

Short Communication



Blending human and AI-powered feedback models in medical education: A practical overview

Ehsan Toofaninejad¹, Mahdieh Zangiabadizadeh^{2,3}, Masomeh Kalantarion^{3*}, Saeed Latifi⁴¹Department of eLearning in Medical Sciences, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran²Department of Midwifery, School of Nursing and Midwifery, Islamic Azad University, Kerman, Iran³Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran⁴Educational Technology Department, Kharazmi University, Tehran, Iran**Article info****Article History:****Received:** July 1, 2025**Revised:** July 7, 2025**Accepted:** August 19, 2025**published:** October 19, 2025**Keywords:**

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Abstract

Effective feedback plays a pivotal role in medical education, bridging the gap between current and desired learner performance. This short communication outlines common types and models of feedback in clinical teaching and explores how artificial intelligence (AI) tools, such as ChatGPT, can complement traditional methods. While AI can offer immediate, data-driven insights, the irreplaceable human element brings contextual awareness and emotional intelligence to feedback processes. We present a practical categorization of feedback types and a comparative overview of ten well-established models. By integrating human expertise with AI-supported systems, educators can enhance formative assessment and foster autonomous, reflective learning. Practical implications are discussed for implementing feedback models in both in-person and digital learning environments.

Introduction

Feedback is widely recognized as one of the most influential components of medical education. It enables learners to monitor and improve their performance based on structured input. According to Hattie and Timperley's influential model, effective feedback answers three critical questions: Where am I going? How am I going? And where to next?¹ In clinical settings, formative feedback not only shapes learners' performance but also fosters reflective thinking and metacognitive awareness.²

With the advent of artificial intelligence (AI), the feedback landscape is evolving. While AI tools offer timely and personalized suggestions, questions remain regarding their effectiveness compared to human instructors. This communication provides an overview of feedback types and models, emphasizing how medical educators can effectively combine human and AI-powered feedback for optimal learner outcomes.

Types and sources of feedback

Feedback in medical education can be classified in various ways. In terms of timing and structure, brief feedback refers to input given during real-time clinical activities.

Formal feedback, on the other hand, is structured and planned, typically provided after specific assessments or events. Major feedback is more in-depth and often occurs midway through a learning experience, aiming to address significant performance gaps.

Regarding the source of feedback, teacher feedback (TF) is personalized and motivational, though it can be limited by time constraints. Computer-generated feedback (CF) is delivered through AI-based or software systems. It offers the advantage of instant evaluation but may lack contextual nuance. Finally, self-feedback (SF) involves learners reflecting on and evaluating their own performance, which promotes critical thinking, autonomy, and self-directed learning.³

Models of feedback in medical education

Several structured models are commonly used to guide effective feedback. Table 1 provides a comparison of ten widely used feedback models in medical education:

Role of AI in feedback

Generative AI models such as ChatGPT can now offer immediate and personalized feedback in clinical education.

*Corresponding author: Masomeh Kalantarion, Email: kalantarion65@gmail.com

Table 1. Ten models of feedback in medical education

Model	Core components	Best for	Limitations
Sandwich	Positive–negative–positive	Beginner learners	May dilute critical feedback
SBI	Situation–behavior–impact	Behavioral feedback	Requires observation precision
STAR	Situation–task–action–result	Clinical scenarios	Slightly complex for quick use
Pendleton's rules	Learner-first, balanced, guided feedback	Self-reflection encouragement	Can feel formulaic
One-minute preceptor	Get commitment, probe, teach, reinforce	Time-limited teaching	Lacks depth for complex skills
SET-GO	Self, educator, target, goals, options	Collaborative goal setting	Needs prior training
R2C2	Rapport–reaction–content–coaching	Longitudinal feedback relationships	Time-intensive
ALOA	Agenda-led outcome-based analysis	Learner-centered feedback	It may be difficult with passive learners
Advocacy–enquiry	Dialogue between teacher and learner	Simulations, communication training	Requires skilled facilitation
AI-based (ChatGPT)	Immediate, automated, reflective prompts	Supplement to feedback sources	Lacks emotional/situational nuance

They can simulate patient interactions, evaluate decision-making, and analyze clinical narratives.³⁻⁷

However, AI tools primarily rely on pattern recognition and may not perform deep syntactic or conceptual analysis. Despite these limitations, AI-generated feedback can still offer valuable support in several areas. For example, it can assist in revising drafts of clinical documentation by providing suggestions for clarity and completeness. Additionally, it can be used to assess communication skills through simulation-based training, offering structured responses and feedback to learners. Furthermore, AI tools can provide quick and consistent feedback in asynchronous online learning environments, helping students reflect on their performance without delay.

The best results occur when AI complements rather than replaces human feedback, especially in high-stakes, emotionally nuanced learning environments⁴.

Practical implications for medical educators

To optimize learning, educators are encouraged to use structured feedback models that align with the learners' experience and educational context. They should also train students in techniques of self-assessment and peer feedback to foster greater engagement and reflective learning. Incorporating AI tools can further expand opportunities for formative feedback by providing timely and personalized responses. A scaffolder approach that blends human and machine-generated feedback is recommended to support learning at different stages. Additionally, ensuring that feedback is delivered in a timely, constructive manner and encourages self-reflection is essential for maximizing its educational impact.

Conclusion

Effective feedback in medical education must be multidimensional—leveraging both human insight and technological innovations. By combining structured models with AI-powered tools, educators can foster deeper learning, promote autonomy, and ultimately

improve clinical competence.

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Authors' Contribution

Conceptualization: Ehsan Toofaninejad, Masomeh Kalantarion.

Data curation: Ehsan Toofaninejad, Mahdieh Zangiabadizadeh, Masomeh Kalantarion, Saeed Latifi.

Investigation: Ehsan Toofaninejad, Masomeh Kalantarion.

Methodology: Ehsan Toofaninejad, Masomeh Kalantarion.

Project administration: Ehsan Toofaninejad, Mahdieh Zangiabadizadeh, Masomeh Kalantarion, Saeed Latifi.

Resources: Ehsan Toofaninejad, Mahdieh Zangiabadizadeh, Masomeh Kalantarion, Saeed Latifi.

Software: Ehsan Toofaninejad, Mahdieh Zangiabadizadeh, Masomeh Kalantarion, Saeed Latifi.

Supervision: Ehsan Toofaninejad, Mahdieh Zangiabadizadeh, Masomeh Kalantarion, Saeed Latifi.

Writing—original draft: Ehsan Toofaninejad, Mahdieh Zangiabadizadeh, Masomeh Kalantarion, Saeed Latifi.

Writing—review & editing: Ehsan Toofaninejad, Mahdieh Zangiabadizadeh, Masomeh Kalantarion, Saeed Latifi.

Competing Interests

The authors declare no conflict of interest.

Ethical Approval

Not applicable. This short communication is a narrative overview and synthesis of existing feedback models and the potential role of AI in medical education. It does not report on any original research involving human subjects, clinical interventions, or the collection of primary data. Therefore, it was not subject to formal ethical review under institutional guidelines. Nonetheless, the conclusions presented adhere to the core ethical principles of academic integrity and transparency.

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