

Admission to Undergraduate and Postgraduate Medical Courses: Looking Beyond Single Entrance Examinations

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In India, a single national level entrance examination for admission to undergraduate and postgraduate medical courses has been introduced. This is largely an effort towards alleviating financial corruption in admission process, improving logistics and ease of examination for students, and resource-efficacy in conduct of examination. Unfortunately, the possible educational impact of such single high-stakes examination has not been overtly discussed. A major handicap in doing so is the lack of documentation and analysis of our own experience with multiple entrance examinations over many years. One adverse aspect of a single high-stakes examination, especially the Postgraduate entrance examination, is that the students' learning priorities get redefined to being 'examination-oriented' rather than 'competency-development oriented'. Hence, we must draw lessons from admission processes in other countries that have gone through similar course. Two key effective practices in these countries include giving weightage to prior academic performance, and use of a combination of some form of cognitive testing, aptitude testing and non-cognitive assessment, for taking selection decisions. It is prudent to modify our existent examination processes utilizing the same principles. There is a need to improve the formative assessments and the end-of-training certification examinations, and possibly also include them as inputs for the admission process.

Keywords: Admission process, Educational impact, Learning, National Eligibility cum Entrance Test (NEET), Selection process.

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Selection of students to medical schools is a matter of world-wide discussion and debate [1-3]. A major reason for this is the gap between medical training and societal health needs. India is at the threshold of a national-level policy change in the procedure of admissions to medical courses. A single examination at the national level has been introduced for selecting students to undergraduate (UG) and postgraduate (PG) medical courses. There is a raging debate, involving educationists, policy-makers and the judiciary, on what is most suitable in terms of logistics, transparency, effectiveness, fitness to purpose, and acceptability. A consolidated opinion of medical educationists is as yet unexpressed.

Only when there is a clear purpose to the selection, linked to orientation, can the most appropriate process for admission to medical schools be evolved. The obvious purpose of selection to undergraduate courses is the identification of the most suitable candidates for a future physician role. The selection process must also weed out the applicants who may harm the community. The purpose of selection to postgraduate courses is to identify the most appropriate amongst the medical

graduates, who have the ability to carry out specialty practice.

Working backwards, a good admission process must involve procedures and criteria that sub serve both, the desired purpose and outcome. It is therefore crucial to know which selection procedures contribute, and to what extent, towards achieving them.

WHAT WORKS AND TO WHAT EXTENT?

Motivation, aptitude and ability are the three pillars that enable a person to perform well in any profession. 'Motivation' is assumed when a student applies for admission to a medical school. 'Aptitude' pertains to natural flair and plays a key role in deciding how comfortable the person will be in functioning as a physician. 'Ability' decides whether the student has the potential to go through the academic rigors of medical training, and subsequently fulfill the demanding roles of a physician. Therefore, the optimal admission process must consider both 'Academic' and 'Non-Academic' criteria. **Table I** compares the processes followed for admission to undergraduate medical courses in India with that of some other countries.

Academic evaluation for selection: Academic evaluation is universally applied for selecting students to medical courses (**Table I**). Academic performance prior to admission to the medical school has a moderate influence on performance during medical school explaining about 13% of the variance [4,5]. This suggests that prior academic performance is not adequate on its own for predicting performance in medical school or in later professional life. For this reason, countries such as the United States, United Kingdom, and Australia utilize a combination of end-of-school examination scores, a medical admission/entrance test score, and also additional criteria for the suitability for admission to undergraduate courses [1,4-7,11-13].

In India, academic performance in the end-of-school examination scores is used almost exclusively to determine eligibility for appearing in the medical entrance examination; it is not used for admission decisions save in the state of Tamil Nadu [8]. For admission to PG courses, the term 'prior academic performance' would refer to the performance during UG medical training. While the USA utilizes the scores of United States Medical Licensure Examination (USMLE) in selection decisions, no such procedure is followed in India and many other countries.

Non-Academic evaluation for selection: It is ironic that while selecting entrants to medical schools, the greatest emphasis is on academic performance/potential whereas at the user end, (when visiting a doctor for consultation), the patient can discern only the professional, ethical and interpersonal behavior of the physician. A higher

compliance with treatment, better satisfaction and less litigation has been found to be associated with such soft skills of the physician [14-16]. The intention in bringing these facts to the fore is not to de-emphasize academic and cognitive attributes, but to shine light on soft skills/non-cognitive attributes.

Non-academic evaluation can cover a wide range of attitudinal and behavioral characteristics, and skills such as interpersonal communication, professionalism, ethical reasoning, team-working skills and stress coping ability [16,17]. All of these, being complex constructs of many human qualities, are not amenable to easy evaluation by a single test. Also, it is not feasible to evaluate for all of these; thus, for selection purposes, only the most important of these may be assessed [17]. The popular methods utilized are aptitude tests, personal interviews, personal statements or essays by applicants, Multiple mini interviews (MMI), letters of reference, Situational judgment tests (SJT), and other tests such as personality assessment and emotional intelligence [4,16,17]. A few key aspects of some of the methods are discussed below.

Personal statements and letters of reference, though extensively used, have been found to lack reliability, and have limited validity and overall utility as a predictor of future performance [3,4]. They are prone to contamination by way of plagiarism and third party inputs. Also, they are resource intensive, as they have to be individually assessed by subject experts. Reference letters have also failed as predictors of future performance perhaps because of inherent bias on the part of the self-selected referees [3].

TABLE I PROCESSES FOLLOWED FOR ADMISSION TO UNDERGRADUATE MEDICAL COURSES IN A FEW COUNTRIES

Parameter	USA and Canada [3]	UK [4-7]	India
Basis of Admission decisions	A combination of cognitive and non-cognitive methods	A combination of cognitive and non-cognitive methods	Usually a single cognitive method*
Eligibility	After three years of graduate college education	Soon after school education	Soon after school education
Methods used	Medical College Aptitude Test (MCAT) scores supplemented by undergraduate Grade Point Average (uGPA), an interview or multiple mini interviews (MMI), personal statements, and letters of reference	End-of-school scores (A Level) supplemented by personal interviews or letters from referees for assessing non-cognitive attributes, and aptitude testing by the UK Clinical Aptitude Test (UKCAT)	An MCQ based written entrance test across almost all states*

[#]Nearly 60,000 students appeared for MCAT in 2015; Approximately 4.75 Lakh students registered for the re-introduced NEET-UG in India in 2016; * Exceptions: In the state of Tamil Nadu, 85% medical admissions are based on class 12 marks in science subjects [8]; The Armed Forces Medical College, Pune, and the Christian Medical College, Vellore, shortlist applicants on the basis of cognitive test scores (the All India entrance examination); the former institution then supplements the scores with a separate Test of English Language, Comprehension, Logic and Reasoning (ToELR), a psychological test, and an interview, while the latter adds on scores based on an online aptitude assessment test [9,10].

The interview is a versatile though resource- and time-intensive method. The way it is conducted, its content, and the interviewer all have a bearing on its reliability and validity. Selection interviews are best conducted in a structured manner, with standardized questions, *via* a trained panel of interviewers and by using validated scoring criteria [4,11,18]. Increasing the number of assessors can minimize interviewer bias. Multiple mini interviews (MMI) offer a further improvement; the predictive validity of MMI is found to be higher (0.4-0.45) than that of traditional interviews (<0.2) [4,19].

Aptitude may be tested separately or incorporated as a separately evaluated and weighted section in the cognitive test. The Medical College Aptitude Test (MCAT) in the USA and the United Kingdom Clinical Aptitude Test (UKCAT) in the UK are some examples. While the UKCAT is predominantly an aptitude test, the MCAT, in addition to aptitude, also tests biological and physical science knowledge base, writing skills, and problem solving skills. The evidence for predictive validity of aptitude testing is positive but widely variable (0.14-0.6) with respect to performance in medical school [4,13]. In India, testing for aptitude is non-existent at present except for Christian Medical College, Vellore where an online aptitude test is conducted [10].

NEED FOR A CHANGE

Lessons from other countries: Most universities and medical schools in USA and Canada utilize a combination of methods for ranking and admission decisions [3]. Three years of graduate college education is a prerequisite for entry into medical school. The undergraduate Grade Point Average (uGPA) score from college education is included, and usually supplemented with MCAT, along with additional methods such as interviews, personal statements, and letters of reference. McMaster University, Canada, is credited with the introduction of MMI that has remarkably improved upon the personal interviews, and has replaced traditional interviews in many universities [19].

It is important to note that the USA does not use a single high stakes examination such as MCAT (for UG admissions) or USMLE (for PG admissions). It is a common misconception that scores at such standardized tests are the major determinants of acceptance. In addition to these being used as one of several measures of suitability for admissions, they are utilized to compare applicants from diverse Universities that have different degrees of rigor in how they award grades that eventually determine the GPA. The MCAT and uGPA are used less as a ranking tool and more to determine who should be

invited for personal interviews. Data from the written examinations is integrated with several other modes of assessment for the admission decisions including selection interviews. Interviews do not test content knowledge but critical thinking and communication skill. Due attention is also paid to the life experiences of the applicants and their ability to evaluate such experiences in their essays. The weight given to each of the above components varies widely in different universities.

Similarly, countries such as the UK, Australia, and the Netherlands use a combination of prior academic performance, some form of cognitive testing, aptitude testing and additional methods of non-cognitive assessment for deciding suitability of the candidates for admission to medical schools [4-7,11,16,17].

Lessons from the past: Initially, the end-of-school *i.e.* higher secondary examination scores alone were used for creating a rank list and selecting students to medical schools; no other input was considered necessary. Variations in standards of school-leaving examinations and unfair practices creeping into the selection process prompted the introduction of entrance examinations as a common platform for entry to medical schools. However, there were multiple examinations, some conducted by individual States, others by institutions, and one national level examination, The All India Pre Medical Test (AIPMT). The State examination was used to fill 85% of the medical seats in a given State, while the remaining 15% seats were filled through the AIPMT; aspirants ended up preparing for and giving several entrance examinations, and as a result often traveled across the country multiple times in the admission year.

Single, nationwide entrance examination: In order to improve selection processes, the Medical Council of India (MCI), in 2009, proposed doing away with entrance examinations conducted by States and Institutions, to be replaced with a single national level examination from 2013 onwards. The Government of India passed the proposal in December 2010 [20,21]. The proposed examination was called the National Eligibility cum Entrance Test [NEET] for admission to undergraduate [NEET-UG] and postgraduate courses [NEET-PG]. However, it was widely challenged in the court and the Supreme Court of India passed a judgment in July 2013 quashing NEET [22,23]. Neither the reasons for which NEET was challenged, nor the basis on which it was struck down, had much to do with the educational utility of the examination [24,25]. In a surprising turn of events, the Supreme Court of India recalled its judgment on 11 April 2016 for reconsideration and finally NEET was reintroduced this year.

The proposing and conducting authorities debated largely about administration logistics, cost, the value of a common standard of examination nationwide, and containment of corrupt practices; medical educationists, on the other hand, deliberated the utility of a single entrance examination - a debate that still stays *sans* consensus [24-27]. The NEET may seem like the end of the discussion for students, parents and conducting authorities, but for medical educationists it is only the beginning of a mammoth challenge. It is a challenge to decide the appropriate modality, content, the assessment tool(s), the duration of such high-stakes examination, weight given to various aspects, and how to use the scores for making a ranking decision.

Pardeshi, *et al.* [27], explored the thoughts of the most important stakeholders – the students - when NEET was first announced. Though they focused on the NEET-PG, it is interesting to note that only about half the interns felt the need for a single entrance examination. This is ironic since one of the bases for introducing NEET was student convenience in appearing for only a single examination. More interesting were the reasons that students shared for not wanting a single examination: they felt that, being their only chance that year, it would be a single high-stakes opportunity; if one was sick on that day or, unable to appear for other legitimate reasons, there would be no second chance or alternative. They also voiced concerns about having a single uniform examination that did not take into account variation in the quality of training in different States. It is worth mentioning that with re-introduction of NEET in 2016, the NEET-UG examination has been scheduled on two dates, and the NEET-PG examination is scheduled on nine dates. This now allows reasonable flexibility to the candidates.

SINGLE ENTRANCE EXAMINATION FOR SELECTION DECISIONS – A CRITIQUE

While NEET appears to be a solution for many ills in the existing selection procedures, it also creates problems relating to this uni-dimensional approach to admissions for medical colleges. Nonetheless, for medical educators, NEET need not be just a challenge but also an opportunity to think about all aspects of medical education in India.

Benefits of a single admission test such as NEET

- Brings down the cost and efforts for students
- Resource efficient
- Potential to curtail financial malpractices in admission

- Seemingly a ‘standardized’ and ‘objectivized’ national level platform

The likely limitations of using a single high stakes examination for admission to PG courses are summarized in **Table II** along with suggestions to counterbalance the limitations. Some of the major limitations deserve further analysis and discussion:

Prior academic performance is ignored: Prior academic performance in the form of school-leaving examination scores have been reduced to an eligibility criterion and that too at a meager cut-off score of 50% (even lower for accommodating special categories of applicants as a welfare effort). The adverse educational impact of this type of assessment can be readily seen - school students have shifted their focus from school studies and concept building to preparing for the Multiple Choice Questions (MCQ) of the medical entrance examinations. To the students it makes sense since the HSE scores are devalued. This devaluation of prior academic performance has weighty consequences. Studies from around the globe, including a relatively recent one from Delhi, demonstrate that past performance can predict performance in medical school [4,5,26]. A similar pattern of entrance examinations exists in selection to Medical Postgraduate courses (PG). The performance in MBBS – which is assessed by 56 examiners - is not given any importance, and students spend their internship preparing for the MCQs that comprise the PG entrance examination. Acquiring competency to practice as a physician is not the focus of UG medical students, nor is it assessed for making admissions decisions to PG courses. This unintended consequence of not adopting systems approach deserves debate and alleviation.

Students become MCQ solvers instead of exploratory learners: NEET has an MCQ-based format and is a knowledge test, whereas the purpose of a selection/admission test should be to assess the overall suitability for further medical training and not just the level of knowledge. This diverts the students to “selection examination” oriented learning, focused solely on solving MCQs. Further, such a test has the potential of discouraging students from exploring other learning experiences, thus distorting their learning priorities [28]. This misalignment in purpose and action needs to be addressed and redressed.

The 3 hour – 200 question format of entrance tests fails to test higher cognition: Traditionally, most entrance examinations follow the ‘3 hour - 200 question’ format, leaving little option for paper setters to go beyond assessing recall of knowledge. Since it becomes difficult to stratify thousands of students on the basis of recall

TABLE II SINGLE ADMISSION TEST FOR PG COURSES: LIMITATIONS AND SUGGESTIONS FOR IMPROVEMENT

<i>Limitations</i>	<i>Suggestions for making selection more valid</i>
<ul style="list-style-type: none"> • Raises the stakes on a single examination with negative educational impact • Limits options for students in case of non-selection [21]. • Suboptimal assessment of knowledge • Students likely to indulge in examination oriented learning for ‘cracking’ MCQs rather than acquiring clinical skills. • Does not assess clinical or soft skills, essential for further medical training. • No testing for ethical judgment, professionalism, teamwork etc. • Students may skip some content with smaller representation (e.g. Anesthesia, Psychiatry etc.) • Performance depends on many factors in addition to knowledge, thus bringing ‘construct irrelevance’. 	<ul style="list-style-type: none"> • Give credit/ weight age to performance in certifying courses, as a qualifying criterion e.g. Higher Secondary examination for selection to UG courses and MBBS for selection to PG courses. • Stop the drift towards MCQ oriented learning. A robust system of formative, on-going, in-training assessment (Internal Assessment) as well as strengthening of the certifying assessment will retain the focus of students on learning contextually, and acquiring clinical and soft skills towards becoming a competent physician. • Knowledge assessment can be improved by changing the format to a longer examination with MCQs that are context based and test clinical reasoning. • Other tools for testing higher order thinking skills, aptitude and ethical judgment may be included.

type questions, the examiners resort to adding some ‘difficult’ questions about rare diseases or single case report, that have no relevance to the objectives of the entrance examination [29]. Although NEET being a computer-based test provides a unique opportunity for incorporating videos, recorded patient encounters and other methods to even test affective domain, the same has not been utilized. Very few efforts have been made to scientifically understand the impact of such large-scale examinations. We allude to the earlier study from Delhi that demonstrated that the entrance examination scores do not predict performance in medical school [26]. This is in agreement with the findings from other countries; no similar study could be identified pertaining to PG entrance examinations. Clearly, more research is needed, along with changes in MCQs so that they test higher order thinking rather than recall, as is the case with most questions in USMLE examinations [30]

Clinical skills are not assessed: The proposed PG-NEET does not test clinical competence, yet the implication is that the applicant has the competence to start PG studies. An improvement in the end-of-course MBBS examination as well as the in-training formative assessment and feedback, is perhaps the key to justifying this presumption.

In-training formative assessment has been regarded synonymous with Internal Assessment (IA) in the Graduate Medical Education Regulations 1997 (GMER), though there is a fine difference [31,32]. It has the potential of redirecting students from examination-oriented learning towards in-depth, conceptual, contextual and experiential learning. Much flexibility

has been provided in the regulations for planning and implementing IA in Indian medical schools and every medical teacher has the potential of making the best of it. Hence this aspect is discussed in some depth.

Improvement in Internal Assessment to offset the undesirable effect of single PG admission test on student learning

The basic tenet of understanding the utility of IA in improving selection to PG courses lies in the fact that contrary to the obvious, UG and PG medical training must be viewed as a learning continuum rather than as two different courses separated by the selection examination. The learning process and competencies mastered during UG training are an important foundation for undergoing further specialty training. Its importance is well elucidated by experts in a recent article wherein they write, “A *formative focus in Undergraduate Medical Education better prepares the students for residency training....*” [33].

The essence of IA lies in its ‘formative’ role for monitoring and positively influencing the process of learning by way of timely feedback during the course. Further, the competencies that can be assessed during training by direct observation at workplace such as communication, professionalism, procedural skills, etc. are not amenable to assessment in the final end-of-training examination. Hence, the educational information provided by the IA and final examination complement each other rather than merely being two numerical scores. This requires careful drafting of a longitudinal assessment program that covers the entire period of study [34]. The

GMER 1997 of the MCI made a beginning in this regard by making it mandatory to pass in IA to be eligible for the final university examination and also according weightage (20% at present) to the IA towards final results [32]. However, the full potential and formative function of IA remains largely untapped in our country [31]. In most institutions, it is reduced to sporadic assessments during MBBS course rather than deliberately linked assessments of developmental attainment of competencies. An effective internal assessment must be based on multiple observations made by multiple examiners over a period of time and, preferably, all faculty members in the department should be involved [31,34]. This can also compensate for any individual examiner's bias.

In the USA, an ongoing comprehensive, multi-modal, in-training assessment is done over the four years of undergraduate training, and these are detailed in a document called the 'Dean's letter'. This is an integral and important part of the application for PG training, along with USMLE scores, personal statements, reference letters, and on-campus interviews. The Dean's letter also includes previous education/accomplishments (prior to medical school entrance), family background (if relevant), extracurricular accomplishments, etc. The idea is to provide a synopsis of personal attributes of the applicant. In clinical subjects, there is a more extensive write-up that takes into account narratives provided by attending physicians and senior residents as well as standardized subject examinations provided by the National Boards. Most schools end by stating 'On the basis of the overall performance we rate this student as Outstanding, Excellent, Very good, etc. Usually each institution has certain academic criteria for these adjectives (typically percentiles). Recognizing the utility of the information provided by this comprehensive document in making selection decisions for residency positions, the Association of American Medical Colleges (AAMC) refined it to a standard format referred to as Medical Student Performance Evaluation (MSPE) [35,36]. Further modifications to it are now suggested such as the focus on the core competencies, details on professionalism, more stress on evaluation of clinical clerkships (clinical postings) [37].

Whether an identical system is appropriate for India can be debated; it is reasonable to say that, in the USA, in-training assessment has been accorded importance during planning, implementation and utilization - not only as a steering force for learning process and skills acquisition in undergraduate education, but also as a measure of suitability for admission to PG training; further, a subjective description of performance in addition to 'objective' scores are also given importance.

Some suggestions for alleviating other limitations of a single entrance examination:

- i. *Duration of test:* It is well known that the reliability increases with the testing time. Increasing the testing time will contribute to building validity as well as reliability. In addition, increasing the time available per question will allow inclusion of application oriented and problem solving questions rather than only recall and recognition questions
- ii. *Don't disregard the assessment of crucial non-cognitive components:* A conscious effort must be made to overcome the tendency to discard the assessment of components such as communication skills, ethics, professionalism that are not easily amenable to 'objective' assessment methods, but are *sine qua non* for good medical practice. We are perhaps missing out on the merits of subjective assessment by equating it with bias. While MCQs are labeled as objective, they are not truly so as the one who designs them does so on subjective thought. Isolated objective testing can be likened to the story of blind men describing only parts individually (and perfectly), but no one with the correct picture. Subjective assessment also permits a better assessment of soft skills. This could be in the form of an essay, discussion of a situation for judgment analysis, interview, etc., depending on feasibility.
- iii. *A limitation not discussed further in this paper* but definitely worth a thought and mention, is that a single high-stakes examination has led to a culture of students attending expensive preparatory courses and coaching classes. The financially/socially disadvantaged students may feel themselves to be at a further disadvantage by way of not being able to afford/ find time for the same. If the examination is designed to largely test for aptitude, thinking process and application rather than recall, this may reduce to some extent.

In conclusion, we welcome the move to have a common national examination in the form of NEET that will help standardization and uniformity of admission process. However, we propose in this paper, several other considerations and improvements, if we are to raise the standard of medical education that is desired by the individual and the society. It should be a well-planned test conforming to the principles of assessment as discussed above and subjected to the rigors of evaluation. Some of the likely drawbacks of a single entrance examination can be counterbalanced by strengthening the MBBS final examination, and by making the in-training formative assessment program/IA

of MBBS course more robust. The students can be kept on a desirable course of learning with acquisition of necessary skills rather than them drifting to only test-oriented learning.

The concept of golden alignment between curricular components *viz.* objectives, teaching methodology and assessment is well accepted. Gliatto, *et al.* [28] have rightly pointed out that a proper balance be maintained between the various curricular components to provide a working space for innovations in medical education to make it relevant to the health needs of the society. However, putting too many stakes on any one component - single assessment for career trajectories in this case - is likely to take away any degree of freedom that we have to innovate [28]. They lucidly express it in the American context as quoted below, and it is easy to draw parallels to Indian context:

“If we want our assessments to reflect our values and societal priorities, we need to break free of the self-imposed constraints of using MCAT and USMLE scores to determine who advances into medical school and residency”[28].

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