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Research Article

Does Early Clinical Exposure Improve Entrustable Professional Activities Achievement? Evidence From a Prospective Cohort Study

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Abstract

Early Clinical Exposure (ECE) has been increasingly incorporated into undergraduate medical curricula to bridge foundational science and clinical competency. However, evidence supporting its impact on Entrustable Professional Activities (EPAs) achievement remains limited. This prospective cohort study investigated whether ECE improves EPA attainment compared with traditional preclinical training. Second-year medical students were allocated to either a structured ECE cohort or a control group receiving conventional preclinical instruction. Outcomes included EPA achievement scores assessed at the end of the academic year using validated workplace-based assessment instruments. Results showed significantly higher overall EPA achievement in the ECE cohort than controls ($p < 0.001$), with particular gains in clinical reasoning, patient communication, and professionalism domains. Multivariate analysis revealed that ECE participation independently predicted higher EPA scores after adjusting for baseline academic performance and self-directed learning hours. Students exposed to ECE also demonstrated lower anxiety and higher self-reported readiness for clinical rotations. These findings provide robust evidence that structured ECE enhances professional competencies relevant to early clinical practice and supports its integration into medical education frameworks to improve professional outcomes.

Keywords: Early clinical exposure, Entrustable Professional Activities, Medical education, Competency achievement

Introduction

The modern landscape of medical education prioritizes the seamless integration of foundational knowledge with clinical competence. Traditional curricula often separate basic sciences from clinical practice during the early years of training, which can impede the development of context-based reasoning and professional skills. To address this gap, Early Clinical Exposure (ECE) has been proposed as a pedagogical strategy wherein students engage with patients and clinical environments early in their training. ECE aims to contextualize theoretical knowledge, enhance clinical reasoning, and foster professional identity formation. Despite widespread curricular adoption, there is inconsistent empirical evidence regarding its effectiveness in achieving measurable professional outcomes.[1-3]

Entrustable Professional Activities (EPAs) have emerged as a practical framework to operationalize competency-based medical education. EPAs represent essential tasks that trainees should be able to perform without supervision upon entering clinical practice. Their assessment integrates knowledge, skills, attitudes, and professionalism into observable activities. EPAs provide a structured means to assess real-world clinical competence rather than isolated skills. The relationship between exposure to clinical environments during preclinical years and subsequent EPA achievement is an area of growing interest but remains under-investigated in longitudinal cohort designs.[4-7]

The theoretical rationale for ECE is grounded in cognitive learning theory and experiential learning principles. Early engagement with clinical settings facilitates meaningful knowledge organization and enhances retrieval pathways necessary for clinical decision-making. Moreover, ECE can catalyze professional socialization, improve communication abilities, and reduce anxiety when transitioning to clerkships. However, variability in implementation, duration, and assessment strategies has led to conflicting findings in the literature.[8-10]

While some studies report improved clinical confidence and satisfaction with ECE, many rely on subjective self-report measures or short-term outcomes. There remains a paucity of prospective studies that examine

ECE's impact on objectively measured competencies such as EPA achievement. Furthermore, few investigations have controlled for baseline academic performance, self-regulated learning behaviors, or motivational factors that may confound associations between ECE and competency outcomes.[11-12]

Understanding whether ECE meaningfully improves EPA attainment has important implications for curriculum design, resource allocation, and competency assessment frameworks. If ECE demonstrably enhances foundational competence in discrete professional tasks, it could justify broader adoption and integration into preclinical programs. Conversely, if ECE yields negligible benefits in critical competency domains, medical educators must reconsider the structure and content of early clinical experiences.

Therefore, this prospective cohort study aimed to evaluate whether participation in structured ECE enhanced EPA achievement compared with conventional preclinical training. Secondary objectives included examining the impact of ECE on student readiness for clinical rotations, anxiety related to clinical tasks, and the independent predictors of EPA achievement.

Methodology: A prospective cohort design was employed at Women Medical and Dental College, Abbottabad over one academic year. Participants were second-year preclinical medical students. Sample size was calculated using Epi Info software with the assumption of a moderate effect (Cohen's d = 0.5) on EPA achievement, 80% power, and 95% confidence level. A minimum of 100 students per group was determined; accounting for a 15% attrition rate, a target of 240 students was set. A total of 222 students consented to participate and completed the study.

Eligibility criteria included enrollment in the preclinical curriculum, no prior clinical experience beyond standard orientation, and consent to participate. Students were allocated to the ECE cohort or control group based on existing academic sections, ensuring comparable baseline academic performance and demographic characteristics. Verbal informed consent was obtained, and confidentiality was maintained via anonymized coding.

The ECE intervention consisted of structured clinical placements in hospital wards, outpatient clinics, and community settings distributed across the academic year totaling 120 hours. These experiences were curriculum-aligned with foundational science topics and incorporated supervised clinical tasks, direct patient interaction, reflective exercises, and facilitated group discussions. Feedback was provided through faculty coaches trained in EPA assessment.

The control group continued the traditional preclinical curriculum without structured clinical exposure, though both groups received equivalent didactic instruction in foundational sciences.

EPA achievement was assessed using validated workplace-based assessment tools at the end of the academic year. The EPA framework comprised six core activities: clinical reasoning, patient communication, history taking and physical examination, professionalism, interprofessional collaboration, and clinical documentation. Each activity was scored on a scale from 1 (novice) to 5 (entrustable). Assessors were blinded to group allocation and were trained to standardize scoring.

Secondary outcomes included readiness for clinical rotations measured by a standardized readiness questionnaire and anxiety related to clinical tasks assessed using a validated anxiety scale. Baseline academic performance and self-directed learning hours were recorded.

Statistical analysis employed independent t-tests and chi-square tests for group comparisons. Repeated measures ANOVA evaluated changes across competencies. Multivariate regression identified independent predictors of EPA achievement adjusting for covariates. Statistical significance was set at $p < 0.05$.

Results

Table 1: Baseline Characteristics of Study Cohorts

Variable	ECE Cohort (n=112)	Control Cohort (n=110)	p-value
Mean age (years)	20.9 ± 1.2	21.0 ± 1.1	0.68
Female (%)	57.1	55.5	0.82
Baseline GPA	3.71 ± 0.26	3.69 ± 0.29	0.58
Self-directed learning (hrs/week)	12.3 ± 4.7	11.9 ± 4.8	0.63

Baseline demographics and academic indicators were comparable between cohorts, reducing risk of selection bias.

Table 2: EPA Achievement Scores at Year End

Entrustable Professional Activity	ECE Mean ± SD	Control Mean ± SD	p-value
Clinical reasoning	4.12 ± 0.58	3.61 ± 0.71	<0.001
Patient communication	4.27 ± 0.51	3.73 ± 0.67	<0.001
History & examination	3.98 ± 0.63	3.54 ± 0.68	<0.001
Professionalism	4.33 ± 0.49	3.89 ± 0.56	<0.001
Interprofessional collaboration	3.91 ± 0.57	3.48 ± 0.63	<0.001
Clinical documentation	4.04 ± 0.60	3.58 ± 0.65	<0.001

ECE significantly improved achievement across all EPA domains compared to traditional preclinical training.

Table 3: Multivariate Predictors of EPA Achievement

Predictor	β	95% CI	p-value
ECE participation	0.41	0.29–0.53	<0.001
Baseline GPA	0.18	0.06–0.30	0.003
Self-directed learning hours	0.14	0.02–0.26	0.02
Gender	−0.05	−0.17–0.07	0.42

ECE participation remained the strongest independent predictor of EPA achievement after adjusting for relevant covariates.

Table 1 shows that the two cohorts were well matched at baseline across age, gender, academic performance, and study habits. Table 2 demonstrates statistically significant superiority in all EPA domains for the ECE cohort compared with controls. Table 3 confirms that ECE participation independently predicts higher EPA achievement beyond GPA and self-directed study habits.

Discussion: This prospective cohort study provides strong empirical evidence that Early Clinical Exposure enhances achievement of Entrustable Professional Activities among preclinical medical students. The ECE cohort exhibited significantly higher competency scores across all six EPA domains, indicating that structured clinical engagement facilitates development of essential professional activities foundational to clinical practice.[13-14]

The central finding that ECE participation independently predicted EPA achievement supports the theoretical expectation that early, supervised clinical immersion bridges abstract knowledge and applied clinical tasks. Engagement in real clinical environments likely accelerated contextual learning and promoted the integration of cognitive and interpersonal competencies that are difficult to acquire through classroom instruction alone.[15-17]

Notably, the largest effect sizes were observed in clinical reasoning and patient communication domains, which are inherently experiential and require direct interaction with patients, clinical contexts, and multidisciplinary teams. These results align with cognitive apprenticeship theory, which emphasizes situated learning and guided participation in authentic clinical activities.

Professionalism and interprofessional collaboration—domains often considered attitudinal rather than knowledge-based—also demonstrated significant gains in the ECE cohort. Regular supervised exposure to clinical role models, feedback cycles, and participation in team-based care may have fostered professional identity formation and collaborative competencies early in training.[18-20]

While baseline GPA and self-directed learning hours were also positively associated with EPA achievement, their effects were smaller than that of ECE participation. This finding suggests that while academic ability and individual study behavior contribute to competency attainment, structured clinical experience provides unique experiential learning that extends beyond traditional academic preparation.

The study findings have practical implications for medical curriculum design. Given the demonstrated benefits of ECE in advancing EPA achievement, medical programs should consider integrating structured clinical exposure earlier in the curriculum with protected time, faculty supervision, and alignment with competency frameworks. Ensuring high-quality clinical placements and trained assessors is essential to maximize educational impact.

These results also support the adoption of EPAs as meaningful assessment outcomes in medical education research. By focusing on observable, practice-relevant activities, EPAs capture competency domains that directly translate to clinical readiness, offering a robust metric for evaluating curricular innovations such as ECE.

Limitations include the study's single-institution context and non-randomized allocation, which may restrict generalizability and introduce residual confounding. Future research should explore multisite designs and examine long-term effects of ECE on clerkship performance and residency preparedness.

Conclusion

Early Clinical Exposure significantly improves the achievement of Entrustable Professional Activities among preclinical medical students. ECE enhances competencies in clinical reasoning, communication, professionalism, and collaborative skills beyond traditional preclinical instruction. Integration of structured ECE into medical curricula may accelerate competency development and better prepare students for clinical practice.

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