

# Implementation of Electives in Emergency Medicine for Medical Undergraduates and Evaluation of Its Effectiveness

Shailaja Sampangiramaiah<sup>1</sup>, Ashith D Shettian<sup>2</sup>, Nagaraj M Bhat<sup>3</sup>, Niveditha G Tekkunje<sup>4</sup>, Manohar Martis<sup>5</sup>, Kiran Shetty<sup>6</sup>, Ruban S Dsouza<sup>7</sup>, Joanne J Sequeira<sup>8</sup>

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## ABSTRACT

**Aims and background:** Competency-based medical education has been widely accepted across the globe and it has been adopted in the undergraduate curriculum in India from 2019. One introduction to this curriculum is the Electives postings. Electives are chosen by the students. The objectives of this project were to document the implementation of electives in emergency medicine for the medical undergraduates and to assess its effectiveness in terms of improving the knowledge and changing in perceptions of students.

**Materials and methods:** The Analysis, Design, Development, Implementation, and Evaluation (ADDIE) instructional design approach was followed to prepare this electives module. The cross-sectional study was conducted on eight students who chose the emergency medicine elective for two consecutive years. The students were engaged in teaching learning activities and assessments for a duration of 15 days. They completed a pre- and post-course survey forms, pre- and post-tests and were given feedback on daily activities conducted.

**Results:** All students gave positive response in terms of course conduct, satisfaction, gain in knowledge, and core skills of emergency medicine procedures. There was significant difference in student perception regarding the role of an emergency physician, triaging patients, taking history, examination, and management of life-threatening emergencies following the posting. All students showed noteworthy improvement in post-test scores compared with pre-course test.

**Conclusion:** A structured 2-week elective posting in emergency medicine has a positive impression on student's perception regarding the specialty and has a remarkable advancement in knowledge and core skills of emergency medicine competencies.

**Keywords:** Elective posting, Learner satisfaction, Structured teaching program, Self-efficacy, Simulation, Undergraduate students.

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## HIGHLIGHTS

Adopting Analysis, Design, Development, Implementation, and Evaluation (ADDIE) instructional design for designing a student training program helps in clear documentation and having a systematic approach to implementation.

One of the high-priority choices among undergraduate students is electives in emergency medicine.

Incorporation of a mix of educative with hands-on training is well appreciated by students.

## INTRODUCTION

The competency-based medical education (CBME) curriculum was rolled out for the 2019 batch of undergraduates throughout all the medical colleges in India. The goal of this new curriculum is to produce Indian Medical Graduates who possess the requisite skills, attitude, values, and responsiveness so that he/she may function appropriately and effectively as a physician of first contact with the community while being globally relevant.<sup>1</sup> The salient features of this CBME includes the foundation course, early clinical exposure, attitude ethics and communication (AETCOM), pandemic module, skills training module, alignment and integration module, and electives module.<sup>2</sup> The electives module is a compulsory 1-month rotation of 15 days each in basic sciences including research and the other in clinical science including community clinics.<sup>2</sup>

The concept of electives first appeared in the United States in 1819 in the curriculum of the University of Virginia.<sup>3</sup> In late

<sup>1-4,6-8</sup>Department of Emergency Medicine, Father Muller Medical College, Mangaluru, Karnataka, India

<sup>5</sup>Department of General Surgery, Father Muller Medical College, Mangaluru, Karnataka, India

**Corresponding Author:** Shailaja Sampangiramaiah, Department of Emergency Medicine, Father Muller Medical College, Mangaluru, Karnataka, India, Phone: +91 9845663466, e-mail: drshaila@fathermuller.in

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1990s, electives in different areas of nursing specialization were introduced.<sup>4</sup> Since then various medical college universities have offered electives on a wide spectrum of specialties and using both onsite and offline courses.<sup>5,6</sup> An elective is defined as "A learning experience created in the curriculum to provide an opportunity for the learner to explore, discover and experience areas, or streams of interest," "A period of time during undergraduate within which there is significant element of student choice."<sup>7,8</sup> An elective course is defined as "A course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides

an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill.<sup>9</sup>

Electives are highly valued by students as they enable them to explore and experience future interests early during their medical training. Electives complement the core curriculum as it is customized to meet the needs/interests of the learners.<sup>10</sup> Electives are well known to promote transformative learning. Transformative learning encompasses instrumental learning and communication learning. Instrumental learning focuses on learning through task-oriented problem-solving exercises which help learners improve work performance or a specific clinical task. Developing communication skills focuses on understanding how others indicate their needs, feelings, and desires.<sup>8</sup> Electives can be grouped into the following different types global health, directed elective, wellness, project work, and career choice electives.<sup>8</sup> There are a few studies in the literature documenting the conduct of a rotation of electives in emergency medicine and student perception of conduct of the electives.<sup>11,12</sup> Emergency medicine electives will provide students first-hand opportunity to witness skills of basic and advanced cardiovascular support, trauma and first aid care, the common medical and surgical emergencies. This will help progress their procedural and communication skills, develop professionalism, and enhance their interprofessional skills.

However, there is limited data regarding the conduct and perception of such electives following the introduction of Competency-Based Medical Education Curriculum from India, hence this prospective observational cohort study was undertaken with the objectives of documenting the implementation of electives in emergency medicine for the medical undergraduates and to assess its the effectiveness in terms of improving the knowledge and change in perceptions of students.

## MATERIALS AND METHODS

The study was approved by the Institutional Ethics Committee. All students provided written informed consent to use their data and pictures for presentations/publication.

The ADDIE Instructional design approach was followed to prepare this electives module.<sup>13</sup> Analysis, Design, Development, Implementation, and Evaluation is an instructional systems design model that presents a series of iterative steps for building effective education and training in five phases – Analysis, Design, Development, Implementation, and Evaluation.<sup>14</sup>

Phase I, Analysis – The Medical education unit of our institute analyzed that there was a need to train faculty on preparing the electives module for their subject specialty as such programs were nonexistent in the college. Hence, a two-day hands-on workshop was executed on 18th and 19th February 2022 which enabled the participants to prepare the electives module for their respective specialty with the schedule of weekly and monthly objectives, teaching learning methods, activities to be conducted, assessment, and program evaluation. Two faculty from emergency medicine department attended the workshop. Following this faculty training program, the preceptors of emergency medicine were able to determine the content and the methods of its delivery for the emergency medicine elective.

Phase II, Design – The trained faculty were preceptors for the module and they deliberated the plan with the remaining faculty of the department and came to a consensus regarding the activities and objectives of the module. All faculty focused on a conceptual

design of the module which included a balance of didactic and clinical components. The common cases for bed-side clinics, formal teaching sessions, use of skill labs and simulation, and the learning resources that will be provided were decided. The prepared timetable and flyer were submitted for review to the Electives Review Committee, and based on the feedback received, the final version was proposed. The reading materials that were decided to be shared with students for independent reading included – a soft copy of the book – iEmergency Medicine for Medical Students and Interns.<sup>15</sup>

Phase III, Development – The preceptors focused on creating an engaging and sustainable educational content. An orientation session for students was planned to include brief introductions, students' job description which included expectations of responsibilities towards patient care, working under supervision of faculty and residents, immunization status, donning appropriate personal protective equipment's to minimize illness hazards, attendance requirement, grading policy, maintaining professionalism and completing the course requirements on time. A pre-course survey questionnaire of 13 questions was developed which included basic details of students, their awareness of the roles of an emergency physician, their confidence level in diagnosing and managing acute undifferentiated illness, future interests, and expectations of this course. The students were required to answer a pre-test consisting of a mix of multiple-choice questions and short answers. The content validity of the questions was checked by the faculty of emergency medicine who were not involved in the preparation of the test. The skills and simulation session activities included – oxygen therapy and airway management, intravenous, intraosseous access, hemorrhage control with tourniquet, compression bandaging, basic suturing, needle decompression, and intercostal drain insertion, extended focused assessment with sonography in trauma (E-FAST), electrocardiogram and electrical station with the defibrillator, arterial blood gas analysis procedure and interpretation and use of full-scale human simulation for trauma scenario to train in team leader skills. All the skills and simulation sessions had lesson plan which included specific learning objections, brief didactics followed by demonstration, students were given a chance to practice skills followed by debriefing and session feedback from students to faculty. During the clinical posting in the department, students were encouraged to take focused history and perform the examination on stable patients, assist and observe procedures performed by residents or faculty on real patients. Follow-up of patients including laboratory and imaging diagnosis and participate in management plans. Case discussion with student feedback was encouraged throughout the postings. Students were required to maintain reflective writing of one case per day in their log books in the following headings – what happened, so what, what next. At the end of the posting, students were required to fill the post-course survey which included 24 questions in the form of 5-point Likert scale which included apart from pre-course survey questions whether the elective increased their knowledge, skills, quality of course content, duration, resources shared, faculty participation, assessment criteria and two open-ended questions on what was good about this elective and what could be improved. The students had to write the post-test and submit the completed log book to the preceptors for obtaining the completion certificate.

Phase IV, Implementation – Recruitment of students – The flyer of emergency medicine elective was displayed to students of Phase III at the end of their professional year. Merit-based counseling of

the second professional year summative university marks was considered for choosing the elective of their choice.

Four students who opted for emergency medicine were posted from 6th of March to 18th of March 2023 and another four from 8th March to 22nd March of 2024. On the first day, brief introductions with course expectations were explained. They filled in the pre-course survey and wrote down their expectations and completed the pre-test. The list of cases they had an opportunity to observe in the clinics included chest pain, abdominal pain, unresponsive patient, snake bite, trauma in the form of road traffic accidents and fall from height, acute onset breathlessness etc. All the eight students completed all the skills and simulation activities and gave written feedback for the same. All students had 100% attendance during the electives. At the end of the posting, they filled the post-course survey questionnaire and answered the post-test. All seven faculty of our department and one faculty from general surgery assisted in the conduct of this program. Students received feedback during all patient encounters and feedback with debriefing for the skills and simulation session.

Phase V, Evaluation – The electives program was evaluated using the Kirkpatrick framework for program evaluation.<sup>16</sup> Kirkpatrick framework includes four levels, at present, we have collected and documented only Level I student reaction and Level 2 student learning outcomes; in future, we wish to follow-up these eight students to compile data for the other two levels of change in behavior and patient care also. In Level I – Student reaction regarding the elective in terms of what they liked and how they felt about the delivery of content, conduct, expectations, and future usefulness was captured using the pre- and post-course survey questions and post-session feedback at the end of all classes. Level II – Change in knowledge, confidence levels and skills following the training were assessed using the pre- and post-test marks and each skill and simulation session was hands-on and had debriefing period when the student's concepts and questions were addressed. Level

III – Application of the training in the form of change in behavior/skills – will be observed during their internship period to note their performance in basic cardiac resuscitation, advanced cardiac and trauma resuscitation, first aid, recognizing, and initial management of common surgical and medical emergencies, ordering for appropriate point of care diagnostics and interpretation of the same, their attitude and team skills. Level IV – To check for the impact of the program on the community and the medical college. This level will be checked in the future when these eight students are able to attribute their career choice or patient outcomes due to this program. The organization will be tracking to see how many in-house and students from other universities opt for emergency medicine electives in our institute.

## RESULTS

The questionnaire was analyzed for frequency of response and the similar questions of pre-course and post-course were analyzed using paired student *t*-test, mean pre-test; and post-test score was analyzed using paired student *t*-test. IBM SPSS Statistics 23.0 was the software used to analyze the data.

The results of the eight students who opted for emergency medicine elective was analyzed. All students were females and their age was 21 years.

Pre-course survey – frequency of responses got for the questions is given in Table 1.

Tables 1 to 3 depict the frequency of responses of the pre-course and post-course survey and their significance level. Following the electives, students were receptive to the role of the Emergency Physician, more confident in triaging and managing patients, and had better insights into the differential diagnosis and identifying life threats in acute illness. There was no significant difference in self-rating of history-taking skills. Table 4 presents the pre-test and post-test results, the students exhibited significant differences in scores of post-test compared with pre-test.

**Table 1:** Pre-course survey questions and responses of the eight students

Question	Likert I	Likert II	Likert II	Likert IV	Likert V
I am aware of the role of emergency physician in the emergency department	None	Little	Somewhat 5	Highly 3	Very highly
I am confident of triaging patients in the emergency department		3	5		
I am confident of identifying life-threatening illness in emergency department		5	3		
I am confident of the differential diagnosis for the clinical symptoms in the emergency medicine	1	5	2		
I am confident of managing acute illness in the emergency medicine	2	6			
I am comfortable taking history from patient/family in the emergency		1	7		
How interested are you in learning the basics of emergency medicine?	Not at all	A little	Somewhat	Considerably 2	Very 6
Are you considering a career in emergency medicine?	No	Probably not 1	Undecided 5	Probably yes 1	Definitely 1
List all your expectations from this elective	How to triage patients, point of care diagnostics, initial assessment and management. Basics of emergency medicine, emergency drugs, ECG, ABG. History-taking in emergencies. Identify the right way to reach the diagnosis, learn management of acute illness, teamwork, learn skills of decision making.				

**Table 2:** Post-course survey and responses of the eight students

Question	Likert I	Likert II	Likert III	Likert IV	Likert V
I am aware of the role of emergency physician in the emergency department	None	Little	Somewhat	Highly	Very highly
				5	3
I am confident of triaging patients in the emergency department			1	6	1
I am confident of identifying life-threatening illness in Emergency Department			1	7	
I am confident of the differential diagnosis for the clinical symptoms in the emergency medicine			1	7	
I am confident of managing acute illness in the emergency medicine			4	4	
I am comfortable taking history from patient/family in the emergency			2	2	4
The elective was what I had expected	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
				4	4
This elective has increased my knowledge in emergency medicine				2	6
This elective has improved my skills in emergency medicine				5	3
The elective was organized and executed well				2	6
The faculty were supportive and encouraging				2	6
The teaching learning methods used by the faculty were appropriate				3	5
Duration of the elective was apt				7	1
Assessment was appropriate			1	6	1
I will be able to apply what I have learnt in future practice				4	4
I will recommend this elective for my peers and juniors				4	4
There was the right percentage of theory and practical sessions				5	3
Are you considering a career in emergency medicine	No	Probably not	Undecided	Probably yes	Definitely
			5	2	1
List some good things about this elective	<p>It was interesting and we learnt a lot about various cases. We could identify symptoms and signs and come to conclusion about diagnosis. Learnt importance of teamwork.</p> <p>Learnt about basic drugs in emergency medicine. Simulation labs were helpful in learning airway management, setting IV, intraosseous cannulation (IO) lines and trauma management. Presentation of different diseases and its management, basic idea of history-taking. How to assess trauma and manage it effectively.</p> <p>Simulation was really helpful in knowing the exact method and procedures. Wide exposure was provided in the postings, got to know many new things from examination skills to managing basic emergencies. Faculty were co-operative to teach us new things, grateful for that. Really liked the way it was organized.</p>				
List some things which needs improvement for this elective	<p>More time to be given for the elective so we can learn more skills and improve our knowledge. More hands-on experience.</p> <p>More hands-on exposure, more theory classes on cases seen, structured objectives for day with daily topics.</p> <p>It would be better if we were guided or allowed to do some procedures on patients.</p> <p>More explanations on individual activities.</p>				

**Table 3:** The mean pre-course and post-course scores of the eight students

Question	Mean pre-course survey score	Mean post-course survey score	Significance
I am aware of the role of emergency physician in the emergency department	3.37	4.37	0.007
I am confident of triaging patients in the emergency department	2.62	4	0.001
I am confident of identifying life-threatening illness in emergency department	2.37	3.8	0.001
I am confident of the differential diagnosis for the clinical symptoms in the emergency medicine	2.12	3.8	0.001
I am confident of managing acute illness in the emergency medicine	1.75	3.5	0.001
I am comfortable taking history from patient/family in the emergency	2.85	4.25	0.008

**Table 4:** Mean pre-test and post-test scores of the eight students

Student	Pre-test score	Post-test score	Mean pre-test $\pm$ SD	Mean post-test $\pm$ SD	Significance
1	15	32	14 $\pm$ 1.83	30.8 $\pm$ 0.96	0.001
2	12	30			
3	13	30			
4	16	31			
5	15	31			
6	13	32			
7	14	32			
8	16	32			

## DISCUSSION

This study was done to document the process of conduct of electives module in emergency medicine and to study the effectiveness of this program in terms of student satisfaction and learning. For preparation of this training module, we have used the ADDIE approach, and there is enough evidence to suggest that the use of appropriate instructional designs optimizes learning through the design of instructional process, and ADDIE framework is a systematic approach to development of education and training programs for improved learner performance.<sup>17</sup> The preparation of any module requires adequate support from administration and training of faculty which was supported very well by our college management and the medical education unit.<sup>18</sup> Faculty development programs that are need-based and hands-on have been found to have maximum benefits, hence, the training of faculty on preparing the objectives and activities for the electives module was helpful.<sup>19</sup>

Emergency medicine is one of the most valued rotations during undergraduate training in terms of learning opportunities, thus, we designed our course contents in line with the level of professional year, incorporating a mix of clinical postings with skills and simulation technology-enhanced learning and giving feedback appropriately. This module incorporated the use of a variety of stimuli, such as images, ECGs, Ultrasound, arterial blood gas analysis (ABGs) in clinical shifts which has been proven to enhance teaching and engage the learners.<sup>20</sup> Learning the core clinical procedures of emergency medicine using task trainers serves as a safe alternative and to refine tasks required for the medical students. The use of technology-enhanced full body simulation benefits by experiential learning, provides opportunities for interdisciplinary interactions and communications.<sup>20</sup> In our study, the post-course survey revealed that the students were better aware of the role of an emergency physician, they were better equipped to take

focused history and examination, were confident in identifying life threats and ordering relevant investigations, and performing the right interventions. Additionally, students self-rated that the electives module enhanced their knowledge, skills, and professional attitudes. These findings correlate with findings of Vander Vlugt, Zargaran, Susheel, and Agarwal who also stated that student satisfaction, confidence, and clinical/procedural skills improved following the training program.<sup>21–24</sup>

Our findings in terms of the number of students who wish to pursue emergency medicine as a career did not change after the course and a similar finding was noted by Lamba S et al.<sup>25</sup> Students experience during an elective affects their career choices, another factor that significantly affects their decisions depends on preset expectations of the specialty and the duration of postings.<sup>26,27</sup> We presume that the duration of our elective for a period of 2 weeks is not sufficient for the students to appreciate their desires for the specialty.

Challenges we faced during the execution of this module included time constraints by our faculty to immerse in clinical teaching, patient variability in terms of clinical presentations and cases, the dynamic, rapidly varying clinical environment, and the low faculty ratio. Similar drawbacks have also been stated by Green GM and McNeil C.<sup>28,29</sup>

## Limitations

The limitations of this study include the small sample size, as it was based on the views and results of eight students. A larger sample would be necessary to draw stronger conclusions. Therefore, we consider this a pilot study and plan to collect more data from students in the following years. Additionally, while we analyzed survey tools and assessment tests developed and validated by our in-house faculty, validation by external experts would have enhanced the credibility of our findings.



## CONCLUSION

A structured 2-week elective posting in emergency medicine has a positive impression on student's perception regarding the specialty and has a remarkable advancement in knowledge and core skills of emergency medicine competencies.

## ORCID

Shailaja Sampangiramaiah  <https://orcid.org/0009-0004-6738-0420>

Ashith D Shettian  <https://orcid.org/0009-0008-1002-3886>

Nagaraj M Bhat  <https://orcid.org/0009-0009-2804-165X>

Niveditha G Tekkunje  <https://orcid.org/0009-0005-5791-6559>

Manohar Martis  <https://orcid.org/0000-0001-7676-8153>

Kiran Shetty  <https://orcid.org/0009-0003-4220-188X>

Ruban S Dsouza  <https://orcid.org/0000-0001-5016-8088>

Joanne J Sequeira  <https://orcid.org/0009-0005-9892-9217>

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