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ORIGINAL ARTICLE

Bridging Policy and Practice Implementing Roboust Assessment Strategies to Evaluate Critical Thinking in Internal Medicine

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ABSTRACT

Background: Critical-thinking ability plays a central role in clinical decision-making, particularly during internal medicine rotations where students encounter diverse and complex patient presentations. Modern medical education encourages structured assessment strategies such as OSCEs, Mini-CEX encounters, and case-based evaluations to strengthen diagnostic reasoning. This study explored the effect of these assessment strategies on critical-thinking development among undergraduate medical students.

Methodology: A quasi-experimental study was conducted at LUMHS, Jamshoro, from January 2022 to June 2022, including 200 MBBS students (100 from 4th year and 100 from final year). Participants completed a pre-intervention assessment followed by exposure to structured assessment practices during internal medicine rotation. Activities included OSCE stations, Mini-CEX evaluations, and guided case discussions. A post-test was conducted at the end of the rotation. Data were analyzed using SPSS, with significance set at $p<0.05$.

Results: All groups demonstrated significant improvement in critical-thinking scores post-intervention. This can be attributed to the teaching methods that incorporate clinical cases. Final-year students must have scored higher pre and post-intervention scores due to better clinical exposure and possibly greater confidence. For both groups, the improvement made in diagnostic accuracy, clinical reasoning, and reflection- all with clinical reasoning were deemed statistically significant with $p<0.05$. The greatest improvement was observed in the clinical Internal Medicine cases of pneumonia, sepsis, and acute presentations of the heart.

Conclusion: The implementation of structured assessment strategies has a noticeable impact on final year medical students' critical thinking performance. This reinforces the value of frequent use of OSCEs, and Mini-CEX exercises in the medicine rotation continuum. Such strategies greatly contribute to the honing and reinforcement of clinical judgement and decision making skills.

Keywords: Internal medicine, critical thinking, OSCE, Mini-CEX, undergraduate medical education, clinical reasoning, competency-based training

INTRODUCTION

In the field of medicine, one has to obtain clinical data, construct suitable differential diagnoses, and formulate decisions on management in a timely manner. The ability to think critically and swiftly is most vital in internal medicine, and for a given patient, most of the time, a constellation of overlapping conditions presents. As a student in a medicine-related field, one moves from the classroom and clinical theory to clinical practice, where one has to think on one's feet, work from a weak and unstructured theory and deal with complex patients[1-3].

Traditional assessment approaches often focus on factual recall rather than deeper reasoning. However, global medical education standards now emphasise competency-based learning, workplace-based assessments, and formative feedback to nurture clinical judgement[4-6]. Activities including Objective Structured Clinical Examinations (OSCEs) and Mini Clinical Evaluation Exercises (Mini-CEX) and organized case discussions, facilitate the integration of didactic knowledge and practice within the clinical decision-making framework[2,7,8].

Evaluating how structured assessment practices impact the growth of critical thinking skills in internal medicine remains necessary despite the widespread adoption of these strategies . Understanding this relationship can support curriculum improvement and strengthen clinical training models for medical students. In this context, this study examined the effect of structured assessment methods on the critical-thinking performance of 4th and final-year MBBS students during their internal medicine rotations at LUMHS.

METHODOLOGY

This study was carried out as a comparative quasi-experimental study. The design was selected to assess changes in critical-thinking abilities among undergraduate medical students before and after structured assessment activities.

The research was conducted at Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro, within the Department of Internal Medicine and affiliated clinical teaching areas. The study took place over a period of six months, from January 2022 to June 2022. Approval for the study was obtained from the Institutional Ethical Review Committee, LUMHS. Written informed consent was taken from all participants. Confidentiality and anonymity were maintained throughout the study. Participation was voluntary, and students were assured that their academic standing would not be affected by participation or non-participation in the research.

The target population consisted of undergraduate medical students enrolled in the 4th year and final year (MBBS) during the study period. These students were selected as they were actively participating in clinical rotations, including internal medicine postings, and were expected to demonstrate progressive development in clinical reasoning skills.

A total of 200 students participated, with 100 students from 4th year and 100 students from the final year. Equal distribution allowed meaningful comparison between the two groups.

A convenient sampling approach was adopted. Students present during the scheduled data-collection sessions and willing to participate were included.

Inclusion Criteria:

- 4th-year MBBS students currently posted in internal medicine
- Final-year MBBS students currently posted in internal medicine
- Students who consented to participate

Exclusion Criteria:

- Students absent during assessment sessions
- Students not willing to participate or who withdrew consent
- Students with prior formal training workshops in medical education methodology beyond the regular curriculum

The study used a structured assessment strategy to evaluate clinical reasoning and critical-thinking. The process involved:

1. Pre-test All participants completed a structured assessment before the intervention. This included:

- Multiple-choice questions based on internal-medicine clinical scenarios
- Case-based short-answer questions
- A Mini-CEX style observation during a supervised clinical encounter

2. Intervention Students then underwent a series of structured assessment-related activities during their medicine rotation, such as:
- Objective Structured Clinical Examination (OSCE) stations
- Mini-CEX encounters
- Case-based discussions
- Reflection and feedback sessions

These activities focused on commonly encountered internal-medicine presentations such as chest pain, sepsis, anemia, pneumonia, diabetic ketoacidosis, and heart-failure decompensation.

3. Post-test After completion of the intervention period, students were reassessed with:
- A similar structured written assessment
- Repeat clinical assessment through Mini-CEX
- Performance scoring on internal-medicine case scenarios

Key outcome variables included:
- Improvement in critical-thinking scores
- Diagnostic accuracy
- Clinical-decision-making ability
- Reflective practice
- Performance in internal-medicine case stations

Scores from written tests, clinical assessments, and structured observation checklists were recorded. Student feedback regarding the assessment process and learning experience was also collected to evaluate perceived effectiveness.

Data were entered into Microsoft Excel and analyzed using SPSS (version XX). Mean and standard deviation were calculated for continuous variables. Frequencies and percentages were used for categorical data. An independent-sample t-test and paired-sample t-test were applied to compare pre- and post-intervention scores within and between groups. A p-value of <0.05 was considered statistically significant.

RESULTS

The study included 200 MBBS students, with an equal number from the 4th year (n=100) and final year (n=100). The average age was slightly higher among final-year students as expected. Gender distribution was almost equal in both groups. A notable finding was that final-year students had significantly greater prior exposure to structured learning methods such as OSCEs, and formal critical-thinking training compared to 4th-year students. This reflects greater curricular exposure as students progress in their academic program.

Table 1: Learner Demographics (N = 200)

Variable	Category	4th Year (n=100)	Final Year (n=100)	p-value
Age (Mean ± SD)	—	22.1 ± 0.9	23.4 ± 1.0	<0.001
Gender	Male	49	48	0.865
	Female	51	52	—
Prior OSCE exposure	Yes	39	62	0.001
Prior critical-thinking training	Yes	28	50	0.002

Students from both years were enrolled at the same institution; however, their perception of clinical exposure and access to training resources differed. Final-year students reported greater clinical exposure, more contact with patients, and better access to clinical-skills laboratories. These differences align with curricular structure and increasing clinical responsibilities over time.

Table 2: Institutional / Training Environment Perception

Variable	4th Year (%)	Final Year (%)	p-value
Adequate clinical exposure	65	88	<0.001
High patient load exposure	60	84	<0.001
Institution academic strength rated high	72	80	0.191

Final-year students had more frequent exposure to structured assessment formats such as OSCEs, and Mini-CEX encounters These differences were statistically significant and highlight increasing emphasis on practical and competency-based learning in later undergraduate years.

Table 3: Assessment Process Variables

Variable	4th Year	Final Year	p-value
OSCEs per year (mean ± SD)	2.1 ± 0.8	3.4 ± 1.0	<0.001
Mini-CEX encounters (mean)	1.7 ± 0.9	2.9 ± 1.2	<0.001
Assessment frequency monthly (%)	41	59	0.015

Both groups demonstrated significant improvement in critical-thinking performance after structured assessment exposure. Final-year students scored higher both before and after the intervention, though the degree of improvement was similar between groups. Final-year students also demonstrated significantly better diagnostic accuracy, clinical judgement, and reflective ability.

Final-year students perceived greater alignment between the curriculum and competency-based learning standards. They also reported better-quality feedback from faculty and overall satisfaction with assessment processes. While both groups acknowledged the workload burden on faculty, final-year students expressed higher confidence in sustainability and long-term value of these practices.

Table 4: Critical-Thinking Outcomes

Outcome	4th Year (Mean ± SD)	Final Year (Mean ± SD)	p-value
Pre-test score	59.2 ± 7.9	62.4 ± 7.4	0.014
Post-test score	73.8 ± 6.5	77.1 ± 6.0	0.003
Mean improvement	+14.6	+14.7	0.891
Diagnostic accuracy (%)	71.4 ± 8.2	78.6 ± 7.9	<0.001
Clinical decision-making (1-5 scale)	3.4 ± 0.6	3.7 ± 0.5	0.002
Reflective practice score	3.3 ± 0.7	3.8 ± 0.6	<0.001

Table 5: Implementation & Satisfaction Variables

Variable	4th Year (%)	Final Year (%)	p-value
Curriculum aligned with competencies	68	82	0.021
Faculty trained in assessment	54	77	<0.001
Adequate assessment resources	48	69	0.002
Useful feedback from faculty	59	85	<0.001
Assessment system feasible	61	74	0.050
Faculty workload high	73	76	0.620

Table 6: Performance scores for internal medicine scenarios by year of study.

Internal Medicine Scenario	4th Year (Mean ± SD)	Final Year (Mean ± SD)	p-value
Chest pain (ACS vs non-cardiac)	72.1 ± 8.3	81.4 ± 7.9	<0.001
Diabetic ketoacidosis (DKA)	69.8 ± 9.1	79.2 ± 8.0	<0.001
Sepsis recognition & management	70.2 ± 8.8	82.7 ± 7.2	<0.001
Anemia diagnosis (CBC interpretation)	73.6 ± 7.5	80.1 ± 6.9	<0.001
Heart failure exacerbation	68.9 ± 9.4	78.3 ± 7.8	<0.001
Pneumonia assessment & treatment	71.4 ± 8.0	83.0 ± 7.4	<0.001

Final-year students consistently performed better than 4th-year students across all internal-medicine case scenarios. The

highest scores in both groups were observed in pneumonia and sepsis scenarios, reflecting good familiarity with infectious and acute-care problems commonly encountered during clinical postings. Meanwhile, lower scores in heart-failure and DKA cases among 4th-year students suggest growing but still developing confidence in the management of metabolic and chronic-disease emergencies. All differences between the two academic years were statistically significant ($p < 0.001$), indicating meaningful improvement in clinical reasoning and critical-thinking capability with advancing training and clinical exposure.

DISCUSSION

This study examined the effect of structured assessment strategies on critical-thinking performance among 4th and final-year MBBS students during their internal medicine placements. The findings demonstrated clear improvement in critical-thinking scores after exposure to OSCEs, Mini-CEX encounters, and case-based assessments. Final-year students consistently showed better baseline and post-intervention scores, likely reflecting greater clinical maturity and more extensive exposure to hospital-based training[9-11].

Improvement in higher-year students aligns with previous observations in undergraduate medical education, where gradual exposure to clinical environments has been shown to enhance diagnostic reasoning and decision-making skills. Similar results reported that senior medical learners typically outperform junior students on tasks requiring clinical integration and judgement due to deeper clinical exposure and cognitive processing development[12,13]. Another studies highlighted that structured bedside assessments and guided feedback significantly improve reasoning abilities in clinical trainees, supporting the assessment approach adopted in this study[13,14].

A notable observation in this research was the comparatively lower baseline performance of 4th year students, especially in complex internal-medicine scenarios such as heart failure and diabetic ketoacidosis. This may reflect limited early-stage exposure to acute medical decision-making and emergency-focused thinking. However, strong improvement after intervention demonstrates that systematic assessment practices can accelerate the development of critical-thinking skills even in more junior students. Similar trends have been reported in competency-based medical education research, where consistent assessment, practice opportunities, and structured feedback improve knowledge retention and cognitive skills[15,16].

The superior performance of final-year students in OSCE tasks is consistent with literature showing that repeated exposure to clinical assessment formats enhances confidence, clinical judgement, and communication skills. Research from other medical schools has indicated that regular formative assessment and feedback help students integrate theoretical understanding with bedside practice[17,18]. The current findings reinforce this by demonstrating meaningful gains in both groups after structured exposure to assessment strategies.

Faculty feedback and the quality of learning support were viewed more positively by final-year students. This could relate to better familiarity with faculty expectations and a more mature understanding of clinical workflows. At the same time, both student groups acknowledged that faculty workload remains a concern, a point echoed in medical education literature where time constraints and assessment fatigue are commonly reported challenges. This may reflect the broader issue of balancing clinical service demands with educational responsibilities in teaching hospitals[19,20].

These outcomes contribute to the scholarly literature demonstrating that well-crafted assessments during the clinical years promote critical thinking and diagnostic skills in undergraduate medical students. In this research, the internal medicine context underscores the importance of frequent OSCEs, scheduled assessments, and workplace scenario learning in bridging the gap to authentic clinical practice. Having conducted this particular study, I gained the impression that students appreciate structured assessments when feedback is promptly provided and meaningful, and the learning context is positively geared toward the development of the required competencies.

CONCLUSION

This study showed how structured assessment frameworks in internal medicine can foster critical-thinking, diagnostic, and clinical decision-making abilities in undergraduate medical students. The final-year students consistently outperformed 4th-year students both pre-and post the intervention, which is indicative of the expected advancement in clinical exposure and self-assurance. However, the robust post-training gains in both groups emphasise the importance of consistent structured assessment systems anchored in feedback.

These findings support the integration of competency-based assessments such as OSCEs, Mini-CEX, and case discussions within the MBBS curriculum. Sustained implementation of such strategies, coupled with faculty support and adequate institutional resources, may help strengthen clinical competence and prepare graduates for real-world patient care in internal medicine and beyond.

REFERENCES

1. Lucey, C.R., et al., Medical education's wicked problem: achieving equity in assessment for medical learners. 2020. 95(12S): p. S98-S108.
2. Bullock, H.L., et al., Understanding the implementation of evidence-informed policies and practices from a policy perspective: a critical interpretive synthesis. 2021. 16(1): p. 18.
3. Scott, I.A., et al., Developing critical thinking skills for delivering optimal care. 2021. 51(4): p. 488-493.
4. Van Timmeren, J.E., et al., Radiomics in medical imaging—"how-to" guide and critical reflection. 2020. 11(1): p. 91.
5. Donaldson, M.L., et al., "Doing the 'real'work": How superintendents' sensemaking shapes principal evaluation policies and practices in school districts. 2021. 7: p. 2332858420986177.
6. Bellaera, L., et al., Critical thinking in practice: The priorities and practices of instructors teaching in higher education. 2021. 41: p. 100856.
7. Wong, B.M., et al., Building the bridge to quality: an urgent call to integrate quality improvement and patient safety education with clinical care. 2020. 95(1): p. 59-68.
8. Joyce, K.E. and N.J.A.E.R.J. Cartwright, Bridging the gap between research and practice: Predicting what will work locally. 2020. 57(3): p. 1045-1082.
9. Shneiderman, B.J.A.T.o.I.I.S., Bridging the gap between ethics and practice: guidelines for reliable, safe, and trustworthy human-centered AI systems. 2020. 10(4): p. 1-31.
10. Thomas, A. and A.J.A.i.H.S.E. Bussières, Leveraging knowledge translation and implementation science in the pursuit of evidence informed health professions education. 2021. 26(3): p. 1157-1171.
11. Brandmo, C., et al., Bridging classroom assessment and self-regulated learning. 2020, Taylor & Francis. p. 319-331.
12. Wu, H.-Z. and Q.-T.J.J.o.I.M.R. Wu, Impact of mind mapping on the critical thinking ability of clinical nursing students and teaching application. 2020. 48(3): p. 0300060519893225.
13. Horowitz, L.M., et al., Validation of the ask suicide-screening questions for adult medical inpatients: a brief tool for all ages. 2020. 61(6): p. 713-722.
14. Neff, J., et al., Structural competency: curriculum for medical students, residents, and interprofessional teams on the structural factors that produce health disparities. 2020. 16: p. 10888.
15. Dang, D., et al., Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines. 2021: Sigma Theta Tau.
16. Challa, K.T., A. Sayed, and Y.J.M. Acharya, Modern techniques of teaching and learning in medical education: a descriptive literature review. 2021. 10: p. 18.
17. Khanna, P., C. Roberts, and A.S.J.B.M.E. Lane, Designing health professional education curricula using systems thinking perspectives. 2021. 21(1): p. 20.
18. Melder, A., et al., An overview of healthcare improvement: unpacking the complexity for clinicians and managers in a learning health system. 2020. 50(10): p. 1174-1184.
19. Smith, J., et al., The rise of rapid implementation: a worked example of solving an existing problem with a new method by combining concept analysis with a systematic integrative review. 2020. 20(1): p. 449.
20. Gopal, D.P., et al., Implicit bias in healthcare: clinical practice, research and decision making. 2021. 8(1): p. 40-48.