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DEVELOPING CLINICAL COMPETENCY THROUGH EARLY CLINICAL EXPOSURE UNDER THE NCISM COMPETENCY-BASED DYNAMIC CURRICULUM (CBDC) : A BLOOD PRESSURE MONITORING PROJECT IN UNDERGRADUATE AYURVEDA EDUCATION

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ABSTRACT

Background: Early Clinical Exposure (ECE) offers integration of key biomedical concepts with supervised clinical learning. Practical activities like taking blood pressure can help develop clinical skills and improve students' knowledge of simple physiological concepts.

Objectives: To assess first year undergraduate student perceptions of an activity called ‘measurement of BP' conducted as part of ECE and explore main learning points and areas for improvement.Objectives: To assess first year undergraduate student perceptions of an activity called ‘measurement of BP' conducted as part of ECE and explore main learning points and areas for improvement.

Design: It is an educational evaluation was done in a single centre among the students of first-year undergraduate Ayurveda. The total number of students was 125 and they were planned to be in 6 batches. The activity covered theoretical orientation, demonstration by faculty, supervised hands-on practice, recording of blood pressure, interpretation of blood pressure, interactive discussion and feedback. Six open-ended questions were used to get feedback. Overall, 69 responses were analysed using content analysis with the support of AI. Numbers of frequencies and percentages were based on the number of feedback records (n = 69).

Results: ECE was the preferred teaching approach in 50 responses (72.5%) and combined/sequential (classroom and ECE) teaching approaches in 12 responses (17.4%) and classroom teaching alone (7.2%) in five. There was a rise in confidence or decreased hesitation to perform the procedure in 30 responses (43.5%). Learning gains and clinical relevance were expressed in 55 responses (79.7%). Practical problems were reported to be the following: difficulty in hearing the Korotkoff sounds or pulse (17; 24.6%), positioning the cuff, stethoscope or artery or the patient (15; 21.7%) and handling the equipment (9; 13.0%). In 35 responses (50.7%), there was a call for more or continued practice was noted.

Conclusion: The students of first year undergraduate studies of Ayurveda gave positive feedback for the blood pressure measurement activity, which is highly demonstration of practical learning, clinical orientation and confidence building of students in performing basic examination procedures in the areas of education from ECE. Providing repeated supervised practice, targeted faculty demonstrations and skill development through an interactive approach may further enhance the ECE experience.

KEYWORDS: Early clinical exposure; Ayurveda education; Blood pressure measurement; Student perceptions; Clinical skills; Medical education.

INTRODUCTION

Early clinical exposure (ECE) is an educational approach which involves students coming into contact with patients, settings or real clinical challenges early in their professional education. This will be used to link basic concepts to clinical situations, to appreciate the importance of basic sciences and to start practicing professional communication and observational skills. Studies of initial practical and clinical experience indicate that meaningful experiences can enhance learning by bringing real-life patients and real-life experiences into the learning process, alongside the social environment in which care is given. (5,12)

ECE education goes beyond procedural skills. Learners may be able to see how physiological concepts are applied to clinical reasoning, understand the duties of the health professional working with a patient and determine what additional learning is required. The concept of experiential learning models is based on the concept that learning is a process of concrete experience, reflective observation, abstract conceptualization and active experimentation. In clinical education, this cycle can be facilitated by a structured briefing, demonstration, supervised practice, reflection and feedback. But

exposure does not necessarily lead to competence – learning outcomes are a function of supervision and opportunities for deliberate practice and valid assessment. (15,26)

Blood pressure measurement is an appropriate activity to be used as an introduction to clinical observation and basic physiological interpretation. It combines the knowledge of cardiovascular physiology with patient preparation, positioning, cuff selection, palpation, auscultation, instrument handling, communication and accurate recording. Standardized measurement is crucial because errors of cuff size, arm position, observer technique, equipment maintenance, and environment can impact readings. However, auscultatory measurement also demands coordination of the function of hearing, vision and manual control, especially when differentiating the Korotkoff sounds during cuff deflation. (16) The demands of this type of learning make supervised practice relevant to novice learners.

Competency-based methods have focused on introducing integration of foundational sciences in a clinical context and the progressive development of clinical and communication skills in India. While varying by the resources available to institutions, the faculty's preparation, and the size of the group and access to clinical settings, ECE has been said to be one way of supporting this integration. Positive attitude towards ECE and demand to expose more and more of ECE is reported in studies of Indian medical undergraduates (9,22). The value of assessing not just perceived benefits, but practical barriers that might impact on the quality of learning has been supported by such findings (10,20).

Supervised blood pressure activity can help the undergraduate students of Ayurveda to bring concepts taught in Kriya Sharir into the clinical context in hospital. The activity can also be helpful in familiarizing the learner with patient interaction and its responsibilities related to clinical measurements. The purpose of the present assessment was thus to report on students' perceptions after a blood pressure measurement activity for ECE, to identify the themes that emerged from open-ended feedback related to the learning experience, to summarise the preferences of the teachers and to identify any obstacles or suggestions for improvement during implementation. This study was not an effort to demonstrate objective competency testing for the purpose of establishing effectiveness of ECE, but rather a descriptive evaluation of perceptions.

MATERIAL AND METHODS

Study design and setting

This was an observational, single centre, post activity evaluation of the educational outcome in Ayurveda via an open-ended feedback from first year undergraduate students. The educational activity was carried out from 10th August 2026 to 20th August 2026 in Inpatient Department (IPD) of R. A. Podar Ayurved Medical College and Hospital, Worli, Mumbai, Maharashtra, India. The activity had been arranged under Early Clinical Exposure (ECE) programme with administrative clearance from the hospital authority vide an official communication dated 10 August 2026.

There were 125 students in six batches (A and B) who were scheduled for supervised BP measurement practice. Educational intervention comprised education, demonstration by the faculty, supervised practical skill development, recording, interpretation of Blood Pressure reading and interactive discussion. Structured, open-ended feedback was then used to examine student perceptions and learning experiences. The evaluation centered around how students felt they learned and how confident they felt, as well as how relevant it was to their clinical experiences and how they experienced it.

Feedback instrument and data source

There were six open questions in the available dataset, which included questions about: (1) confidence in clinical procedures; (2) perceived clinical relevance of blood pressure theory; (3) difficulties faced; (4) initial experience of first patient interaction and clinical exposure; (5) preference for classroom teaching or ECE with reasons; and (6) suggestions for future improvement.

Data Collection and Management

Post-ECE structured Google Forms questionnaires were used to gather feedback from students. The programme received feedback responses from 69 out of 125 first year undergraduate Ayurveda students (55.2%). The answers were added together and only the Form Responses 1 worksheet was analysed.

Sixty-nine feedback records were kept for analysis. The roll numbers were checked and cross checked within the organization to detect any resubmission attempts. A total of 11 roll-number groups were entered, with 22 records, and it was found there were 58 different roll-number values. There were no exact duplicates of complete 6-answer response row. Responses that were worded in a similar way were not considered as duplicate or invalid responses.

Batch labels were set up for consistent analysis. During data processing missing response–question matches were noted.

Content analysis

The analysis examined the aspects of confidence, specific learning or clinical relevance, procedural problems, and first encounter experience and recommendations for improvement, in addition to a mutually exclusive classification of teaching preference. A response may be used in more than one theme, but may only be counted in one theme. Moderate and excellent were coded but not generic (good). Not being mentioned did not mean no benefit or difficulty.

A combined preference (explicit endorsement of both approaches), sequential (theory followed by ECE), or integrated (theory and practice together) theory–practice was included. Two answers were conservatively grouped together that were in favour of practical knowledge but also supported theory. The coding of procedural problems was not carried over to the question 3 difficulty coding: procedural problems coded during question 4 were not recorded as questions 3 difficulty. This analysis is descriptive coding of short free-text responses and does not claim to be a fully validated qualitative study or evidence of thematic saturation.

Statistical analysis

All feedbacks were considered, and frequencies and percentages were calculated for the 69 feedbacks that were available. The denominator of 69 was used for the principal percentages. Themes could overlap, so the total of the theme counts does not have to add to 69 or 100%. No values were imputed, and no scale scores, means and standard deviations were

calculated from free-text responses. The available data and study objectives were not suitable for the hypothesis tests, batch comparisons, paired tests, and regression analyses. Unique respondent identity and batch specific denominators were not resolved, thus a verified individual response rate could not be computed. Where appropriate, the STROBE guidelines for observational studies were used to guide reporting. (23)

Ethics

Ethical issues and data privacy.Ethical issues and privacy of data.

The permission was acquired from all the required institutions for conducting Early Clinical Exposure (ECE) activity in the Inpatient Department of M. A. Podar Hospital at Worli, Mumbai. Department of Kriya Sharir, R. A. Podar Ayurved Medical College has issued official correspondence dated 10 August 2026 to the authority of the hospital for the first year undergraduate Ayurved students to be involved in the supervised activity known as blood pressure measurement. The activity was done in collaboration with the staff and faculty of the hospital.

Participating students gave informed consent and patient permission was obtained prior to students engaging in supervised clinical learning activities. Confidentiality, dignity and privacy of patients were kept throughout the sessions. Appropriate supervision was ensured during student–patient interactions.

The feedback data were gathered by Google Forms and only for the purposes of education evaluation and for analysis of the educational research. The base response book, which may include information that could identify the student, was not made available to the general public and was kept confidential. Data shared for research will be appropriately de-identified to ensure participant confidentiality.

RESULTS

Dataset and Participation

There were a total of 6 batches, each comprising 125 first-year undergraduate Ayurveda students, who were scheduled to participate in Early Clinical Exposure (ECE) programme in the month of August 2026. Feedback was gathered using google forms, a total of 69 students responded (55.2% of students) out of 125. The number of feedback records available is 69. While verifying the data, 58 different values of roll-number were found, and 11 roll-number groups were found to have two data values in each. The reporting of the findings is based on 69 feedback records as the denominator.

Table 1. Audit of the available feedback dataset

Variable	Finding
Scheduled participants (investigator-reported)	125
Available feedback records	69
Distinct roll-number values	58
Repeated roll-number groups / records affected	11 / 22
Exact duplicate six-answer rows	0
Parseable / unparseable timestamps	68 / 1
Batch labels represented in feedback records	A: 21 (30.4%); B: 22 (31.9%); D: 10 (14.5%); E: 7 (10.1%); F: 9 (13.0%)

Teaching preference

ECE alone was preferred in 50 of 69 records (72.5%). A combined or sequential approach was supported by 12 records (17.4%) and classroom teaching by five records (7.2%). 2.9% (two) did not give a discernible preference. Of the 67 documents where a preference was interpretable, 50 (74.6%) indicated a preference for ECE, 12 (17.9%) a preference for a combined or sequential approach and five (7.5%) a preference for classroom teaching. Sixty-two of 69 records (89.9%) indicated ECE or a combination of ECE, the combined number should not be considered as the proportion of records that preferred ECE alone.

Table 2. Student teaching preferences

Preference category	N	% of 69
ECE alone	50	72.5
Combined or sequential classroom teaching and ECE	12	17.4
Classroom teaching	5	7.2
Unclear or nonresponsive	2	2.9

Perceived confidence and clinical relevance

In 30 records (43.5%), there were explicit statements that the level of confidence or fear or hesitation increased. The limited confidence (1.4%) was recorded for those who only had one chance to handle the instrument. The remaining 38 records did not clearly fall into either of the confidence categories, and should not be interpreted as a group reporting no improvement. Of the 55 records identified for specific learning or clinical relevance, 79.7% of these were identified. For the remaining 14, there were a range of other approvals; placeholders or statements that did not mention a learning outcome.

Reported difficulties

The 41 records (59.4%) that were reported in response to question 3, indicated at least one difficulty. No major difficulty was reported explicitly by 12 (17.4%) participants, off-topic / nonresponsive was reported by 12 (17.4%) and missing / placeholders was reported by four (5.8%). In 41 out of the 53 records that answered the difficulty question substantively, 77.4% referred to a difficulty (secondary denominator).

Table 3. Status of responses to the difficulty question

Response category	N	% of 69
At least one difficulty reported	41	59.4
No major difficulty reported	12	17.4
Off-topic or nonresponsive	12	17.4
Missing or placeholder	4	5.8

Table 4. Specific difficulties reported in question 3

Difficulty theme	N	% of 69
Hearing Korotkoff sounds or pulse	17	24.6
Cuff, stethoscope, artery or patient positioning	15	21.7
Equipment, valve, inflation or deflation handling	9	13.0
Communication or patient cooperation	5	7.2
Anxiety	4	5.8
Interpretation of systolic or diastolic readings	2	2.9
Limited hands-on opportunity	1	1.4
Unspecified difficulty	1	1.4

Most common coding problems were related to the ability to hear sounds or pulse (17/69; 24.6%), positioning the cuff, stethoscope, artery or patient (15/69; 21.7%) and handling the equipment (9/69; 13.0%). Themes overlapped. When asked whether the patient had nervousness, anxiety or low initial confidence during the first patient interaction, 15 records (21.7%) responded in the affirmative. Question 4 had nine records (13.0%) of procedural problems instead of feelings, which may be a response entry or field alignment problem. The following records were not included as negative feelings.

Suggestions for improvement

Table 5. Suggestions recorded in question 6

Suggestion theme	N	% of 69
More or continued exposure/practice	35	50.7
Smaller groups or more equipment	6	8.7
Individual supervision or feedback	7	10.1
Theory revision, demonstration, simulation, checklist or technical instruction	7	10.1
Blood pressure camps	2	2.9
Quieter environment	1	1.4
Diverse readings or patient exposure	2	2.9

The most commonly suggested intervention was increased or ongoing exposure and practice (35/69; 50.7%). Other recommendations were smaller groups or more equipment (6/69; 8.7%), preparatory or technical instruction (7/69; 10.1%) and individual supervision or feedback (7/69; 10.1%). These categories were not mutually exclusive.

The following illustrate responses and sensitivity audit.

Some examples included: “I just got to handle bp instrument once so I dont have that much experience”; “Difficulty in hearing Korotkoff sounds”; and “classroom teaching provides knowledge and ECE provides practical experience” (as long as the original feedback consent is confirmed for publication of anonymous quotes). The following are excerpts to show the questions that may have been coded and which do not stand alone as proof of their frequency.

The results of a sensitivity check using an exploratory identifier indicated that keeping only the first record of each roll number would result in 42/58 (72.4%) ECE preferences, while keeping only the last record would result in 44/58 (75.9%). There are no deduplication procedures that are valid in these hypothetical scenarios, nor are they any alternative final analysis. They show that there are estimates of preference that require verification of the source data; they do not provide a guarantee that 58 distinct respondents participated.

DISCUSSION

This current educational assessment outlines the perceived importance of Early Clinical Exposure (ECE) in the integration of Biomedical Knowledge with Clinical Exposure in the first year undergraduate Ayurvedic students. The activity of blood pressure measurement was used to observe, understand and do a basic clinical procedure in a true hospital setting with faculty supervision. The feedback suggests that students are favouring experiential learning, where ECE had been the highest preference, and another group preferred experiential learning along with the classroom teaching. The results demonstrate that experiences in practice can enhance classroom learning and offer valuable opportunities to connect theory to practice. ECE has been linked in undergraduate medical learning to better clinical orientation, contextual learning and student engagement, similar observations have been reported. (9,10,20,22)

Measurement of blood pressure is a useful introduction to the clinical activity and is a good example of bringing together the physiology and clinical aspects of the cardiovascular system. It asks pupils to be aware of the physiological mechanisms of blood pressure and to learn co-ordination in positioning the patient, applying the cuff, palpation, auscultation, handling the instruments and recording the pressure. This evaluation illustrates how a seemingly simple clinical procedure can lead students to a variety of interdependent patient-examination skills. The practical problems that were highlighted, in particular the ability to hear the Korotkoff sounds, positioning and handling the equipment appropriately, also indicate specific areas where structured demonstrations and repeated supervised practice can be used to address the problem. There are guidelines for blood pressure measurement that have been established that focus on using the correct cuff size, arm placement, proper rest period, controlled cuff deflation and identifying Korotkoff sounds. (16,18,24)

The results provide helpful guidance for developing the design and implementation of ECE. It may be useful to review the physiological concepts briefly before the students, in a step-wise manner with explanations, to help students appreciate the science behind each step. Using a checklist can help the learning process to be systematic. Small group rotation and individual supervised attempts may offer more opportunities to handle equipment and practice skills. A relatively quiet learning area can make it easier to auscultate, and positive feedback from faculty can enhance the student's ability to improve cuff placement, positioning the stethoscope, the method of cuff deflation, and the interpretation of cuff readings. The recommendations for future ECE sessions, given these strategies, are based on the learning needs identified by students and the tenets of blood pressure measurement.

One very important finding was the high level of interest in further or ongoing practice. Measurement of blood pressure requires the simultaneous use of conceptual knowledge, sensory recognition and psychomotor coordination. This repetition might, then, inspire students to gradually gain familiarity and confidence with the procedure itself. There is a learning loop that can enhance experiential learning: Demonstration, experience, reflection, feedback, and repeated performance. Deliberate practice and constructive feedback are also identified as a critical element in clinical skills development, and this is supported by the present findings. (6,13)

The feedback also gives some indication of students' confidence when they first encounter patients. In 30 records, there were explicit indications of increased confidence or decreased hesitation. This observation indicates that the supervised involvement in a "real clinical setting" may make a student more comfortable with the use of basic examination procedures. While there is no standardised assessment scale to measure students' confidence, open-ended feedback is provided which may give valuable preliminary information about students' learning experiences. Similarly, the descriptions of specific learning experiences and clinical relevance in 55 records indicate that students could relate the activity to practical clinical applications. These perceptions are significant in determining the engagement of learners and the relevance of their early clinical exposure in education.

The difference between perceived learning, confidence and demonstrated clinical competence is significant in the learning of health professions. Miller's framework is a helpful guide to the development of knowledge to application and demonstration in real practice. In this context, the present evaluation offers information regarding what students perceive and identifies opportunities to further develop their skills in procedures. Student feedback can be supplemented with directly observed procedural checklists or objective structured clinical examinations (OSCEs) in future evaluation to evaluate the acquisition and application of practical competencies.

ECE also offers a time to teach students the foundational behaviours for professional care of patients. Participation in supervised clinical activities can familiarize students with patient communication, respectful interaction, appropriate permission, privacy, confidentiality and professional responsibilities. Patient encounters led by faculty may also enable students to understand the significance of patient-centred care and the clinical applicability and impact of core biomedical knowledge. These experiences may help shape gradually the professional identity and clinical orientation from an early phase of undergraduate education. (5,12)

The educational value and applications

The present study has special relevance to undergraduate Ayurveda education as it deals with the integration of classical theoretical education and fundamental biomedical sciences with the modern clinical practices is an important educational goal. Measurement of blood pressure is a simple activity that is accessible and clinically relevant and through which students can apply knowledge of cardiovascular physiology in a hospital setting.

The study has three major educational implications:

1. It shows the feasibility and education potential of incorporating a basic clinical examination procedure into the first year of Ayurveda undergraduate course work.
2. Identification of learning needs: Students feedback to identify specific areas that need more attention, particularly auscultation, correct positioning and equipment handling. These observations can inform faculty in planning demos and supervised practice/skill reinforcement.

4. Future ECE planning: The learner's preference for experiential learning and the learner's interest in repeated practice give a practical basis for developing structured, competency oriented ECE sessions. Other clinical skills could be similarly adapted for the progressive learning of theory to application.
Hence, this evaluation can be used as a preliminary reference document in education in the Ayurveda institutions when planning and improving the ECE activities. It also gives a framework for the more systematic and measurable assessment of clinical learning experiences.

Strengths and areas for development
The advantages of this assessment are that it was conducted in a real hospital setting, focused on a specific hospital procedure, and examined students' perceived learning experiences, preferences, and challenges. The open-ended feedback gave students the opportunity to express their experiences in their own words and offered insights which could not be obtained in a closed-ended questionnaire. An analysis of the existing data also helped to provide a clearer picture of participation and response patterns.
These results could be replicated with larger groups of students across multiple centers in future studies. The use of standardized feedback instruments and unique anonymous participant identifiers and the independent review of the qualitative coding may increase the consistency of data collection and analysis. The length of recording sessions, the number of children present and the availability of equipment and supervision would also assist in the assessment of programme implementation. The use of objective assessment with procedural checklists and OSCE based assessment and repeated skill assessment may add further information to the practical skill acquisition and retention. A pre- and post-test design, planned in advance, can also be used to investigate the change in knowledge, confidence and procedure performance.
The results indicated that supervised blood pressure measurement has educational significance as one of the first activities for undergraduate students of Ayurveda. The positive student feedback regarding their perception of these experiences, as well as their clinical relevance and desire to keep them going, indicate that opportunities for linking foundational biomedical concepts to clinical experiences are meaningful. The identified learning needs provide directions to action that can be utilized in order to enhance the planning of the sessions, the demonstration of skills by the faculty, and the supervised development of skills. The study thus provides initial educational evidence that can be helpful to the Ayurveda institutions to improve the implementation of structured, clinically relevant and learner-centred ECE programmes.

CONCLUSION
Feedback received after the activity indicates that first year under-graduates in Ayurveda considered the activity to be beneficial for the learning of BP measurement. Auscultation was preferred in 50 of 69 records (72.5%), with students noting specific technical challenges with auscultation, positioning and equipment handling. The most common recommendation was additional or continued practice. These findings can be used to make changes to group organization, demonstration, supervision and repeated skills practice. But the assessment does not prove that objective competency has improved, that the measurement is accurate, or that it is better than classroom instruction.

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This record is a template for completing before submission.

Ethical approval and declarations.Ethical approval and declarations.
Ethical Approval: The study was carried out with a view to complying with the ethical guidelines of the institution. The school has received approval from the Ethics Committee with the letter no. 0133/2026.
Consent to Participate: Students who participated were informed and consented to have their feedback collected.
Patient Permission and Privacy: Appropriate permission and consent were obtained for supervised student–patient interaction. All patients' confidentiality and privacy was respected during the activity.
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Conflict of Interest Statement: The author(s) declare(s) that there are no conflicts of interest.
All authors contributed to the design, data collection, analysis and interpretation, manuscript preparation and critical revision of the manuscript. All the authors have read and approved the final manuscript.

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