatory, iterative research approach commonly used in educational settings to drive practical change while generating knowledge (Khoddam *et al.,* 2024). It typically involves cycles of planning, action, observation, and reflection, engaging both researchers and stakeholders in collaborative problem-solving.

Curriculum Development Process

Development of the new curriculum guide followed a structured framework adapted from Kern's six-step approach to curriculum development (Thomas & Kern, 2022): (1) problem identification and general needs assessment, (2) targeted needs assessment of learners and context, (3) formulation of goals and objectives, (4) selection of educational strategies, (5) implementation, and (6) evaluation and feedback. These steps were used as a guiding roadmap, but we could revisit and refine earlier steps based on feedback and findings as the project progressed (Figure 1).

In the planning phase (steps 1–3 of Kern's model), we analyzed the 2015 curriculum guide to identify gaps and areas needing update. This included reviewing international neurology curriculum standards and recent literature on competency-based training. We also gathered input from stakeholders to perform a needs assessment about what changes were necessary. For example, feedback indicated a need for clearer definitions of progressive trainee responsibilities, more explicit assessment criteria, and inclusion of newer competencies. We then defined the aims and objectives of the new curriculum. Nine broad competency areas were agreed upon, encompassing the roles and capabilities expected of a neurologist. Each competency area was broken down into specific sub-competencies (53 in total), which are more granular behaviours or skills.

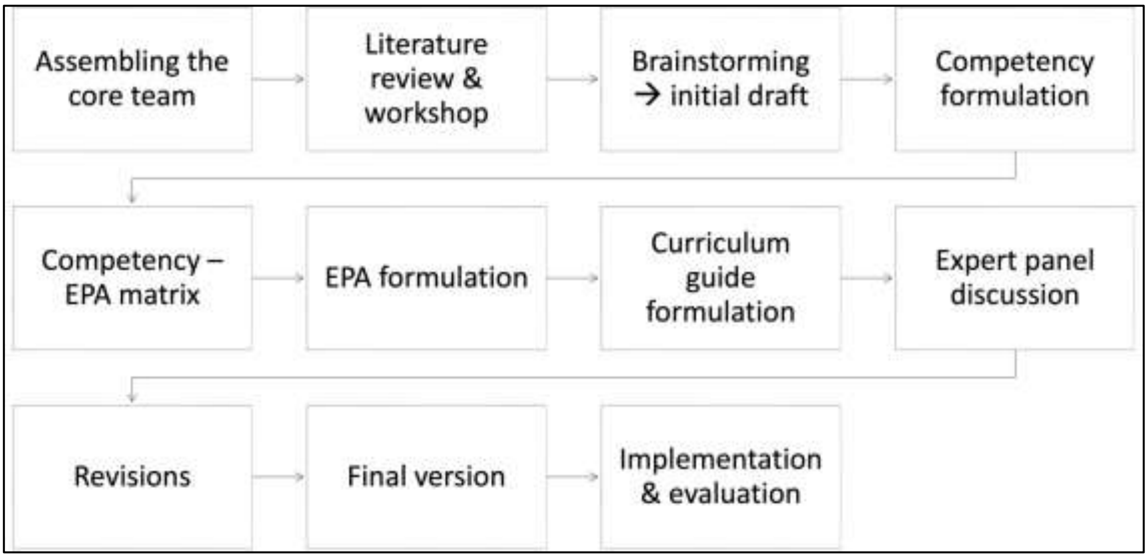

Figure 1: Iterative development process for the updated 2024 Neurology Postgraduate Curriculum Guide (PKPPDSN).

This figure illustrates the sequential phases of curriculum development, beginning with team assembly and progressing through literature reviews, initial drafting, competency and EPA formulation, consensus-building through expert panel discussions, and iterative revisions. The process, guided by Kern's six-step framework, engaged stakeholders from 13 neurology study programs across Indonesia and integrated scholarly input to ensure contextual relevance and feasibility. Final implementation and evaluation planning concluded the development cycle.

Milestones were defined on a progressive scale from novice to expected proficiency for a new specialist. These milestone levels would later inform the level of supervision or entrustment in related EPAs.

In the action phase (step 4-developing educational strategies), the key innovation was constructing an EPA-based framework tailored to our context. The team identified and formulated EPAs that a neurology resident should be able to perform upon reaching certain stages of training. To generate EPAs, we considered the typical responsibilities of neurologists in Indonesia across various settings (inpatient, outpatient, emergency, community) and the expectations of a newly graduated neurologist. We used a matrix method to ensure alignment between the competency framework and the EPAs: each EPA was mapped to the relevant competency domains and the milestone level at which it should be entrusted to the trainee.

We implemented reflection and revision cycles throughout development. Draft versions of the competency framework and EPA list were circulated to all neurology training program directors in Indonesia for feedback. Their input led to revisions in wording, the addition of certain EPAs, and adjustments of training stage expectations. The process continued with back-and-forth refinement – effectively multiple mini-cycles of action research within the larger project.

Formal implementation (step 5) of the new curriculum was planned to begin in the academic year following approval, with dissemination of the guide to all training centers. We also outlined an evaluation plan (step 6) as part of the curriculum: this included mechanisms for periodic review of EPA-based assessments, trainee performance data, and feedback from faculty and residents.

Data Collection and Analysis

Throughout the action research process, data were collected in the form of meeting minutes and mapping documents. These qualitative data were analysed through team discussions and consensus-building, given the primarily developmental aim of the project. In writing this manuscript, we treated the curriculum guide itself and its development history as the subject of analysis, describing the final structure and content as outcomes and the iterative process as the means to those outcomes. No separate ethical approval was required for this curriculum development project, as it was conducted under the auspices of the Neurology Collegium as an educational quality improvement initiative.

Results

Competency Areas and Milestones

Nine major competency areas (domains) form the foundation of the curriculum. These were derived from the vision of the “ideal neurology specialist” and correspond to the roles and expertise that a neurologist must develop. Although the guide uses Indonesian terminology, the competency areas parallel international competency frameworks (such as ACGME’s six core competencies and CanMEDS roles) with adaptations. They include, for example: (1) Professionalism and Ethics (*Profesionalitas yang Luhur*, PL), (2) Personal and Professional Development *(Mawas Diri dan Pengembangan Diri, MD*), (3) Medical Knowledge (*Pengelolaan Masalah Kesehatan dan Sumber Daya, PMKSD*), (4) Clinical Skills (*Keterampilan Klinis, KK*), (5) Patient Care and Management (*Pengelolaan Masalah Kesehatan dan Sumber Daya, PMKSD*), (6) Communication (*Komunikasi efektif, KOM*), (7) Collaboration (*Kolaborasi dan Kerja sama, KOL*), (8) Intellectual, analytical, and creative (*Intelektual, Analitikal, dan Kreatif, IAK*), and (9) Literation, information technology, and communcation *(Literasi, Teknologi Informasi, dan Komunikasi, LTK*). Each competency area is further specified by a set of sub-competencies (53 in total across all domains). For instance, within Professionalism, sub-competencies cover ethical decision-making, maintaining accountability, and cultural sensitivity; within Clinical Skills, sub-competencies include performing a neurological exam, interpreting neurodiagnostic tests, etc.

For every sub-competency, milestone levels were defined to mark the trajectory from novice to expert. The milestone scale was generally divided into four levels corresponding to the four stages of training, plus an initial “entry” level and a final proficiency level equivalent to an independent new neurologist. The milestones articulate what behaviors or performances are expected at each stage. For example, in the sub-competency of performing a neurological examination: at early training a trainee should be able to do a basic exam with significant supervisor guidance (milestone level 1), by mid-training perform a complete exam identifying major findings (level 2), later perform nuanced exams eliciting subtle signs (level 3), and by end of training efficiently adapt the exam to complex cases independently (level 4). These milestone descriptors provide a developmental roadmap for each skill and were largely informed by the ACGME Milestones concept (ACGME, 2020). However, the Indonesian guide contextualizes them to local training conditions. The milestones serve as benchmarks of competency achievement in a formative way throughout the program.

Training Stages and EPA Framework

The residency program is structured into four stages that align with the Competence by Design framework used in competency-based residency programs. These stages are: Transition to Discipline, Foundation of Discipline, Core Discipline, and Transition to Practice. Each stage roughly corresponds to a phase of training in terms of semesters, responsibilities, and expected level of entrustment. In our 4-year neurology program, we mapped the stages onto the timeline as follows: Transition to Discipline (approximately semester 1, an orientation and introduction period), Foundation of Discipline (covering the early residency years when foundational knowledge and basic skills are built, roughly semesters 2 through 4), Core Discipline (the mid to advanced years, where residents manage complex cases and refine advanced skills, approximately semesters 5 through 7), and Transition to Practice (the final portion of training, around semester 8, where residents function with near-independence to prepare for unsupervised practice).

A total of 32 EPAs were identified and they are distributed across the four stages of training. These EPAs represent the key clinical tasks and responsibilities that a neurology resident must progressively master. Each EPA includes key specifications such as scope, limitations, potential risks if performed incorrectly, and the most relevant linked competencies. An example is shown in Table 1, outlining 'EPA Transition to Discipline 01: Performing history-taking and physical examination for patients with neurological symptoms.' This format helps standardize entrustment decisions and facilitate programmatic workplace-based assessments (ten Cate, 2005). Importantly, each EPA is linked to one or more competency domains and is achievable at a certain milestone level. Table 2 provides an overview of how the EPAs map to the competency domains and milestone levels in a matrix format. Each EPA is written as a descriptive statement of an activity, often beginning with an action verb (e.g., “Perform…,” “Manage…,” “Lead…”). For clarity, the curriculum guide grouped the EPAs by stage and labeled them accordingly.

The curriculum guide provides narrative descriptions for each EPA, which detail the scope of the activity, the context in which it should be assessed, and what level of supervision is required at various stages. For example, the EPA of administering thrombolysis for acute stroke includes prerequisites such as completion of stroke protocol training and demonstration of knowledge about inclusion/exclusion criteria.

Table 1: Sample of EPA Format

Element	Content
EPA Code	EPA Transition to Discipline 01
EPA Title	Conduct anamnesis and physical examination for patients with neurological clinical manifestations
Specification and Limitations	Focus: initial application of clinical skills in new specialist settings. Includes: • History taking (auto-/hetero-anamnesis) • General and neurological physical exam • Mental status assessment • Excludes diagnosis/treatment planning No teaching/supervision roles at this level
Potential Risks if Performed Poorly	1. Misdiagnosis leading to delayed or incorrect treatment 2. Erosion of patient trust and communication breakdown 3. Legal and ethical consequences due to inadequate documentation
Relevant Competency Areas	PL1, PL2, PL3, MD1, KOL1, KOL2, KP1, KP2, KP3, KP4, LTK1, PMKSD1, KK1, KK2, KK3
Required Knowledge	Neurological history, anatomy of nervous system, clinical manifestations of neurological disorders
Required Skills	Perform patient interview, execute neurological examination, communicate findings clearly
Professional Attitudes	Respect, honesty, empathy, confidentiality, teamwork, adherence to standard operational procedures, learning from errors.

Table 2: Matrices that link between competencies and EPAs through the academic stages

Competencies	**EPA**			
	Transition to discipline	**Foundation of discipline**	**The core of discipline**	**Transition to practice**
	(EPA 1A-5A)	(EPA 1B-7B)	(EPA 1C-16C)	(EPA 1D-4D)
PL1: Professional Behavior and Ethical Principles				
PL2: Accountability/Precision				
PL3: Maintaining Personal Health				
MD1: Reflective Practice & Commitment to Personal Development				
KOL1: Interprofessional and Team Communication				
KOL2: Communication within the Healthcare System				
KP1: Patient Safety				
KP2: Quality of Healthcare Services				
KP3: Patient-Centered Care				
KP4: Physician's Role in the Healthcare System				
IAK1: Application of Scientific Methods in Research				
IAK2: Literature/Scientific Article Review				
IAK3: Health Education for the Public				
LTK1: Evidence-Based and Information-Based Practice				
LTK2: Scientific Presentation				
PMKSD1: Lesion Localization/Neuroanatomy				
PMKSD2: Diagnostic Examination				
PMKSD3: Neurotraumatology				
PMKSD4: Stroke, Neurovascular, and Vascular Interventions				
PMKSD5: Neuro-oncology				
PMKSD6: Neuroinfection, Neuroimmunology, and CSF Disorders				
PMKSD7: Epilepsy				
PMKSD8: Clinical Neurophysiology and Neuromuscular Disorders				
PMKSD9: Neurobehavior				
PMKSD10: Sleep Disorders				
PMKSD11: Neurogeriatrics				
PMKSD12: Neuropediatrics				
PMKSD13: Neuro-ophthalmology, Neuro-otology, and Vertigo				
PMKSD14: Pain and Pain Intervention				
PMKSD15: Headache				

PMKSD16: Movement Disorders				
PMKSD17: Neuroemergency, Neurocritical Care, and Neurotoxicology				
PMKSD18: Neurorestoration				
KK1: History Taking				
KK2: Neurological Examination				
KK3: Formulation				
KK4: Diagnosis & Management of Outpatient Neurological Cases				
KK5: Diagnosis & Management of Inpatient Neurological Cases				
KK6: Diagnosis & Management of Neuroemergency and Neurocritical Cases				
KK7: Determination of Death by Neurological Criteria				
KK8: Interpretation of Neurological Imaging/Neuroimaging				
KK9: EEG and Introduction to PSG Examination				
KK10: NCS, EMG, Evoked Potentials, and Introduction to IOM				
KK11: Lumbar Puncture & CSF Analysis				
KK12: Neurobehavioral Examination				
KK13: Neuro-ophthalmology & Neuro-otology Examination				
KK14: TCD, CV Ultrasound, and Neuromuscular Ultrasound				
KK15: Extra- and Intra-articular Injections for Pain & Headache				
KK16: Neurological Examination in Infants and Children				
KK17: Thrombolysis				
KK18: Neurorestorative Interventions				
KOM1: Patient and Family-Centered Communication				
KOM2: Mitigating Barriers and Biases				

Remarks: CSF=cerebrospinal fluid; EEG=electroencephalography; PSG=polysomnography; NCS=nerve conduction study; EMG=electromyography; IOM=intra-operative monitoring; TCD=transcranial doppler; CV=carotico-vertebral

0%
1 – 20%
21 – 40%
41 – 60%
61 – 80%
81 – 99%
100%

Assessment Methods

Aligned with the EPA-based approach, the curriculum emphasizes workplace-based assessments (WBA) as the primary tools for evaluating residents. For each EPA, appropriate assessment instruments are recommended. These include direct observation tools like mini-Clinical Evaluation Exercise (mini-CEX) for clinical encounters, Direct Observation of Procedural Skills (DOPS) for technical procedures (e.g., performing a lumbar puncture or EEG), case-based discussions for management decisions, and multi-source feedback for areas like professionalism and teamwork. The guide suggests that when a supervisor judges a resident ready to be entrusted with an EPA (i.e.,to perform it with indirect or no supervision), this decision should be based on repeated observations in the clinical setting. In practice, entrustment decisions would be documented using an entrustment-supervision scale (for instance, level 1=not allowed to practice, to level 5=independent practice) for each EPA. This approach resonates with competency-based assessment trends elsewhere, where frequent low-stakes assessments inform entrustment decisions (Horak *et al.,* 2018). By linking assessments to EPAs, the new curriculum ensures that evaluation is focused on integrated clinical tasks. For example, the EPA of managing a status epilepticus case might be assessed through a combination of DOPS (for administering IV antiseizure medications properly) and a case discussion evaluating the resident's judgment and coordination of care during the emergency.

Discussion

This project resulted in an updated neurology curriculum that is one of the early examples of EPA-based design in Indonesian specialist training. The action research approach allowed the curriculum to be developed with continuous input. This participatory method meant that the curriculum changes were being evaluated and refined in real time by those who would ultimately use them (trainers and trainees). One advantage of this approach was greater buy-in: faculty from various universities felt ownership of the final product since they were engaged during its development. This addresses a known challenge in curriculum reform, where stakeholders might resist new approaches if they feel imposed (Khoddam *et al.,* 2024). By involving them through an iterative process, we mitigated this issue. Additionally, action research's cyclic nature ensured that problems were identified and solved early. This reflects how action research can improve educational interventions by continuous reflection.

However, we also encountered challenges consistent with what literature on action research notes. One challenge was the inherent complexity of analyzing and changing a curriculum, which involves educational theory, stakeholder values, and practical constraints all at once (Khoddam *et al.,* 2024). Maintaining scientific rigor was challenging due to the need to balance documenting the process with making real-time decisions. We had to continuously act and adapt, even as we were trying to study and document the process, a balancing act that is rarely straightforward. There is also a risk of bias since the researchers (curriculum team) are deeply invested in a positive outcome. Despite these challenges, we believe the benefits outweighed the drawbacks. Our experience suggests this approach can generate both practical solutions and new understanding about change management in education.

The adoption of an EPA-based curriculum in Indonesian neurology training aligns with global trends and also shows some distinctive adaptations. In the United States, residency programs have traditionally been structured around competencies and sub-competencies, with the ACGME Milestones providing a developmental framework (ACGME, 2020). The ACGME Milestones approach is similar to our use of milestones for sub-competencies, in that it tracks progression from novice to expert in each skill or knowledge area. Carraccio et al., (2017) argued for building frameworks of EPAs supported by competencies and milestones to better bridge the educational continuum and focus training on the delivery of care. The 2024 Indonesian Postgraduate Neurology Education Curriculum Guide is a practical instantiation of that idea – competencies and their milestones were created as the building blocks assessed through EPAs – each EPA is cross-referenced to milestones in relevant sub-competencies, which mirrors the "EPA as a bundle of milestones" concept.

Implementing an EPA-based curriculum is not without challenges. Faculty development is a major factor – clinicians who are used to traditional assessment need training to perform workplace-based assessments and make entrustment decisions. In Canada's experience with CBD, many faculty initially felt unprepared for the new system (Bogie *et al.,* 2021). There could also be resistance to the increased documentation burden: assessing 32 EPAs to all residents requires a cultural shift toward frequent feedback and paperwork. Another challenge is ensuring consistency and reliability in EPA assessment. Different supervisors might have varying thresholds for entrusting an activity. We anticipate a similar need in Indonesia; workshops and guidelines are being prepared to socialize the EPA framework among clinical teachers as well as to conduct rater training sessions. This is analogous to calibration exercises done for milestone evaluations in ACGME programs (ACGME, 2020). From the trainee perspective, the EPA framework can be very motivating but also anxiety-provoking if not well explained. Early orientation for new residents about EPAs and how they will be used in training is planned. Residents should understand that EPAs provide a clear standard for what it means to be ready for unsupervised work in core professional activities (Horak *et al.,* 2018).

The process we undertook is part of a continuous quality improvement cycle. Now that the curriculum guide is published and implementation is starting, the action research will continue in the form of monitoring and feedback collection. This will inform future revisions of the curriculum guide. Therefore, this curriculum will not remain static; we have built in a mechanism for regular updates. In the future, we might incorporate additional EPAs, for emerging therapies or technologies, or adjust competencies according to the national health priorities.

Our work also provides a model that could be extended to other specialty training programs in Indonesia. The structure of competencies, milestones, and EPAs could be customized to any discipline. In fact, it aligns well with the national movement towards outcome-based education. Notably, other countries in Southeast Asia are also considering competency-based reforms (Fong *et al.,* 2025). Collaboration and comparison across countries might be beneficial.

In summary, the development of the EPA-based neurology curriculum via action research was a complex but fruitful endeavor. It brought together educational theory and practice, international standards and local wisdom, in a new synthesis. The result is a curriculum guide that is oriented toward producing neurologists who are knowledgeable and capable of performing the necessary clinical tasks. The most important future challenge for this curriculum guide will be its implementation and evaluation in clinical specialist training. However, we are confident that the guide's flexibility and adaptability will enable it to meet this challenge.

Conclusion

Through an action research-driven process, we successfully developed the 2024 Indonesian Postgraduate Neurology Education Curriculum Guide, an updated curriculum guide for post-graduate neurology education in Indonesia that incorporates an Entrustable Professional Activities framework. It aligns competency domains, milestones, and EPAs in a structured manner to ensure that training is outcome-focused and relevant to actual clinical practice. Looking ahead, the emphasis will be on effective implementation: training faculty to utilize the EPA framework and workplace-based assessments, and supporting residents in this transition to a new model of learning and evaluation. This project adds the evidence that EPA-based curricula can be successfully developed outside of Western contexts, and it underscores the importance of using scholarly, research-informed approaches, like action research.

References

Accreditation Council for Graduate Medical Education (ACGME), 2020. *Neurology Milestones.* [online] Available at: https://www.acgme.org/globalassets/pdfs/milestones/neurologymilestones.pdf

Association of American Medical Colleges (AAMC), 2014. Core Entrustable Professional Activities for Entering Residency: *Curriculum Developers' Guide*. Washington, DC: AAMC. Available at: https://www.aamc.org/data-reports/medical-students/report/core-epas.

Bogie, B., Payne, S., Harms, S., McConnell, M. and Samaan, Z., 2021. Leading from behind: An educational intervention to address faculty and learner preparedness for competence by design in psychiatry. *Journal of Multidisciplinary Healthcare,* pp.2587-2595.

Carraccio, C., Englander, R., Gilhooly, J., Mink, R., Hofkosh, D., Barone, M.A. and Holmboe, E.S., 2017. Building a framework of entrustable professional activities, supported by competencies and milestones, to bridge the educational continuum. *Academic Medicine*, 92(3), pp.324-330.

Findyartini, A., Raharjanti, N.W., Greviana, N., Prajogi, G.B. and Setyorini, D., 2021. Development of an app-based e-portfolio in postgraduate medical education using entrustable professional activities (EPA) framework: Challenges in a resource-limited setting. *Asia Pacific Scholar,* 6(4), pp.92–106.

Fong, S.L., Lim, K.S., Lim, S.H., Octaviana, F., Tran, T.C., Thuy Le, M.A., Suwanwela, N.C., Yassin, N., Vorachit, S., Navuth, C. and Gutrierrez, J.C., 2025. Education research: training of neurologists in South East Asian countries: a cross-sectional survey on the current neurology curriculum. *Neurology Education*, 4(1), p.e200201.

Horak, H., Englander, R., Barratt, D., Kraakevik, J., Soni, M., Tiryaki, E. and UES subcommittee of the AAN, 2018. Entrustable professional activities: a useful concept for neurology education. *Neurology*, 90(7), pp.326-332.

Khoddam, H., Halakou, S., Modanloo, M., Nikpeyma, N. and Mojaver Aghili, S.B., 2024. Participatory action research on framework of promoting action on research implementation in health services: A pathway to evidence-based changes in the development of medical science education. *Journal of Medical Education Development*, 17(55), pp.164-166.

Kolegium Neurologi Indonesia, 2015. *Standar Kompetensi Dokter Spesialis Neurologi Indonesia Tahun* 2015.

Kolegium Neurologi Indonesia, 2024. *Panduan Kurikulum Program Pendidikan Dokter Spesialis Neurologi Indonesia Tahun* 2024. Surakarta: UNS Press.

Rinaldi, I., Findyartini, A., Widaty, S. and Hasan, I., 2022. Identification and validation of entrustable professional activities in Indonesian internal medicine residency programs. Acta Medica Indonesiana - *The Indonesian Journal of Internal Medicine*, 54(1).

Royal College of Physicians and Surgeons of Canada, 2025. *EPAs and CanMEDS milestones – Competence by Design resources.* [online] Available at: https://www.royalcollege.ca [Accessed 10 May 2025].

ten Cate, O., 2005. Entrustability of professional activities and competency-based training. *Medical Education*, 39(12), pp.1176–1177.

ten Cate, O. and Scheele, F., 2007. Competency-based postgraduate training: can we bridge the gap between theory and clinical practice? *Academic Medicine,* 82(6), pp.542–547.

Thomas, P.A. and Kern, D.E., 2022. Curriculum Development for Larger Programs. *Curriculum Development For Medical Education*, p.241.