

**Microbiology Module for Elective Posting of Medical Students- A Novel Approach****Samiksha Patil<sup>1</sup>, Hiren Patel<sup>2</sup>, Sunil Kuyare<sup>3</sup>, Samiksha Giri<sup>4</sup>, Apurva Pawar<sup>5</sup>, Kalpesh Khutade<sup>6</sup>, Harshada Shah<sup>7</sup>**<sup>1,2</sup>Assistant professor, Department of Microbiology, Vedantaa Hospital and Research Center, MUHS University, Palghar- 401606, Maharashtra, India<sup>3</sup>Apoorva Academics, Bangalore<sup>4,5</sup>3<sup>rd</sup> year M.B.B.S student, Department of Microbiology, Vedantaa Hospital and Research Center, MUHS University, Palghar- 401606, Maharashtra, India<sup>6</sup>PhD Research Scholar, Department of Biological Sciences, School of Science, Sandip University Nashik, Maharashtra, India<sup>7</sup>Professor and HOD, Department of Microbiology, Vedantaa Hospital and Research Center, MUHS University, Palghar- 401606, Maharashtra, India

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**Abstract:****Introduction:** Elective posting, a newly introduced concept in the CBME curriculum helps student decide his/her aptitude in the PG subject, students are given choice of one clinical and one pre / Para-clinical subject in their III-major course. The study aimed to develop and validate the newly designed elective module in microbiology subject.**Methods:** The module was introduced to 33-medical students who voluntarily selected microbiology electives and feedback taken. Organized, well designed module for elective posting in microbiology (15 days duration) was prepared by four qualified microbiologists which covered different topics including paperless audits in infection control (hand hygiene, BMW and antibiotic usage), visit to microbiology laboratory, breaking bad news (informing patient about HIV positive report), prevention of HAIs including device associated infections, clinical application of microbiology in practice, interpretation of reports and antibiotic-stewardship program, etc. Hands on practice was given for three types of audits, bedside teaching and device associated infections.**Results:** A validated feedback form was distributed to the 33 participating students to assess their experiences and satisfaction levels. Descriptive statistical analysis revealed high satisfaction scores across various parameters, including the relevance of the elective to future medical practice (score rating: 4.27) and overall enjoyment (score rating: 4.07). Notably, 72.72% of students found the elective extremely relevant, while 45.45% reported being extremely satisfied with their experience.**Conclusion:** The innovative approach to microbiology education could serve as a valuable model for future curricula, facilitating a deeper comprehension of microbiological principles among medical students.**Keywords:** Self-directed learning, HAIs, Microbiology Module, MBBS students.

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**Introduction**

Competency Based Medical Education (CBME) has been introduced by National Medical Council (NMC) for acquiring skills by the medical students thereby becoming competent in the medical field. The complete CBME is a detailed, structured format in regards to the competencies to be covered, time allocation, duration etc. for each subject separately [1]. Apart from change in medical curriculum involving teaching pattern and assessment, a new concept of elective posting in part 2 of third year MBBS was introduced as module 6 by NMC which is a recently introduced concept [2]. Hence, there is scarcity of published studies on this topic.

In India, elective posting was introduced in the CBME during the year 2019. Elective posting is a new concept to bring about curriculum clarification to enable selection of specialized subject in future by the student. The basic goal of elective posting is to provide transformative learning which has two parts i.e. instrumental and communicative learning [3]. The instrumental learning targets specific clinical skills in the selected subject by the student, whereas communicative learning focuses on building interpersonal skills with patients and helping students to understand assertive way of communication related to selected subject. This elective

posting is an add on to the routine curriculum [4]. Authors have suggested that even though the concept is introduced by NMC, its implementation will be a challenge. Also, to make the elective posting innovative as well as interesting thereby achieving the desired goal is another challenge. Presently, the students are more inclined towards clinical subjects, thereby adding challenge for introducing elective posting in pre and Para clinical subjects. Less inclined to microbiology as a carrier option. Thus, choosing para-clinical subject especially microbiology for post-graduation by medical students is not a choice of preference [5], [6]. Hence, the present study was planned to create and assess the utility of pre-validated module for elective posting in subject of Microbiology.

### Materials and Methods

NMC has provided a guideline to the institutions for elective postings with equal and mandatory distribution for clinical as well as pre/para clinical subjects i.e. 15 days for clinical subject and 15 days for pre/para-clinical subjects. Also, there are no available structured modules for elective postings in clinical as well as pre/para-clinical subjects.

**Ethical Consideration:** The study was approved by the Ethics Committee of Vedantaa Institute of Medical Sciences, Palghar (EC/OA/08/2023).

**Study Design and duration:** This was a prospective, observational cross-sectional study. The study was conducted for two consecutive batches in June 2023 and June 2024 for the students who willingly chose microbiology for the elective posting.

### Inclusion criteria

1. IIIrd. MBBS medical students who were posted in microbiology department during their elective posting.
2. Medical students willingly giving consent for participation in the study.

### Microbiology Study Module

Department of microbiology took an initiative to develop a structured, prevalidated module for elective posting in microbiology. The module was planned keeping in mind the innovation, creating interest as well as to make the medical students realize the importance of microbiology in their clinical practice and lastly, decision making for choosing the subject for post-graduation.

A team of four microbiologist selected different and clinically relevant topics and prepared a structured module for a period of 15 days. After brainstorming session, the topics selected along with its schedule is seen in Table. 1.

The module was balanced with didactic lectures for relevant topics for medical students as clinicians as well as exposure to different paperless audits in important fields. It was thought that conducting audits provide better understanding of important subjects and hence the same was included as hands on practice by the students for topics like hand hygiene, biomedical waste management, Device associated infections and antibiotic usage. The schedule of the module was prepared as mentioned in Table 1. This module was validated by taking inputs of microbiologists from different medical colleges.

**Table 1: The schedule of structured module for elective posting**

Day	Topic
Day 1	<ul style="list-style-type: none"> <li>• Explanation about the module in elective posting</li> <li>• Importance of Microbiologist Diseases and causative organisms</li> <li>• Visit to microbiology laboratory</li> <li>• Interpretation of reports</li> </ul>
Day 2	<ul style="list-style-type: none"> <li>• Journey of hand hygiene practices &amp; Hand hygiene- importance and technique</li> <li>• Introduction to hand hygiene audit tool (speedy audit)</li> </ul>
Day 3/4	<ul style="list-style-type: none"> <li>• Hand hygiene audit of hospital</li> <li>• Analysis and lessons learnt for hand hygiene</li> </ul>
Day 5	<ul style="list-style-type: none"> <li>• Microbiological application of common diseases (TB, Diarrhoea, Typhoid, HIV)</li> <li>• Breaking bad news (Counselling HIV positive patient)</li> </ul>
	<ul style="list-style-type: none"> <li>• Visit to ward for one case</li> <li>• Components of Personal Protective Equipment (PPE)</li> <li>• Steps of donning and doffing</li> </ul>
Day 7	Biosafety measures while handling infectious materials
Day 8	Common Hospital Associated Infections (HAI) and preventive measures as well as audit process for Device associated infections i.e. <ul style="list-style-type: none"> <li>• Catheter Associated Urinary Tract Infections(CAUTI)</li> <li>• Surgical Site Infections(SSSI)</li> <li>• Central Line Associated Blood Stream Infections(CLABSI)</li> <li>• Ventilator Associated Events(VAE)</li> </ul>
Day 9	Discussion on Biomedical Waste Management (BMWM) and teaching the audit process

Day 10	To carry out BMWM audit in the hospital Audit data presentation by the students for hand hygiene and BMWM
Day 11	Discussion on spill management and Needle Stick Injury(NSI)
Day 12	Audit on device associated infections in hospital and compilation and presentation.
Day 13	<ul style="list-style-type: none"> <li>Basics of antibiotic stewardship programme and hands on training of antibiotic audit process</li> <li>Conduct of antibiotic audit in the hospital.</li> </ul>
Day 14/15	<ul style="list-style-type: none"> <li>Analysis antibiotic audit</li> <li>Feedback session about the module.</li> </ul>

**Utility of module:** At the institutional level, the students of III<sup>rd</sup> MBBS part 2 were given choice for selection of subjects for elective postings. Students who chose microbiology in the year 2023 underwent elective posting in microbiology as per the structured prevalidated module. The need for introducing this module in microbiology were explained to students on the day 1 of the module. At the end of the posting, feedback were taken from the students about the module and suggestions asked for any modification in the module. Thereafter, the second batch in the year June 2024 underwent their elective posting with the utilization of same module.

**Feedback from medical students:** The feedback received from both the batch of students under the following headings and were analyzed.

1. General information
2. The experience of microbiology module
3. Any suggestion to improvise the module

**Statistical Analysis:** Descriptive statistical analysis were used for the data collected through feedback from medical students.

### Results

Two batches of Phase III students underwent elective posting in microbiology in the year 2023 and 2024 respectively. A total of 33 students attended elective posting with 15 and 18 in the year 2023 and 2024 respectively with male (n=17) to female (n=16) ratio of 1.06:1. All the 33 participants provided feedback for the 13 parameters as mentioned in Table 2.

**Table 2: Evaluation of Elective Posting: Mean Scores**

Parameter	Score (Out of 5 rating )
Duration of elective posting was found appropriate	4.47
Enjoyable	4.07
Difficulties/Challenges faced during elective postings	3.27
Elective posting was found to be satisfactory	4.13
Module was found to be helpful	4.27
Relevance of Elective for future practice	4.27
Relevance and experience with audit tools	4.27
Achievement of goal of elective posting	4.27
Relevance of each session(average)	4.27
Satisfaction with handson experience of audit tools	4.13
Precise take home messages from each topic	4.20
Satisfaction with Session Content	4.07
Additional Feedback provided on Microbiology Electives	4.07

**Duration of elective posting was appropriate:** Of the 33 participants, 33 (100%) found that the duration was appropriate to complete the module.

**Enjoyable:** All students enjoyed the elective posting which was carried out through structured module. They provide an average rating of 4.07 out of 5, with 1 being considered unsatisfactory and 5 being highly enjoyable.

**Elective posting was found to be satisfactory:** 15/33 (45.45%) of students were extremely happy with their optional placements, while a further 11/33 (33.33%) were satisfied. The majority of students had a meaningful experience during their optional posts, which is shown in the high degree of satisfaction, which is a good consequence.

**Module was found to be helpful:** The module was found to be highly beneficial, as indicated by a score of 4.27 out of 5, suggesting that participants gained valuable insights and skills that contributed positively to their learning experience.

**Relevance of Elective for future practice:** An impressive 24/33 (72.72%) of students thought the elective was extremely significant, and 7/33 (21.21%) thought it was useful. This indicates that the elective module aligns in well with the students' academic and professional objectives. The high percentage of students finding it "very relevant" is an encouraging sign of the module's effectiveness.

**Relevance and experience with audit tools:** The relevance of the module and the experience with

audit tools received a score of 4.27 out of 5, indicating that participants found the tools both pertinent to their learning and effective in enhancing their understanding of the subject matter.

**Achievement of Goals of elective posting:** About 22/33 (66.66%) elective posting scored 4.27 out of 5 of students completely accomplished their elective posting targets, while 11/33 (33.33%) only partially did so. This shows that the elective gave students the chance to achieve their goals, greatly enhancing their learning results.

**Relevance of each session (average):** Of the 15 days, maximum relevance was given to 3/33 (9.4%) followed by 6.2%. The least relevance was given to 3.1%. A resounding 29/33 (87.87%) of students thought the particular sessions were really useful. This illustrates how strongly the participants connected with the information presented during the elective posting.

**Satisfaction with handson experience of audit tools:** Significantly 13/33 (39.39%) of students stated a high level of satisfaction with the audit tools, and a further 11/33 (33.33%) did so as well. The Speedy App and other auditing tools appear to have satisfied the expectations of the students for efficient medical practice and prevention and control of infections.

**Precise take home messages from each topic:** A significant 27/33 (81.81%) of students said they

had learned important lessons from their elective postings. This suggests that the optional module was effective in providing the participants with important information and abilities that they may use in their future medical practice.

**Satisfaction with Session Content:** The majority of students, 20/33 (60.60%) were extremely satisfied with the session content, while the remaining 13/33 (39.39%) were satisfied. It suggests that the participants were generally satisfied with the level of substance presented during the elective postings.

**Additional Feedback provided on Microbiology Electives:** The additional feedback on the microbiology electives included 33 comments in total, with 28 being positive, 5 neutral, and none negative in Figure 1. This indicates a strong overall satisfaction with the electives. In table 3 showed that seven individuals noted an enjoyable experience, highlighting engagement with the course material.

Additionally, practical relevance and informative content were both praised by seven respondents, emphasizing the real-world applicability of what they learned. Three comments appreciated the motivational environment, fostering active participation. The effective use of digital tools received recognition, along with one comment on helpfulness and a suggestion for improvement. Overall, the 28 positive comments reflect a high level of satisfaction with the electives.

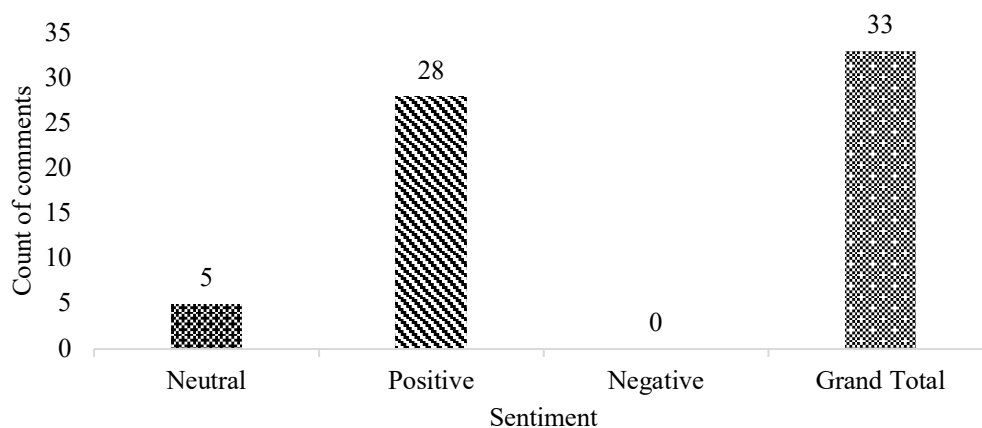


Figure 1: Microbiology electives posting feedback

Table 3: Positive Feedback Themes on Microbiology Electives posting

Feedback Category	Count of Comments
Enjoyable Experience	7
Practical Relevance	7
Informative Content	7
Motivational Environment	3
Digital Tools and Innovation	2
Helpful	1
Suggestions for Improvement	1
<b>Total Positive comments</b>	<b>28</b>

## Discussion

Tejender Singh [4], that elective posting introduction is good but implementation is a challenge. hence, based on this concept of improvising the implementation as well as achieve the actual goal of elective posting, this study was planned with a motto of module preparation as well as feedback from the medical students.

This is the first article presenting module in elective posting. The authors began by conducting a needs assessment to identify the key areas of interest and importance for medical students. This ensured that the module would be aligned with both educational goals and the expectations of the healthcare field. By incorporating feedback from previous cohorts, the authors were able to refine the content and structure, making it more engaging and applicable. In developing the module, the authors focused on a variety of teaching methods, including interactive lectures, hands-on laboratory experiences, and the use of digital tools to enhance learning. This multifaceted approach aimed to cater to different learning styles and promote active participation among students. Furthermore, the authors emphasized the importance of relevance in the module's design.

The difficulties and challenges faced during the elective postings received a score of 3.27 out of 5, indicating that while participants encountered some obstacles, they were not overwhelmingly negative. Balancing diverse student backgrounds required differentiated instructional strategies to engage all learners. Time constraints made it difficult to cover comprehensive content within limited hours. Integrating technology added complexity, necessitating careful planning and troubleshooting. Lastly, gathering real-time feedback for continuous improvement demanded flexibility and open communication.

The satisfaction level of the module, reflected in the score of 4.13 out of 5, indicates that students felt they achieved their goals during the elective posting. This high rating suggests that the module effectively met the educational objectives set out at the beginning of the course. Students likely appreciated the relevance and applicability of the content, which contributed to their sense of accomplishment. The structured approach, including practical experiences and engaging teaching methods, may have facilitated a deeper understanding of microbiology, allowing them to connect theory to real-world scenarios. Moreover, the positive feedback implies that the authors succeeded in creating an environment that not only fostered learning but also motivated students to engage actively with the material.

According to the outcomes of our study, students who completed clinical microbiology elective

postings had a high degree of satisfaction. These results are consistent with other studies that highlighted the beneficial effects of such elective modules on medical students' learning experiences. The issues covered in the training sessions, as well as the audit tools, were very relevant and beneficial to the students [7,8]. The highest of students who succeeded in their aims shows how well the elective module met its objectives. This emphasizes the value of organized elective postings for improving students' understanding of and development of clinical microbiological skills [9]. According to Samadbeik et al. (2018) [10] and Guze PA. (2015) [11] showed that the acceptance of audit tools such as the Speedy App emphasizes the potential advantages of using technology into medical education.

The results of our investigation of the Microbiology Module for Elective Posting of Medical Students offer significant light on the effectiveness of the curriculum, student happiness, and perceived relevance to medical practice. Although goal of the elective posting is selection of particular discipline, microbiology being para-clinical subject may not be considered by medical students to opt in future. However, Microbiology plays an important role in clinical practice. Hence, this was included as 2nd goal of our module. Thus, the microbiology elective posting can be considered as bridging the gap between academic knowledge rendered in phase II to its application in clinical practice in future. The "Microbiology Module for Elective Posting of Medical Students" integrates Infection Prevention and Control (IPC) with a focus on hospital-associated infections (HAIs). Students learn about key HAIs, including surgical site infections and catheter-associated urinary tract infections, through practical sessions and audits. The curriculum emphasizes effective hand hygiene, PPE use, and environmental cleaning. This novel approach equips future physicians with essential skills to reduce HAIs and promote patient safety. The final days focus on antibiotic stewardship and provide opportunities for reflection and feedback. Overall, the module equips future physicians with vital skills for effective patient care and safety. Although the medical student may not opt for microbiology as post graduate subject, this module will provide a glimpse as well as the hands on practice will create an impact in their life for its future use.

The feedback on the microbiology module were overwhelmingly positive, with 28 out of 33 comments reflecting strong satisfaction among participants. The absence of negative comments indicates successful content delivery and relevance, while the 5 neutral comments highlight potential areas for improvement. Overall, the responses suggest that the module effectively enhanced

students' understanding of microbiology and infection prevention. Students were satisfied with the module and did not suggest any changes. Hence, this module in microbiology can be utilized by other institutes. Similarly, such modules can be prepared in other subjects for elective postings which can then be shared with other colleges.

### Conclusion

Medical students expressed satisfaction with the design and implementation of the elective posting in clinical microbiology in this research. This strategy has the potential to improve students' comprehension of microbiology and its real-world applications in clinical settings. As the module is improved and researched further, it may become more widely used in medical education and perhaps serve as a model for other schools looking to implement elective positions like this into their curricula.

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