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FEEDBACK-DRIVEN SKILL ACQUISITION IN COMPETENCY-BASED HEALTH PROFESSIONS EDUCATION: A NARRATIVE REVIEW WITH IMPLICATIONS FOR INDIAN COMPETENCY-BASED MEDICAL EDUCATION

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ABSTRACT
Competency-based health professions education (CBHPE) has replaced time-based progression with measurable competencies, learner-centred advancement and authentic workplace-based assessment. Within this model, feedback has moved from an adjunct of summative evaluation to the principal mechanism through which skills are acquired, refined and certified. This narrative review synthesises literature on feedback-driven skill acquisition across undergraduate and postgraduate health professions education, with particular attention to the competency-based medical education (CBME) curriculum introduced in India by the National Medical Commission. It examines the theoretical foundations of feedback (skill acquisition models, educational theories and feedback frameworks), the integration of feedback into programmatic assessment, entrustable professional activities and coaching models, the evidence on learner outcomes, the role of digital and artificial intelligence (AI)-enabled tools, and the barriers that impede implementation. The literature indicates that feedback which is timely, specific, criterion-referenced, dialogic and longitudinal supports procedural skill acquisition, clinical reasoning, communication, professional identity formation and reflective practice, provided it is delivered within a relationship of trust and a psychologically safe climate. Persistent barriers include inadequate faculty development, time pressure, large student-to-faculty ratios, hierarchical culture, inconsistent documentation, limited infrastructure and the digital divide. Evidence linking specific feedback characteristics to long-term clinical performance and patient outcomes remains limited, and research from India is sparse. Priorities include faculty capacity building, culturally adapted feedback practices, rigorous validation of technology-enhanced feedback, implementation science and longitudinal outcome studies.

KEYWORDS: Feedback; Competency-based medical education; Skill acquisition; Programmatic assessment; Entrustable professional activities; Feedback literacy; Workplace-based assessment; India

INTRODUCTION

Health professions education has undergone substantial transformation over the past few decades. Traditional models, characterised by time-based progression and knowledge-centred evaluation, are being replaced by competency-based approaches grounded in observable abilities, performance outcomes and learner accountability [1,2]. Competency-based health professions education (CBHPE) seeks to ensure that graduates possess the knowledge, skills, attitudes, values and professional behaviours required for safe and effective practice.

Feedback is among the most influential components of this approach. It has evolved from a unidirectional transfer of a teacher's perceptions to a learner into a dialogic, learner-centred process that promotes reflection, self-regulation and continuous improvement [3,4]. Feedback-driven skill acquisition may be defined as the process by which learners develop competencies through structured observation, assessment, reflection and corrective guidance. In competency-based systems, feedback is embedded within formative assessment, entrustable professional activities (EPAs), milestones, portfolios, simulation training and programmatic assessment.

The importance of the topic is threefold. First, a health professional needs to operate with growing complexity in clinical situations that require adaptability, collaboration and lifelong learning, all of which rely upon reflective practice and self-directed learning. Second, it is important that patient safety is guaranteed by making accurate assessments and making corrections in a timely fashion for learner deficiencies. Third, there is a growing demand from accreditation bodies globally for workplace-based assessment and documentation of competence.

In India, the competency-based medical education (CBME) curriculum introduced by the National Medical Commission (NMC) mandates formative assessment, reflective learning, attitude, ethics and communication (AETCOM) competencies, skills laboratories, logbooks and workplace-based assessment [5], all of which presuppose effective feedback. Implementation, however, is constrained by faculty workload, large student numbers, limited infrastructure and inadequate training in educational methods.

This review therefore aims to (i) describe the conceptual and theoretical foundations of feedback-driven skill acquisition in CBHPE; (ii) examine how feedback is integrated into formative, workplace-based and programmatic assessment; (iii) summarise evidence on the effect of feedback on learner outcomes; (iv) describe technology-enhanced and simulation-

based feedback; (v) identify barriers to implementation; and (vi) outline implications and a research agenda for Indian CBME.

METHODS

This is a narrative review. Literature was identified through searches of PubMed, MEDLINE, Scopus, Web of Science, ERIC, ScienceDirect and Google Scholar using combinations of the terms competency-based medical education, competency-based health professions education, feedback in medical education, skill acquisition, workplace-based assessment, programmatic assessment, formative assessment, entrustable professional activities, feedback literacy, reflective learning, simulation-based education, clinical competence and faculty development, combined with the Boolean operators AND, OR and NOT. Publications from 2000 to 2026 were prioritised; earlier landmark works were included to establish theoretical foundations.

Peer-reviewed articles, systematic and scoping reviews, meta-analyses, and qualitative and mixed-methods studies involving undergraduate or postgraduate health professions learners and addressing feedback, competency development, workplace-based assessment or skill acquisition were included. Non-English articles, editorials without substantive evidence, studies unrelated to health professions education, and purely technical skill training without an educational feedback component were excluded. Findings were organised thematically and synthesised narratively; no formal quality appraisal was undertaken, consistent with the narrative review format.

Theoretical foundations

From time-based to competency-based education

Traditional medical education followed a “fixed time, variable outcome” model in which learners progressed through uniform curricula of fixed duration and were assessed relative to their peers rather than against a defined standard [1]. This process-oriented approach was criticised for emphasising curriculum completion over outcomes relevant to patient care, and growing public concern about patient safety, variability in graduate competence and accountability of training programmes drove the move to CBME [1]. CBME defines predetermined competencies that integrate knowledge, skills, values and attitudes as the essential outcomes, and seeks to make time a resource for learning rather than a proxy for competence [1,2]. At the centre of this shift is a reconceptualisation of feedback, from a component of summative evaluation to a continuous, formative driver of skill acquisition [1].

Models of skill acquisition

Several models shape how CBME conceptualises the development of skills, and each depends on feedback.

The Dreyfus model describes progression through the stages of novice, advanced beginner, competent, proficient and expert, each characterised by a different way of understanding and performing tasks [1]. CBME uses this model to justify individualised learning, recognising that learners may be at different stages for different competencies and may progress at different rates; it is operationalised through milestones that describe observable stages within each competency [1]. The feedback a learner needs changes across these stages. Novices depend on external guidance and benefit from explicit, directive, stepwise and immediate feedback; advanced beginners benefit from feedback that refines technique and encourages self-assessment; and at competent, proficient and expert levels feedback becomes more reflective and goal-oriented, focusing on efficiency and judgement, and can inform certification decisions.

The three stage model by Fitts and Posner outlines the cognitive stage (where feedback is highly important), the associative stage (where feedback is used to refine and eliminate errors), and the autonomous stage (where feedback is not needed and the task is performed automatically).

Miller's pyramid is a hierarchical classification of competences, starting from “knows” and ending with “does” [6]. It helps determine the type of assessment methods for the “shows how” and “does” competencies [1].

Ericsson's deliberate practice theory states that skills are acquired by repeated performance of specific tasks with well-defined objectives and error correction and feedback, not simply by repetition [3,7]. Deliberate practice in CBME is achieved in skills laboratories, through simulation, workplace-based assessment and repeated formative assessment with feedback.

Educational theories underpinning feedback

Feedback is seen as reinforcement in behaviourist theory that reinforces the desired behaviour and corrects undesirable behaviour. This view has been helpful for training in procedures, but is not enough for complex clinical learning, in which reflection on practice and professional judgement are crucial. Cognitivist theories consider feedback as information for learners to recognize the difference between their actual and desired performance, and Sadler suggested that feedback needs to help the learner realize the standard, make a comparison with their performance, and take action to close the gap [8]. Constructivist views have a strong focus on active meaning making and the feedback process is treated as a social, dialogic process; Vygotsky's zone of proximal development is focused on guided support, which closely mirrors the clinical supervision process. Sociocultural perspectives acknowledge that trust between learner and supervisor, the educational climate, receptiveness of the learner, psychological safety and professional identity are all important for the success of feedback; Carless and Boud's feedback literacy focuses on the learner's ability to accept, interpret and act on feedback [9]. Finally, self-regulated learning theory describes how learners plan, monitor and evaluate their own learning; self-regulated learners actively seek feedback and integrate it into future performance [10], which is central to progressive competency attainment.

Frameworks for delivering effective feedback

Learning models are descriptive of why feedback is important but provide little guidance on how. There are three frameworks to fill this void. Kluger and DeNisi's feedback intervention theory suggests that feedback should focus on the task and task strategies rather than on the self [3,11] which follows the CBME principle of task-focused feedback. In CBME, Hattie and Timperley's model focuses on feedback at the task, process, self-regulation and self levels [12] with the task and process levels being the most common targets for effective feedback, which is aimed at metacognitive skills required for lifelong professional development [13]. The educational alliance framework places feedback in the context of a shared agenda and trust relationship between educator and learner, similar to the therapeutic alliance with clinical care [14,15]. It is about changing the focus of feedback from the content of the feedback to the relational conditions under which feedback is accepted and acted upon [3].

There are some different conversational models in practice. This is a very popular model that invites the learner to consider what they have done well and what they can do better before the observer makes comments, but can be too rigid and artificial. In the feedback sandwich, criticism is sandwiched between positive comments to maintain comfort, so there is a balance that could be too much positive or not enough. Reflective feedback conversations involve students in analyzing their own work and encourage students to be agents and set goals. The R2C2 model (relationship, reaction, content and coaching for change) has been adopted by CBME due to its capacity to engage learners and change their behaviour [16,17].

Characteristics of effective feedback in CBME

Feedback that is synthesised in accordance with CBME is timely (close to performance), specific (aligned to observable behaviour), criterion-referenced (aligned to competencies and milestones), actionable (includes guidance for improvement), dialogic (invites learner reflection and self-assessment) and longitudinal (builds across encounters). These are the features which make it different from standard evaluative comments. They are exemplified in the "ask–tell–ask" approach: the learner first self assesses, the observer then shares his/her perspective, and both then collaboratively create an action plan [1].

There are several roles that feedback has in skill development. It allows for errors to be noticed before they are aggregated, preserving patient safety; it transforms repetition into deliberate practice; it helps novice learners to prioritise tasks and break down complex tasks in smaller steps, reducing cognitive load; it enhances motivation and self-efficacy; it allows for self-monitoring, moving towards internal control of tasks; and when collected longitudinally, it provides an indication of performance trends for the purposes of entrustment and certification decisions.

Emotional and sociocultural dimensions

Emotional and cognitive impact of feedback. Emotions can have a negative impact on feedback use, with learners potentially feeling shamed or defensive and less confident and validated when they feel negative emotions [18]. Practices of feedback are also cultural. In hierarchical teacher–learner relationships, learners might be reluctant to ask questions from faculty and supervisors because they are afraid of getting into trouble or losing credit and supervisors are not tempted to give criticism because they wish to maintain harmony. This has a lot to do with medical education in India. They can be reduced through a gradual process of building trust, facilitating reflective conversations, sensitizing faculty, adopting structured observation tools and setting up mentoring systems, and should be viewed as a prerequisite for effective feedback.

Feedback within programmatic assessment

Principles

Programmatic assessment shifts CBHPE from an episodic, high-stakes assessment system to a multi-modal assessment system that is integrated in a learning and decision-making system to maximise learning and decision-making [19]. It is based on three principles [19]. Longitudinality refers to continuous assessment during training and allows for monitoring and regular feedback. Triangulation means aggregating data from multiple methods, assessors and occasions so that no single assessment defines a learner's competence. Proportionality means that high-stakes progression decisions are based on many aggregated low-stakes data points; this deliberately separates the formative function of individual assessments from the summative function of progression decisions, so that each data point can be used for learning rather than perceived as a high-stakes judgement [19]. Programmatic assessment has been described as essential to effective CBME implementation [20] and addresses the limitations of single-occasion assessments that provide little or no feedback [4].

Integrating feedback from diverse sources

Workplace-based assessments (WBAs) such as the mini-clinical evaluation exercise and direct observation of procedural skills provide authentic, context-rich data on clinical performance and create opportunities for in-the-moment coaching [1]. Importance of direct observation, as without it feedback might be provided without being accurate, and setting a minimum number of observations can enhance the quality and reliability of the feedback [21]. EPAs are observable and measurable tasks, which in aggregate, are the professional competencies, and can be discussed and entrusted [22,23]. They provide supervisors with a framework for ongoing feedback and entrustment decisions and enable specific and relevant feedback to actual performance [24]. In Canada's Competence by Design, EPA observations are a key component of coaching, and form part of the learner's portfolio, but are not the only way to gather data; multiple methods and timepoints should be used to examine all competencies from the base to the apex of Miller's pyramid [19]. The picture is completed by simulation, multisource (360-degree) feedback, and guided self-assessment and reflection [19] and the intentional triangulation of these sources helps to reduce the limitations of any single source.

NMC in India mandates logbooks, which record skill performance, faculty feedback, learner reflection and certification status [5]. With thoughtful application, written feedback in logbooks becomes a formality that turns informal communication into formal educationally productive interventions, fosters reflection and serves as documentation for remediation or certification decisions.

Feedback literacy and coaching

For learners to benefit from a feedback-rich system, they need feedback literacy: the capacity to seek, understand and use feedback [9,25]. Strategies to develop it include introducing the purpose of feedback early in training, modelling effective feedback behaviours and co-creating psychologically safe environments for feedback dialogue [26]. Structured coaching models provide a framework for these conversations. A qualitative study of learner–preceptor conversations found that the R2C2 model supported feedback literacy behaviours, particularly by encouraging learners to judge their own performance, although its success depended on the learner–preceptor relationship and on how thoroughly the action-planning phase was carried out [16]. An "in-the-moment" adaptation of R2C2 has been developed for brief clinical encounters, preserving the collaborative ethos of the model within time constraints [17].

Competence committees

In programmatic assessment, competence committees play a key role in decision making. These multidisciplinary groups review the aggregated and triangulated information in the learner's portfolio, identify patterns and make decisions using professional judgement within standardised guidelines, making progression decisions that are proportionate and based on a wide range of information and not on any single encounter [19]. They are effective if they have clear institutional structures and enough trained members and technology that makes the data coherent.

Feedback rich programmatic assessment is not easy to implement. It is acknowledged that some of the challenges are related to resistance of traditional assessment cultures, lack of understanding of the feedback system and individual low-stakes assessments as high-stakes, while designed as the latter [19,27]. Thus, faculty need to be trained in assessment literacy, in the delivery of feedback and in coaching skills, as well as in interpreting data [28].

Effect of feedback on learner outcomes

Clinical skill acquisition and performance

Feedback is the key element of CBME for achieving mastery of the clinical skill. Specific knowledge and skills are considered outcomes and formative assessment is used to move learners through the developmental milestones; feedback related to formative assessment should be regular, timely and specific and should prompt self-assessment [1]. This supports a training model in which learners process evaluators' information and translate it into concrete steps for progression [29]. Realising this potential requires an institutional commitment to meaningful, observation-based assessment; reliance on superficial evaluations undermines the promise of CBME [30].

Professional identity formation

Feedback interactions influence learners' professional identity formation, which is the internalisation of values, norms and behaviours of the profession. The incremental capability development approach of CBME is naturally useful in this formative process [31]. Timely, targeted, actionable and meaningful feedback helps learners own their performance and develops a developing professional sense of self [32]. Here, the educational alliance is helpful as it relies on trust and shared objectives to make feedback more credible, which in turn needs structural support, careful selection and training of faculty, and continued faculty development [15].

Self-assessment and reflective practice

One of the key goals of feedback-driven CBME is the capacity to accurately self-assess, enabling lifelong learning and self-regulated professional practice [1]. Certain feedback modalities seem to be especially effective for the development of reflection. A mixed-methods study of nursing students revealed that structured peer feedback was more effective than faculty feedback in enhancing reflective thinking skills [33], suggesting that feedback was received in ways that engaged metacognition and that were different from faculty feedback. A thoughtful design of the assessment, faculty development, and attention to emotional barriers and a psychologically safe context are necessary to integrate the qualitative (narrative) and quantitative (rating) feedback [18].

Comparison of feedback modalities

Different feedback modalities offer distinct advantages for different competency domains (Table 1).

Table 1. Strengths, limitations and target competency domains of feedback modalities

Feedback modality	Primary strengths	Key limitations	Competency domains
Direct observation by faculty	Objective, real-time performance data; enables immediate correction; essential for entrustment decisions	Time-intensive; subject to observer bias; difficult in high-volume clinical settings	Patient care, procedural skills, interpersonal communication
Peer feedback	Enhances reflective and critical thinking; promotes a	Variable quality; potential social desirability bias;	Professionalism, teamwork,

Feedback modality	Primary strengths	Key limitations	Competency domains
	collaborative learning culture; develops feedback-giving skills	requires training and structure	communication, self-assessment [34]
Patient feedback	Authentic patient-centred perspective; directly improves doctor–patient communication	Limited to specific aspects of the encounter; may emphasise interpersonal over technical skills	Communication, patient-centred care, professionalism [35]
Multisource (360-degree) feedback	Comprehensive perspective; mitigates single-observer bias; supports holistic assessment	Logistically complex; requires integration of disparate data; may give conflicting messages	Systems-based practice, professionalism, leadership

Longitudinal outcomes

The impact on lifelong learning and patient care is the ultimate evidence of feedback-driven CBME. CBME is designed to link learning outcomes to competencies required for high-quality care [36] while programmatic assessment is a dynamic, time-based integrated approach that uses complementary methods to create a comprehensive view of progress [4]. EPAs offer multiple opportunities for observation and feedback towards independent practice [22]. But the quality of the narrative comments in EPA assessments varies and making sure that the feedback is consistently high quality is hard [37].

Technology-enhanced feedback

Digital tools can help overcome structural constraints such as high student-to-faculty ratios and are increasingly central to the delivery, documentation and tracking of feedback.

Assessment management systems and e-portfolios

Electronic systems offer the infrastructure to monitor competencies in clinical settings and to combine longitudinal data. There are competency-based electronic platforms available for providing structured assessment and feedback to students and residents [38]; smartphone-based platforms have been developed for clinical skills training and assessment using standardised patients [39]; and commercial systems provide suites of competency management software [40]. E-portfolios are more than just storage – they allow the learner to assemble evidence of competence, to reflect on clinical experiences, to link experiences to competencies and milestones, and to incorporate feedback from supervisor, peers and patients into a coherent growth story.

Simulation and AI-enabled tools

Simulation offers safe, repeatable environments for deliberate practice and assessment. AI-enabled platforms such as MedSimAI use large language models (LLMs) to create virtual patient encounters in which students practise history-taking, communication and diagnostic reasoning, and receive automated formative feedback aligned with validated instruments such as the Master Interview Rating Scale [41,42]. Such tools aim to provide consistent, immediate feedback that supplements resource-intensive simulation and supports self-directed deliberate practice [42,43]. Virtual patient simulations have an established evidence base in health professions education [44], and LLM-based virtual patients now enable on-demand practice of clinical conversations and decision-making [45]. LLMs and related techniques such as retrieval-augmented generation may also be able to automate parts of the assessment of communication skills against predefined rubrics, potentially allowing more frequent low-stakes feedback cycles. Learners have reported acceptance of AI-generated feedback on communication skills in video-based simulation [46]. These tools nevertheless require rigorous validation, transparency and safeguards against over-reliance, and should support rather than replace human judgement and mentorship [47].

Digital peer-feedback platforms

The digital platforms can be used to provide structured, criterion-referenced and timely peer feedback. A mobile application called Medifeeding enables medical students to upload videos of their clinical skills performance and get rubric-based feedback from their peers and facilitators, in audio, video or text format, and is based on an existing peer assessment model which facilitates near-peer learning on a large scale [48]. Peer feedback can be further improved with digital platforms, by using standardised frameworks, optional anonymisation of the feedback, and training modules on giving and receiving feedback.

Data analytics in programmatic assessment

Programmatic assessment gathers a wealth of data from direct observation, EPA ratings, examination, and narrative comments. Digital systems that combine these data are based on principles of longitudinality and triangulation and can more accurately represent competence than a single assessment [4,49]. Competency dashboards provide a visualisation of progress against milestones and highlight learners at risk, decision-support tools are used to collate evidence for promotion, remediation or entrustment and feedback aggregation tools provide an early-warning system by identifying themes across assessors. Large volumes of comments could be analysed with automated text analysis, which could help

coaches and competence committees understand the comments in their entirety, identifying the themes and sentiment detected using natural language processing [50]. These categories are summarised in Table 2.

Table 2. Categories of technology supporting feedback in programmatic assessment

Tool category	Key functions	Role in programmatic assessment
Assessment management systems	Data aggregation; portfolio management; progress visualisation	Compile longitudinal data from diverse sources for holistic review by competence committees [19]
Digital feedback and assessment tools	Mobile data collection; structured forms; peer feedback exchange	Facilitate in-the-moment EPA observations and peer feedback models such as Medifeeding [48]
Automated text analysis	Natural language processing; sentiment analysis; theme identification	Interpret large volumes of narrative feedback, identify key themes and relate them to performance to support coaching and decision-making [50]

Integrating new tools with existing systems, faculty training, equity of access, data privacy and the need to demonstrate educational impact and fairness, particularly for AI-driven tools, remain significant hurdles.

Barriers to implementation

Institutional and structural barriers

Academic calendar, assessment timeframes and accreditation policies need to be adapted, and institutional resistance on the basis of current institutional structures is a significant challenge, in order to transition from fixed-duration programmes to variable duration that is competency-based [51,52]. This inertia is exacerbated by accreditation systems that have been developed for curricula that are not competency-based [53]. There is no consensus in many institutions about how to reconcile the conflicting views of time as a container with time as a resource for learning.

Faculty development and infrastructure

In the context of CBME, feedback-driven CBME requires faculty who are good in direct observation, formative assessment and constructive feedback, however faculty development in assessment has been mentioned as the missing link in CBME [54] from long time ago. Many of those who are trained in traditional systems are not ready for these roles [55,56]. Finally, a strong feedback system needs technological platforms for longitudinal tracking which many institutions, especially publicly funded institutions, lack [57]. While some of these are difficult to overcome, programmatic assessment can. And it requires significant investment in technology and human resources [4].

Cultural and workplace barriers

Feedback is still viewed as summative and evaluative in many institutions, and while it is important to consider emotional barriers and contextual comfort, it is also key to improving the effectiveness of feedback [18]. These challenges are exacerbated in workplaces: both WBAs and standard in-training evaluation reports do not always provide quality, actionable narrative feedback, and residents and faculty may not agree on who should initiate feedback [58]. Table 3 shows the common challenges in clinical settings.

Table 3. Challenges to feedback quality in clinical settings

Challenge	Effect on feedback quality
Variable clinical workload and time pressure	Limits opportunities for deliberate observation and reflective feedback conversations
Inconsistent faculty expertise and learner engagement	Produces unreliable assessment standards and variable feedback quality across settings
Competing clinical priorities	Reduces the focus and time dedicated to educational feedback
Lack of standardised tools and training	Produces subjective assessments that learners perceive as unfair or unhelpful

Feedback also carries ethical obligations of fairness, confidentiality and respect for learner dignity. It should support learning without humiliation and be equitable and inclusive of learners from diverse backgrounds.

Resources, equity and systemic complexity

Resource constraints in low-resource settings (many state-funded institutions) are a major challenge; individualised learning plans and embedding CBME within existing structures are expensive; and inequitable access to digital tools can exacerbate existing inequalities [59]. Programmatic assessment demands complex cross-contextual and temporal integration of a number of data points, and there is a constant conflict between assessment for learning and assessment for certification [19]. Similarly, faculty training to evaluate EPAs and infrastructure to monitor EPAs can only enhance feedback [60].

Implications for Indian CBME

The Indian CBME curriculum calls on faculty to engage in facilitating learning and not just content delivery, and the requirements of formative assessment, skills certification, logbooks, AETCOM all rely on high quality feedback [5]. Feedback is typically given in the practical demonstration phase, small group teaching, skills laboratory, and objective structured practical examinations and is further provided following such assessments to clarify expectations and allow for remediation prior to summative assessments. Feedback prior to skill certification is especially critical as certification in the absence of feedback may be superficial or incomplete.

Even with this focus on feedback, the quality of feedback differs from institution to institution and from department to department. The main constraints are: large batches, shortage of faculty, time pressure, and hierarchy and limited digital infrastructure. In this context, it is important to highlight the need to prepare faculty for feedback literacy, coaching skills, implementing milestones and EPAs, and documenting narrative feedback, or CBME can become a bureaucratic process instead of a transformative one. To make dialogic feedback possible in a hierarchical culture, culturally sensitive approaches are required, including building trust gradually, using structured tools for observation, and using mentoring systems and explicit attention to psychological safety. Digital tools, such as e-portfolios and peer feedback tools, can be used to provide feedback to many students, as long as they are accessible to all.

Gaps in evidence and future directions

There are multiple evidence gaps. Further studies are required to find the relationship between certain feedback attributes (e.g. timeliness of feedback, specificity) and measurable changes in performance and outcomes over time [3]. There are no clear guidelines for which faculty development strategies are most likely to enhance feedback quality [3,56]. The impact of feedback-driven approaches on learners of different social and cognitive backgrounds, and in different stages of training, has not been systematically explored. Longitudinal studies are needed to determine whether competencies developed with feedback are sustained and transferred to independent practice. Research from India is particularly sparse. A research agenda for the field can be organised around five themes.

- Technology: validating AI-generated feedback against expert human assessment across clinical domains, examining effects on performance in objective structured clinical examinations, developing adaptive systems that tailor the specificity and timing of feedback, and tracking long-term effects on clinical performance and patient safety [46,47,61].
- Equity and culture: detecting and mitigating algorithmic bias, adapting feedback systems that were largely developed in Western settings to contexts such as Indian CBME, examining how the directness, specificity and timing of feedback operate across cultures [3], and studying the effect of the digital divide on learners with differing digital literacy, socioeconomic resources and disability status.
- Implementation science: identifying the conditions for successful, sustainable adoption of programmatic assessment, including faculty assessment literacy, institutional commitment and integrated data systems [56,62]; and conducting economic evaluations comparing AI-enhanced, peer-based and faculty-intensive feedback [61].
- Interprofessional education: developing validated tools for team-based competencies such as role clarification, shared decision-making and collaborative leadership, and evaluating feedback through observation of team interactions, video-assisted debriefing, simulation and AI analysis of team communication [63].
- System integration: incorporating patient feedback into competency assessment [35], and linking educational assessment data with clinical quality and safety metrics, with appropriate governance.

Coordinated, multi-institutional research that balances automated systems with human coaching, validates feedback systems across cultures, evaluates them across their life cycle from design to sustainability, and informs accreditation policy will be needed [64].

LIMITATIONS

This is a narrative rather than a systematic review. Although several databases were searched, study selection and synthesis were not conducted according to a formal protocol, study quality was not formally appraised, and selection bias cannot be excluded. Only English-language publications were included. Several sources describing emerging technologies are preprints or non-peer-reviewed reports, and their findings should be interpreted with caution. Much of the evidence originates from North American and European settings, which limits its direct transferability to India.

CONCLUSION

Feedback is not an extra in CBHPE, but essential to the curriculum design. It should not be considered just a way of passing on information, but rather as an educational collaboration for professional development, reflection on practice and safe patient care. The evidence suggests that feedback is more effective for improving skills when it is timely, specific, credible and dialogic, and when it is delivered in the context of a supportive relationship; and that the structures through which feedback is delivered are programmatic assessment, workplace-based assessment, EPAs, simulation and reflective portfolios. It is important to plan for feedback opportunities in curriculum lessons, choose assessment tools that allow for feedback, and to teach staff how to deliver feedback as well as assess. To achieve this potential, Indian CBME will need continued faculty development, institutional commitment, digital infrastructure, learner orientation, culturally appropriate feedback practices, and research to validate the effectiveness of providing feedback in resource-limited environments without compromising educational outcomes.

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