

MedPeer Publisher

Abbreviated Key Title: MedPeer

ISSN : 3066-2737

homepage: <https://www.medpeerpublishers.com>

Does the Combination of Objective Structured Clinical Examination (OSCE), Structured Feedback, and Reflective Debriefing Improve Medical Students' Learning in Gastroenterology? A Randomized Controlled Study

DOI: 10.70780/medpeer.000QGWI

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ABSTRACT

Background

The primary goal of undergraduate medical education is to train future physicians who are capable of applying theoretical knowledge to authentic clinical situations. However, clinical teaching remains largely observation-based, which limits the development of clinical reasoning and decision-making skills. Although Objective Structured Clinical Examinations (OSCEs) were initially designed as assessment tools, they are increasingly recognized as effective learning strategies when combined with structured feedback and reflective debriefing. Evidence regarding the educational value of this integrated approach in gastroenterology clerkships remains limited.

Objective

To evaluate the effectiveness of an educational program combining formative OSCEs, structured feedback, and reflective debriefing on the development of clinical reasoning and clinical competencies among undergraduate medical students during a gastroenterology rotation.

Methods

A prospective randomized controlled study was conducted among 40 undergraduate medical students undertaking a gastroenterology clerkship. Participants were randomly assigned to either an intervention group (OSCE + structured feedback + reflective debriefing) or a control group receiving conventional clinical teaching. Clinical competencies were assessed before and after the rotation using a standardized OSCE. The primary outcome was the overall clinical reasoning score. Secondary outcomes included communication skills, physical examination performance, self-confidence, student engagement, and overall satisfaction.

Results

Baseline characteristics and pre-intervention performances were comparable between the two groups. At the end of the clerkship, students in the intervention group achieved significantly higher overall clinical reasoning scores than those in the control group (16.6 vs. 11.4, $p < 0.001$). They also demonstrated greater self-confidence and reported significantly higher satisfaction with their learning experience.

Conclusion

Integrating formative OSCEs with structured feedback and reflective debriefing significantly enhances clinical reasoning, practical skills, and learner satisfaction among undergraduate medical students in gastroenterology. This educational strategy promotes active learning and represents an effective approach for competency-based clinical education.

KEYWORDS

Objective Structured Clinical Examination; OSCE; formative assessment; structured feedback; reflective debriefing; clinical reasoning; competency-based medical education; undergraduate medical education; gastroenterology; active learning

MAIN ARTICLE

INTRODUCTION

Undergraduate medical education aims to prepare future physicians who are able not only to acquire theoretical knowledge but also to apply it effectively in authentic clinical settings. Developing competent physicians requires more than factual learning; it requires the acquisition of clinical reasoning, communication skills, professionalism, and the ability to make appropriate decisions in real patient encounters. Consequently, contemporary medical education has progressively shifted from a knowledge-based paradigm toward competency-based medical education (CBME), in which students are expected to demonstrate observable clinical competencies rather than merely recall information.

Despite this evolution, clinical teaching in many medical schools continues to rely predominantly on traditional apprenticeship models. During hospital clerkships, students often spend much of their time observing senior physicians rather than actively participating in patient care. Although observation remains an important component of clinical learning, passive exposure alone may be insufficient to promote the development of clinical reasoning and decision-making skills. As a result, many students complete their clinical rotations with adequate theoretical knowledge but limited confidence in managing patients independently.

Objective Structured Clinical Examinations (OSCEs), first introduced by Harden and Gleeson in 1975, were initially developed as standardized tools for assessing clinical competence. Over

the past decades, however, their educational role has expanded considerably. Beyond summative assessment, formative OSCEs provide learners with opportunities to actively engage in authentic clinical scenarios, identify their strengths and weaknesses, and receive immediate educational guidance. When integrated into the learning process, OSCEs can become powerful instruments for promoting experiential learning and competency development.

The educational effectiveness of formative OSCEs is largely dependent on the quality of the feedback provided. Structured feedback enables learners to compare their observed performance with expected standards, identify performance gaps, and formulate targeted improvement strategies. Furthermore, reflective debriefing encourages students to critically analyze their clinical reasoning, explore alternative diagnostic and therapeutic approaches, and consolidate newly acquired knowledge. Together, structured feedback and reflective debriefing transform assessment from a purely evaluative process into a meaningful learning experience consistent with the principles of "assessment for learning."

Experiential learning theory, particularly Kolb's learning cycle, provides a strong theoretical framework supporting this educational approach. According to this model, learning occurs through a continuous cycle involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. Formative OSCEs naturally incorporate each of these components by allowing students to manage authentic clinical situations, reflect on their performance, receive constructive feedback, and subsequently apply newly acquired knowledge in future clinical encounters.

Although numerous studies have demonstrated the educational value of OSCEs in simulation-based settings, evidence regarding the effectiveness of formative OSCEs conducted with real patients during hospital clerkships remains scarce, particularly in gastroenterology. Moreover, few studies have investigated the combined impact of formative OSCEs, structured feedback, and reflective debriefing as an integrated educational intervention.

Therefore, the present randomized controlled study aimed to evaluate whether an educational program combining formative OSCEs, structured feedback, and reflective debriefing could improve clinical reasoning, clinical competence, self-confidence, and learner satisfaction among undergraduate medical students completing a gastroenterology clerkship compared with conventional clinical teaching.

METHODS

Study Design

A prospective, randomized, controlled educational trial was conducted to evaluate the effectiveness of an educational intervention integrating formative Objective Structured Clinical Examinations (OSCEs), structured feedback, and reflective debriefing during an undergraduate gastroenterology clerkship. The study compared this innovative educational strategy with conventional clinical teaching.

Study Setting and Participants

The study was carried out in the Department of Gastroenterology, Avicenna Military Hospital, Marrakech, Morocco. Undergraduate medical students assigned to the gastroenterology rotation during the study period were invited to participate.

A total of **40 medical students** were enrolled. Participation was voluntary, and all students completed both the pre-intervention and post-intervention assessments.

Randomization

Following enrollment, participants were randomly allocated in a 1:1 ratio into two groups:

- **Intervention group (n = 20):** students participated in a structured educational program combining formative OSCEs, structured feedback, and reflective debriefing.
- **Control group (n = 20):** students received the conventional clerkship curriculum based on bedside teaching, ward rounds, outpatient consultations, multidisciplinary meetings, and observation of senior physicians' clinical practice.

Baseline demographic characteristics, including age, sex, and academic level, were comparable between the two groups.

Educational Intervention

The educational intervention was designed according to the principles of competency-based medical education and experiential learning.

Students assigned to the intervention group completed a series of formative OSCE stations using real hospitalized patients presenting with common gastroenterological conditions. Clinical scenarios were selected to reflect routine clinical practice and included upper gastrointestinal bleeding, ascites, jaundice, and inflammatory bowel disease.

During each station, students were required to independently perform history taking, physical examination, formulate differential diagnoses, propose appropriate investigations, and discuss initial management strategies.

Faculty members directly observed student performance using standardized assessment checklists specifically developed for each clinical scenario.

Immediately after each OSCE encounter, individualized structured feedback was provided. Feedback focused on strengths, identified performance gaps, and proposed concrete strategies for improvement.

This was followed by a reflective debriefing session during which students were encouraged to analyze their clinical reasoning process, discuss diagnostic challenges, identify errors, and formulate personal learning objectives for subsequent clinical encounters.

The intervention was designed to transform clinical assessment into a formative learning experience promoting self-reflection, active participation, and progressive competency development.

Control Group

Students in the control group completed the standard gastroenterology clerkship offered by the institution.

Teaching consisted of traditional bedside instruction, attendance during ward rounds and outpatient clinics, participation in departmental meetings, and observation of senior physicians during patient management. No structured formative OSCE sessions, standardized feedback, or formal debriefing sessions were incorporated into their clinical training.

Outcome Measures

Clinical performance was evaluated before and after completion of the clerkship using the same standardized OSCE.

Primary Outcome

The primary outcome was the overall clinical reasoning score obtained during the final OSCE assessment.

Secondary Outcomes

Secondary outcomes included:

- Communication skills;
- Physical examination performance;
- Diagnostic reasoning;
- Self-confidence in clinical practice;
- Student engagement during the clerkship;
- Overall satisfaction with the educational experience.

Statistical Analysis

Statistical analyses were performed using **Jamovi** software.

Continuous variables are presented as mean $\pm$ standard deviation, whereas categorical variables are expressed as frequencies and percentages.

Baseline characteristics were compared to verify the equivalence of the two study groups before the intervention. Pre- and post-intervention performances were subsequently analyzed to determine the educational effect of the intervention. A two-sided p value < 0.05 was considered statistically significant.

The figures below illustrate examples of ECOS stations in use (figure 1).

MANUEL DES ECOS EN GASTRO-HÉPATO-ENTÉROLOGIE

Guide pratique pour les étudiants en médecine et les résidents

Auteurs

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ECOS 5 : HEPATITE VIRALE B AIGUE
ECOS 6 : HEPATITE VIRALE B CHRONIQUE
ECOS 7 : HEPATITE VIRALE C

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Grille d'évaluation

Item 1 : Présentation Générale

Critère	NOTE
L'étudiant s'est présenté au patient	0.5
Demande le motif de consultation	0.5

Item 2 : Interrogatoire : Les caractéristiques de la douleur :

Recherche du siège et intensité	0.5
Recherche d'irradiation de la douleur	0.5
Recherche des signes digestifs associés	0.5
Recherche signes extradiigestifs associés	0.5
Recherche des facteurs soulageant aggravant	0.5

Item 3 : Antécédents et facteurs étiologiques

Recherche notion de consommation d'alcool	1
Recherche prise médicamenteuse (AINS)	1
Recherche ATCD de pancréatite	0.5
Recherche ATCD familiaux	0.5

Item 4 : Examen Clinique

Recherche d'ictère	1
Palpation abdominale	1

Item 5 : Examens complémentaires

Demande NFS, CRP, ionogramme sanguin	1
Demande de la lipasémie	1
Demande l'ECG	1
Demande du bilan hépatique	1
Demande du scanner abdominale	1

Item 6 : Raisonnement Clinique

Identifie une poussée de pancréatite aigue	1
Evoquer le diagnostic d'ulcère gastro duodénal	1
Recherche des signes de gravité	1.5
Identifie une lithiase biliaire	1

Item 7 : Communication

Vérifie compréhension du patient	1
Clôture la consultation	1

Total	/20
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ECOS 2*: EPIGASTRALGIES AIGUES : PANCREATITE AIGUE

GRILLE D'ÉVALUATION

Item 1 : Présentation Générale

	Fait / Non fait
L'étudiant s'est présenté au patient	0.5
Demande le motif de consultation	0.5

Item 2 : Interrogatoire :

	Score
Recherche début brutal	0.5
Recherche intensité douleur	0.5
Recherche diffusion abdominale	0.5
Recherche vomissements	0.5
Recherche position antalgique	0.5

Item 3 : Antécédents et facteurs étiologiques

	Score
Recherche d'helicobacter pylori	1
Recherche AINS	1
Recherche douleur ulcéreuse ancienne	1
Recherche tabac	0.5
Recherche alcool	0.5

Item 4 : Examen Clinique

	Score
Mesure constantes	1
Recherche contracture	1
Examen abdominal complet	1
Reconnait péritonite	1

Item 5 : Examens complémentaires

Critère	Score
Demande imagerie	1
Demande radiographie	1
Demande scanner	1

Item 6 : Raisonnement Clinique

	Score
Évoque péritonite	1
Évoque perforation	1
Diagnostic ulcère perforé	1.5
Propose chirurgie urgente	1

Item 7 : Communication

	Score
Explique la gravité	0.5
Clôture consultation	0.5

Total:	/20
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GRILLE D'ÉVALUATION

Item 1 : Présentation Générale		Fait / Non fait
L'étudiant s'est présenté au patient		0.5
Demande le motif de consultation		0.5
Item 2 : Interrogatoire :		Score
Recherche hématurie		0.5
Recherche méléna		0.5
Recherche vertiges		0.5
Recherche asthénie		0.5
Recherche douleur épigastrique		0.5
Recherche prise AINS		0.5
Item 3 : Antécédents et facteurs étiologiques		Score
Recherche AINS		1
Recherche cirrhose		1
Recherche alcool		1
Recherche anticoagulants		1
Item 4 : Examen Clinique		Score
Mesure constantes		1
Recherche signes de choc		1
Examen abdominal		1
Toucher rectal		1
Item 5 : Examens complémentaires		Score
Demande NFS		1
Demande groupage		1
Demande endoscopie		1
Item 6 : Raisonnement Clinique		Score
Reconnait HDD		1
Évalue gravité		1
Évoque ulcère		1
Propose PEC urgente		1
Item 7 : Communication		Score
Explique la situation		0.5
Clôture consultation		0.5
Total:		/20

Grille d'évaluation

Item 1 : Présentation Générale	Fait / Non fait
L'étudiant s'est présenté au patient	0.5
Demande le motif de consultation	0.5
ITEM 2 : INTERROGATOIRE :	SCORE
Recherche hématurie	0.5
Recherche mélanie	0.5
Recherche vertiges	0.5
Recherche asthénie	0.5
ITEM 3 : ANTÉCÉDENTS ET FACTEURS ÉTIOLOGIQUES	SCORE
Cirrhose	1
Alcool	1
Hépatite virale chronique	1
Ascite	1
ITEM 4 : EXAMEN CLINIQUE	SCORE
Mesure constantes	1
Recherche choc	1
Recherche signes cirrhose	1
Examen abdominal	1
ITEM 5 : EXAMENS COMPLÉMENTAIRES	SCORE
Demande NFS	1
Demande TP-TCK	1
Demande bilan hépatique	1
Demande endoscopie urgente	1
ITEM 6 : RAISONNEMENT CLINIQUE	SCORE
Reconnait HDD	1
Évoque origine variqueuse	1
Identifie cirrhose	1
Propose traitement spécifique	1
ITEM 7 : COMMUNICATION	SCORE
Explique gravité	0.5
CLÔTURE	0.5
Total:	/20

Figure 1 :Objective Structured Clinical Examination stations

RESULTS

Participant Characteristics

A total of **40 undergraduate medical students** were included in the study and completed both the pre-intervention and post-intervention assessments. Twenty students were allocated to the intervention group, while the remaining twenty were assigned to the control group.

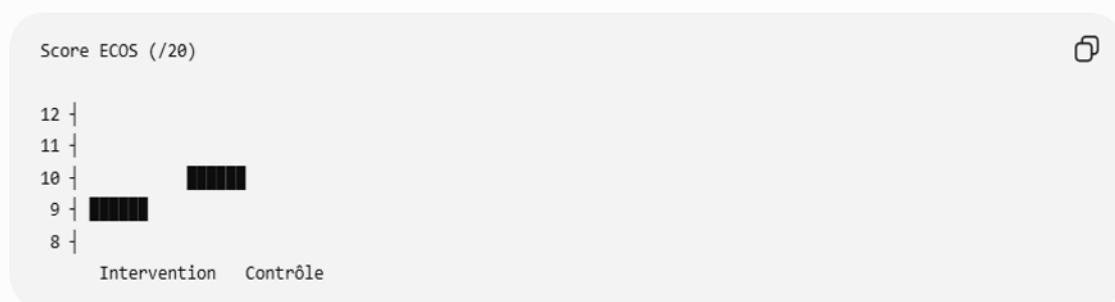
The baseline characteristics of the participants were comparable between the two groups. The mean age was **21.6 ± 0.9 years** in the intervention group and **21.8 ± 1.1 years** in the control group ($p = 0.58$). Female students represented **55%** of the study population, and no

significant differences were observed between the two groups regarding sex distribution or academic level ($p = 0.75$), confirming successful randomization.

Variable	Groupe intervention	Groupe contrôle	p
Examen clinique			
Raisonnement clinique			
Communication			
Score ECOS (/20)	9,8 ± 1,5	10,1 ± 1,5	0,67

Résultat 1 : Comparabilité initiale (Pré-test)

Graphique en colonnes :



Valeurs

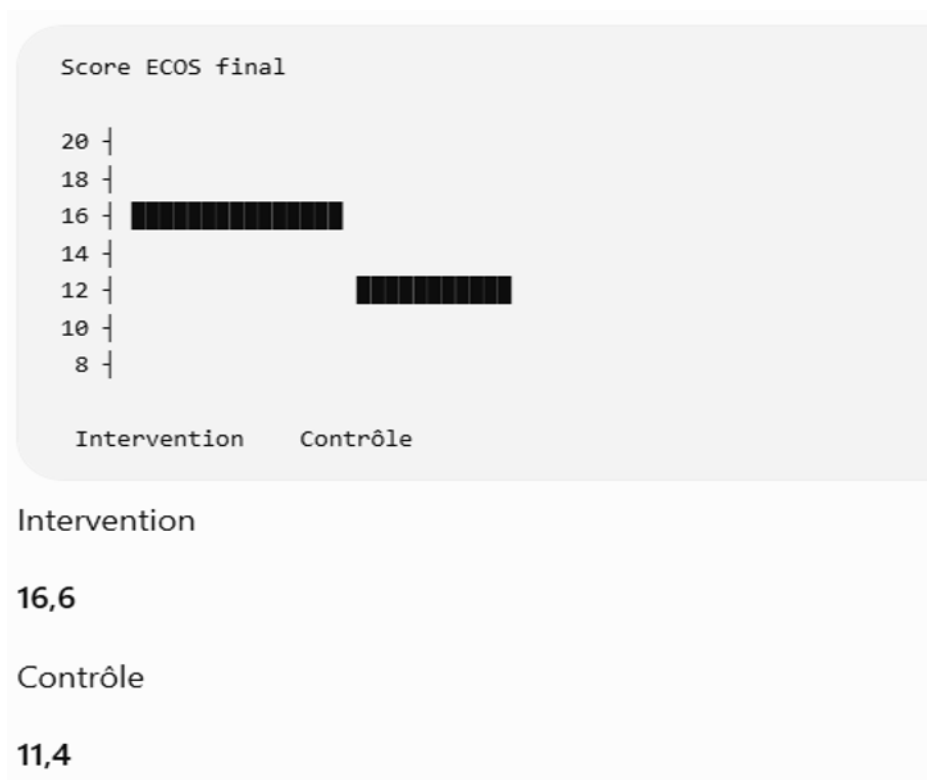
- Intervention : 9,8 ± 1,5
- Contrôle : 10,1 ± 1,5
- $p=0,67$

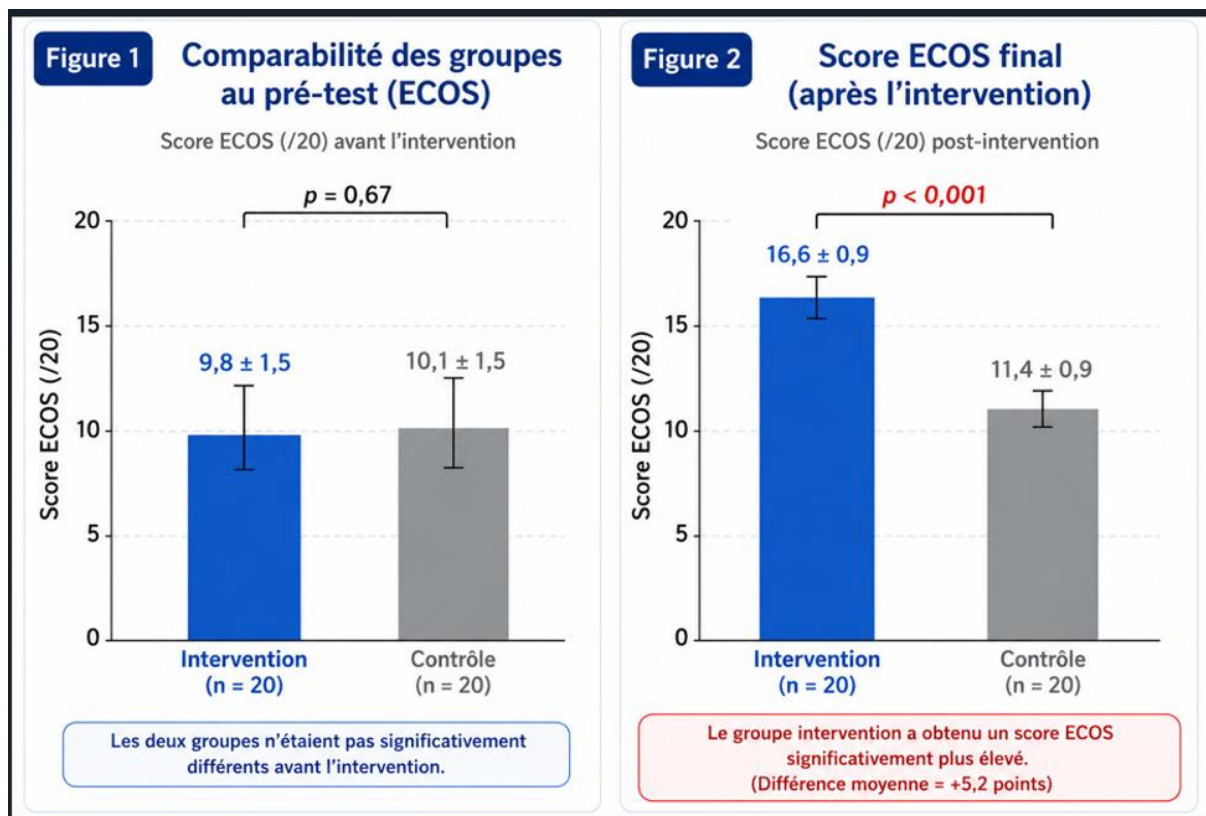
Baseline Clinical Performance

Before the gastroenterology clerkship, no statistically significant differences were observed between the intervention and control groups with respect to baseline clinical knowledge or clinical performance.

Pre-intervention OSCE scores were comparable, indicating that both groups had similar levels of competence prior to the educational intervention.

Variable	Intervention	Contrôle	Différence moyenne Δ	p
Examen clinique				
Raisonnement clinique clinique				
Conduite diagnostique				
communication				
Score ECOS total (/20)	16,6 $\pm$ 0,9	11,4 $\pm$ 0,9	+5,2	<0,001





Primary Outcome

Clinical Reasoning Performance

Following completion of the clerkship, students who participated in the integrated educational program demonstrated significantly better clinical performance than those who received conventional clinical teaching.

The mean overall OSCE score was significantly higher in the intervention group than in the control group:

- **Intervention group: 16.6**
- **Control group: 11.4**

This corresponded to a **mean difference of 5.2 points**, which was highly statistically significant ($p < 0.001$).

These findings indicate that the combination of formative OSCEs, structured feedback, and reflective debriefing substantially improved students' clinical reasoning abilities during the gastroenterology rotation.

Secondary Outcomes

Communication Skills

Students exposed to the integrated educational intervention demonstrated better communication with patients during the final OSCE assessment. They showed greater confidence when conducting medical interviews and explaining clinical decisions.

Physical Examination Skills

Direct observation during the final assessment revealed more structured and comprehensive physical examination techniques among students in the intervention group compared with those receiving conventional training.

Self-Confidence

Students who participated in the intervention reported significantly greater confidence in managing common gastroenterological clinical scenarios independently.

They also expressed greater confidence in history taking, clinical examination, diagnostic reasoning, and decision-making.

Student Engagement

Faculty members observed higher levels of active participation among students in the intervention group throughout the clerkship.

Rather than remaining passive observers during clinical activities, these students became active participants in patient assessment and clinical decision-making.

Student Satisfaction

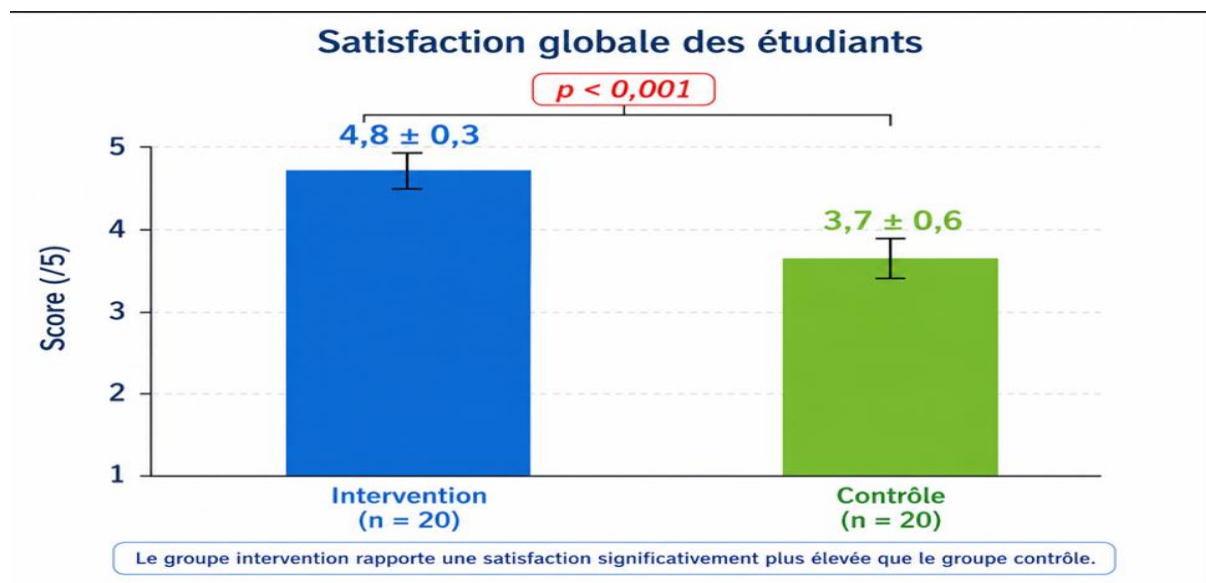
Overall satisfaction with the educational experience was significantly higher among students in the intervention group.

Participants particularly appreciated:

- the opportunity to actively manage real clinical cases;
- immediate individualized feedback;
- reflective discussions following each clinical encounter;
- the supportive learning environment created by the intervention.

Domaine	Intervention	Contrôle	p
Qualité du feedback			
Confiance clinique			
Motivation			
Satisfaction globale	4,8 ± 0,3	3,7 ± 0,6	<0,001





DISCUSSION

The present randomized controlled study demonstrated that an educational program combining formative Objective Structured Clinical Examinations (OSCEs), structured feedback, and reflective debriefing significantly improved clinical reasoning, practical clinical skills, self-confidence, and learner satisfaction among undergraduate medical students completing a gastroenterology clerkship. Compared with conventional clinical teaching, students exposed to this integrated educational strategy achieved substantially higher OSCE scores, supporting the hypothesis that active, competency-based learning is more effective than traditional observation-based teaching (1).

The most important finding of this study is that the educational benefit observed cannot be attributed to the OSCE alone. Rather, it appears to result from the synergistic combination of three complementary educational components: authentic clinical encounters, structured feedback, and reflective debriefing. Together, these elements transform the OSCE from a summative assessment tool into a powerful learning experience that actively promotes competency development (2).

Traditionally, OSCEs have been regarded primarily as standardized methods for assessing clinical competence. Since their introduction by Harden and Gleeson in 1975, they have become one of the most widely used assessment tools in undergraduate and postgraduate

medical education. However, during the past two decades, educational research has progressively shifted toward the concept of **assessment for learning**, emphasizing that assessment should actively support learning rather than merely measure performance. Within this framework, formative OSCEs provide immediate opportunities for students to recognize performance gaps, receive constructive feedback, and progressively improve their clinical competence (3).

Our findings are consistent with this educational paradigm. Students who participated in formative OSCE sessions demonstrated superior clinical reasoning compared with those receiving conventional bedside teaching alone. This improvement is likely explained by the active participation required during the intervention. Instead of observing senior physicians, students were responsible for independently interviewing patients, performing physical examinations, generating differential diagnoses, and proposing initial management plans. Such active engagement promotes deeper cognitive processing and facilitates the integration of theoretical knowledge into clinical practice (4).

These findings are also supported by Kolb's experiential learning theory, which proposes that effective learning occurs through a continuous cycle involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. The educational intervention implemented in our study naturally incorporated all four stages of this learning cycle. Students first encountered authentic clinical situations, then reflected on their performance during structured debriefing sessions, received individualized feedback from faculty members, and subsequently applied newly acquired knowledge during future patient encounters. This iterative process is likely responsible for the substantial improvement observed in clinical reasoning(5).

Another important strength of our educational intervention is the use of **real patients** rather than simulated patients. Although simulation offers excellent standardization and remains essential for competency assessment, authentic patient encounters expose learners to the complexity and unpredictability of real clinical practice. Students must adapt their communication, clinical reasoning, and decision-making to individual patient presentations, thereby enhancing the ecological validity of the learning experience. This authenticity is widely recognized as an important determinant of knowledge transfer from educational settings to real-world clinical practice.

An equally important finding concerns the role of **structured feedback**. Feedback is considered one of the most influential factors affecting learning outcomes in medical education. Nevertheless, its educational value depends largely on its quality. Immediate, specific, objective, and constructive feedback enables learners to identify their strengths and weaknesses while providing practical guidance for improvement. In our study, structured feedback was delivered immediately after each clinical encounter, maximizing its educational impact by allowing students to reflect on their performance while the experience remained fresh in memory (6).

Reflective debriefing represented another essential component of the intervention. Reflection encourages learners to critically analyze their own diagnostic reasoning, recognize cognitive biases, and identify opportunities for improvement. Rather than simply correcting mistakes, reflective discussions foster metacognitive skills, enabling students to become more autonomous and self-directed learners. These higher-order cognitive processes are central to the development of clinical expertise and lifelong learning.

Beyond improving objective clinical performance, the intervention also had a positive impact on learner confidence and satisfaction. Students who actively participated in the integrated educational program reported feeling more confident in approaching patients independently and expressed greater satisfaction with their clinical training. Increased self-confidence may enhance motivation, encourage active participation during clerkships, and ultimately facilitate the transition from undergraduate education to independent clinical practice.

Our study also has important implications for competency-based medical education. Contemporary curricula increasingly emphasize direct observation, workplace-based assessment, formative feedback, and continuous competency development. Our findings suggest that integrating formative OSCEs into routine clinical clerkships represents a practical and effective strategy for operationalizing these educational principles. Importantly, the intervention does not require sophisticated simulation centers or expensive technological resources. With appropriate faculty development, formative OSCEs using real patients can be incorporated into everyday clinical teaching, making this approach feasible even in resource-limited educational settings.

Several limitations should nevertheless be acknowledged. First, this was a **single-center study**, which may limit the generalizability of our findings to other institutions or educational

contexts. Second, the sample size was relatively small, although randomization ensured comparable baseline characteristics between the two groups. Third, educational outcomes were assessed immediately after the clerkship, and therefore the long-term retention of acquired competencies remains unknown. Finally, although standardized assessment tools were used, complete blinding of faculty assessors was not feasible because of the educational nature of the intervention.

Future multicenter randomized studies involving larger cohorts and longer follow-up periods are warranted to determine whether improvements in clinical reasoning are sustained over time and translate into better patient care. Further research should also explore the cost-effectiveness of implementing formative OSCEs during routine clinical clerkships and evaluate their applicability across different medical specialties.

Overall, the present study provides robust evidence that combining formative OSCEs with structured feedback and reflective debriefing enhances undergraduate clinical education. By promoting active participation, deliberate practice, reflective learning, and competency development, this educational strategy represents an effective alternative to traditional observation-based clerkships and supports the ongoing transition toward competency-based medical education.

CONCLUSION

This randomized controlled study demonstrates that integrating formative Objective Structured Clinical Examinations (OSCEs) with structured feedback and reflective debriefing significantly enhances clinical reasoning, practical clinical skills, self-confidence, and learner satisfaction among undergraduate medical students during a gastroenterology clerkship. Compared with conventional observation-based teaching, this educational strategy promotes active learner engagement and facilitates the acquisition of competencies required for clinical practice.

Importantly, our findings suggest that the educational value of formative OSCEs extends beyond assessment. When embedded within a structured educational framework that includes immediate feedback and guided reflection, OSCEs become powerful learning tools capable of fostering deeper understanding, deliberate practice, and progressive competency development.

As undergraduate medical education continues to evolve toward competency-based curricula, educational approaches should move beyond passive observation and encourage students to actively participate in authentic clinical encounters. The integrated educational model evaluated in this study represents a practical, reproducible, and feasible strategy that can be incorporated into routine clinical clerkships without requiring sophisticated simulation facilities.

Future multicenter studies involving larger cohorts and longer follow-up periods are needed to confirm the generalizability of these findings and to determine whether improvements in undergraduate clinical performance translate into better patient care and long-term professional competence.

In conclusion, the combination of formative OSCEs, structured feedback, and reflective debriefing should be considered not merely as an assessment strategy, but as an effective educational intervention that supports the development of competent, reflective, and patient-centered physicians.

ACKNOWLEDGEMENTS

Declarations

Ethics Approval and Consent to Participate

The study was conducted in accordance with the principles of the Declaration of Helsinki. All participating students were informed about the objectives of the study and provided informed consent before enrollment.

Ethics approval was obtained from the Ethics Committee

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Funding

This research received no external funding.

Authors' Contributions

KG conceived the study, designed the educational intervention, supervised data collection, performed data interpretation, and drafted the manuscript.

SS, HM, BAY, and RA participated in the implementation of the educational program, data collection, critical revision of the manuscript, and approved the final version.

All authors read and approved the final manuscript.

Acknowledgements

The authors would like to thank all medical students who voluntarily participated in this study and the faculty members of the Department of Gastroenterology, Avicenna Military Hospital, Marrakech, for their valuable contribution to the implementation of the educational program.

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