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RESEARCH ARTICLE

A CRITICAL APPRAISAL OF ACADEMIC STANDARDS IN PHYSIOLOGY DEPARTMENTS IN INDIA: KNOWLEDGE GAPS, RESOURCE MANAGEMENT, AND ASSESSMENT GOVERNANCE—A COMPREHENSIVE UPDATE

Snehasis Bhunia

Professor, Department of Physiology, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, Uttar Pradesh-206130

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***Corresponding author:**
Snehasis Bhunia

ABSTRACT

Background: Physiology is a fundamental component of undergraduate medical education, providing the scientific basis for understanding normal body functions and the mechanisms of disease. The quality of Physiology education depends on faculty competence, student preparedness, educational infrastructure, institutional governance, and reliable assessment practices. **Objective:** To critically examine potential challenges affecting academic standards in Physiology departments in India, with particular emphasis on knowledge gaps among teachers and students, procurement and utilization of educational instruments, intradepartmental governance, and the selection of examiners for theory and practical examinations. **Methods:** This narrative review draws on established medical education literature, competency-based medical education principles, assessment research, and relevant regulatory frameworks. It identifies key areas for institutional evaluation and proposes strategies for improving educational quality. The article is not a systematic review and does not estimate the prevalence of the identified concerns across Indian institutions. **Discussion:** Important areas requiring attention include continuing faculty development, conceptual learning among students, needs-based procurement of laboratory equipment, transparent departmental decision-making, and fair examiner-selection procedures. Inadequate implementation of these safeguards, where present, may affect teaching effectiveness, educational expenditure, assessment reliability, and institutional confidence. **Conclusion:** Improving Physiology education requires an integrated approach combining faculty development, student support, accountable resource management, transparent governance, and standardized assessment. Institutional audits and multicentre research are essential to establish the extent of existing problems and evaluate the effectiveness of proposed reforms.

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INTRODUCTION

Physiology occupies a central position in medical education because it explains the functional organization of the human body and establishes the foundation for understanding pathophysiology, pharmacology, and clinical medicine. A sound understanding of Physiology enables medical students to interpret physiological measurements, understand disease mechanisms, and develop scientific reasoning essential for clinical practice. India has progressively adopted competency-based medical education (CBME), emphasizing defined learning outcomes, integration of subjects, active learning, and assessment of knowledge, skills, and professional competencies. The National Medical Commission's revised CBME curriculum, issued in 2024 for implementation from the 2024–2025 admission batch, provides an important contemporary framework for undergraduate medical education. Nevertheless, curricular reform alone cannot guarantee educational quality. Effective implementation requires competent teachers, motivated students, adequate teaching facilities, responsible administration, and credible examination procedures. Concerns regarding inadequate subject knowledge, inappropriate equipment procurement, institutional conflicts, and inconsistent examiner-selection practices merit objective scrutiny. However, these concerns should not be generalized to all Physiology departments without representative evidence. The purpose of this review is to identify relevant areas for critical appraisal and recommend measures that can strengthen academic standards and institutional accountability.

Faculty Knowledge and Teaching Competence: The academic quality of a Physiology department depends substantially on the disciplinary knowledge and teaching competence of its faculty. Teachers must understand physiological mechanisms, interpret experimental findings, explain complex concepts, and relate basic science to clinical applications. Knowledge gaps may arise when opportunities for continuing professional development are limited or when teaching practices do not keep pace with advances in

physiology, educational technology, and assessment methodology. Such gaps should be identified through structured academic evaluation rather than assumptions based solely on professional designation or seniority. Subject expertise alone is insufficient. Effective teaching also requires lesson planning, communication skills, appropriate use of educational technology, constructive feedback, and the ability to recognize misconceptions among learners. Overdependence on conventional lectures may restrict student participation if alternative methods are not incorporated. Small-group discussions, case-based learning, demonstrations, simulation, and problem-solving exercises can promote deeper understanding when they are aligned with the curriculum and evaluated for effectiveness.

Institutions should implement continuing faculty-development programmes covering subject updates, competency-based teaching, assessment design, research methodology, and educational leadership. Peer observation, departmental seminars, journal clubs, and collaborative teaching can support professional growth. Faculty appraisal should incorporate multiple indicators, including teaching performance, student learning outcomes, practical instruction, research activity, professional conduct, and participation in academic development. Student feedback is useful but should be interpreted alongside independent evaluation and objective evidence. The objective should be educational improvement rather than punitive identification of individual weaknesses. A supportive academic culture encourages teachers to acknowledge learning needs, seek assistance, and participate in continuous professional development.

Student Knowledge Gaps and Learning Outcomes: Student achievement in Physiology depends on prior knowledge, learning strategies, teaching quality, practical exposure, and access to academic support. Students may experience difficulty understanding complex regulatory mechanisms, interpreting physiological graphs, integrating concepts, or applying theoretical knowledge to clinical problems. An important concern is the possibility that learning becomes focused on memorization and examination performance rather than conceptual understanding. Physiology requires students to explain mechanisms, predict responses to changes in physiological variables, interpret experimental observations, and apply knowledge to unfamiliar situations.

Assessment practices can influence learning behaviour. If examinations primarily reward recall, students may prioritize memorizing information over developing analytical and problem-solving abilities. Departments should employ regular formative assessments, short quizzes, practical exercises, clinical correlations, and structured feedback to identify learning difficulties early. Remedial teaching and academic mentoring should be available to students who need additional support. Students also require opportunities to practise essential laboratory competencies and understand the interpretation and limitations of physiological measurements. Digital simulations may provide supplementary learning opportunities, but their effectiveness should be assessed against defined educational objectives. Academic responsibility should be shared by teachers, students, and institutions. Student performance must therefore be interpreted in the context of curriculum delivery, teaching resources, assessment methods, and the support available to learners.

Procurement and Utilization of Educational Instruments: Laboratory facilities and teaching instruments contribute to practical understanding in Physiology. Depending on curricular requirements, these resources may include physiological recording systems, measuring instruments, simulation equipment, demonstration models, audiovisual aids, and digital learning platforms. The availability of equipment does not necessarily indicate effective practical education. Instruments may be underutilized if they are purchased without a clear understanding of curricular requirements, are unsuitable for the intended competencies, or lack maintenance and trained personnel. Procurement decisions should begin with a documented assessment of educational needs. Departments should identify the competencies to be achieved, the practical sessions required, the number of students to be accommodated, and the equipment necessary for each activity. Technical evaluation should consider suitability, accuracy, durability, consumable requirements, maintenance costs, calibration needs, staff training, and compatibility with existing facilities. Procurement must also comply with institutional purchasing policies and applicable financial rules.

A transparent process should involve relevant subject experts, technical staff, and administrative authorities. Where conflicts of interest are possible, appropriate disclosure and review mechanisms should be established. After procurement, departments should maintain equipment inventories, usage records, maintenance schedules, and periodic performance assessments. These measures can help identify equipment that is essential, underused, defective, or no longer appropriate. Resource planning should prioritize educational value rather than the quantity or cost of instruments purchased. Shared laboratories, simulation facilities, and digital teaching tools may improve access where suitable, but they should not replace hands-on learning when direct practical experience is required (https://www.nmc.org.in/; https://wfme.org/standards/bme/; Kaur et al. 2021; Harden 1975; Miller, 1990). An effective resource-management policy therefore connects educational objectives, procurement decisions, equipment utilization, and measurable learning outcomes.

Intradepartmental Environment and Institutional Governance: A healthy departmental environment encourages academic discussion, collaboration, professional development, and responsible decision-making. Conversely, unresolved interpersonal disputes, unclear administrative responsibilities, perceived favouritism, or inadequate grievance procedures may adversely affect departmental functioning. Allegations of intradepartmental collusion or deliberate misconduct require careful handling. Such claims should be supported by verifiable evidence and should not be presented as established facts merely because disagreements or professional rivalries exist. A more constructive approach is to examine institutional safeguards relating to conflicts of interest, transparency, accountability, and procedural fairness. These principles apply to recruitment, allocation of academic duties, procurement, faculty appraisal, examination administration, and other significant departmental decisions. Institutions should maintain clearly documented procedures for decision-making and provide appropriate channels for reporting concerns. Grievance mechanisms should ensure confidentiality, impartial investigation, protection against retaliation, and a fair opportunity for all concerned parties to respond. Regular departmental meetings, recorded decisions, internal academic audits, and collaborative educational planning can improve

accountability. Leadership should encourage evidence-based disagreement while preventing personal conflicts from interfering with teaching and student welfare. Institutional governance must also distinguish between genuine academic criticism and personal allegations. Documented procedures protect both individuals and institutions by ensuring that concerns are investigated consistently rather than handled through informal influence (https://wfme.org/ standards/bme/; Kaur et al. 2021; Harden 1975; Miller, 1990; Frank, 2010).

Examiner Selection and Assessment Governance: The credibility of medical examinations depends on the validity, reliability, fairness, and transparency of assessment procedures. Theory and practical examinations must evaluate the intended competencies and follow applicable regulatory and institutional requirements. Examiner selection is an important component of assessment governance. Clear eligibility criteria, verified qualifications, relevant subject expertise, and appropriate management of conflicts of interest are necessary safeguards. Appointment procedures should be documented and consistent with the rules applicable to the relevant university and examination. Where selection criteria or appointment processes are unclear, concerns may arise regarding impartiality and consistency. However, the existence and extent of such problems in Physiology examinations across India require systematic evidence.

Theory examinations should be appropriately aligned with curricular objectives. Assessment blueprinting helps distribute questions across topics and competencies, reducing the risk that examinations disproportionately emphasize selected areas of the syllabus. Kaur and colleagues, in their 2021 study on blueprinting in undergraduate Physiology, discussed its value for improving the balance and quality of assessment. Practical examinations present additional challenges because students may encounter differences in equipment, examination stations, instructions, and examiner expectations. Structured assessment formats, including the Objective Structured Practical Examination (OSPE), can improve consistency by defining tasks and scoring criteria in advance. Examiner orientation, agreed marking schemes, appropriate moderation, and periodic review of assessment outcomes may further improve fairness. These mechanisms should be designed to support professional judgment while reducing avoidable variation (Frank et al., 2010). Assessment governance should also include pr*ocedu*re s for addressing examination-related grievances and reviewing suspected irregularities. Investigations must follow established rules and protect the procedural rights of all concerned parties. Transparent examiner appointments and standardized assessment practices help strengthen confidence in examinations and ensure that academic results reflect student competence as accurately as possible.

Quality Assurance and Institutional Accountability: Quality assurance should be an ongoing institutional process rather than an exercise undertaken only during inspections. The World Federation for Medical Education's 2020 standards for basic medical education identify curriculum, assessment, students, academic staff, educational resources, quality assurance, and governance as interconnected areas of educational quality (Norcini *et al*., 2011). Physiology departments can apply these principles through periodic internal reviews. Such reviews should examine curriculum implementation, faculty development, student achievement, laboratory utilization, assessment quality, and compliance with applicable regulations. Useful indicators may include faculty participation in development programmes, completion of practical competencies, student performance across assessment domains, equipment utilization, maintenance compliance, and the frequency and resolution of academic grievances. Indicators should be interpreted carefully. For example, high pass rates do not automatically establish high educational quality, just as lower pass rates do not independently prove ineffective teaching. Multiple sources of evidence are required to identify underlying causes and guide corrective action. Institutions should use audit findings to develop measurable improvement plans with defined responsibilities and timelines. Follow-up evaluation is essential to determine whether the interventions have produced meaningful changes.

Recommendations for Reform

A coordinated approach is required to address the interconnected challenges discussed in this review. First, regular faculty-development programmes should strengthen subject knowledge, teaching methods, practical instruction, assessment literacy, and research skills. Second, departments should implement student-centred learning strategies, frequent formative assessment, structured feedback, and academic mentoring. Third, procurement should be based on documented educational needs, transparent technical evaluation, lifecycle costs, and periodic review of equipment utilization. Fourth, institutions should establish clear governance procedures, conflict-of-interest safeguards, impartial grievance mechanisms, and appropriate documentation of academic decisions. Fifth, examiner appointments should comply with applicable regulations and documented eligibility requirements. Assessment quality should be supported by blueprinting, standardized practical formats, examiner orientation, and appropriate moderation. Sixth, institutional audits should evaluate both compliance and actual educational outcomes. Findings should lead to specific improvement plans rather than merely generating administrative reports. Finally, multicentre research should investigate the prevalence and distribution of these concerns across public and private medical colleges, different regions, and institutions with varying resource levels.

Limitations and Future Research: This article is a narrative review and does not use a systematic search strategy or formal critical appraisal of all eligible studies. It therefore cannot establish the national prevalence of deficiencies in faculty knowledge, student learning, resource management, departmental governance, or examiner selection. Future reviews should document databases searched, search terms, eligibility criteria, publication periods, and methods of evidence synthesis. Empirical research should incorporate institutional surveys, validated questionnaires, interviews, equipment audits, and examination-quality indicators. Research should also evaluate the effectiveness of proposed reforms rather than relying exclusively on perceptions or descriptive observations. Such evidence would enable institutions and policymakers to prioritize interventions according to demonstrated educational needs.

CONCLUSION

Academic standards in Physiology departments are shaped by the interaction of faculty competence, student preparedness, teaching infrastructure, institutional culture, and assessment governance. These components should be evaluated together

rather than treated as isolated administrative concerns. Continuing faculty development, improved student support, educationally justified procurement, transparent departmental decision-making, and fair examiner-selection procedures provide a practical foundation for quality improvement. A constructive and evidence-based approach is essential. Generalizations about all Indian medical institutions should be avoided unless supported by representative research. Institutional audits, current regulatory guidance, and multicentre studies can help identify genuine shortcomings and establish effective corrective measures. The ultimate objective is to strengthen Physiology education through academic excellence, responsible resource utilization, professional integrity, and credible assessment, thereby contributing to the preparation of competent medical graduates.

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