



REDEFINING MEDICAL EDUCATION IN INDIA: A PERSPECTIVE

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ABSTRACT

India has largest number of Medical Teaching institutions in the world. However, there has been a wide, qualitative and quantitative disparity in the teaching standards, infrastructures as well as competency of medical teachers and students in our country. Medical Education is a highly dynamic & evolving science that needs to be transformed to meet with the pace of the progress in the field of medicine. It should be capable of adapting newer teaching modules as well as the socio-economic expectations and changing pattern of the diseases with ultimate aim to provide highly responsive and reliable health care delivery system in the country. The teaching should be able to generate enough interest and enthusiasm among medical students to inculcate ethos and practice of problem solving approach towards curative, preventive aspects of clinical medicine as well as commitments towards genuine research and innovations. Restructuring of curriculum & mode of medical education should directly focus on the need of better understanding of various aspects of managing Indian subcontinent based tropical, communicable, epidemiological & other diseases. The review article is aimed to highlight the role and reframing of Artificial Intelligence as augmented intelligence in medical education, application of Competency-based medical education (CBME) that is to be effectively clubbed with the concept of lateral, vertical and horizontal integration of mode of education. The proposed module is comprised of Intra & Inter-professional team-based learning (TBL) of particular disease and its management strategies among various sub disciplines of medicine & clinical transformation of basic sciences. Stress will be on integration of medical education, basic and clinical research with biomedical research and innovations befitting with the need of the country.

KEYWORDS : Competency based medical education, Medical Student Performance Evaluation, Stanford Faculty Development Program Model,

INTRODUCTION AND BACKGROUND:

The word education originated from the Latin word educatio which means "to bring up". Modern day system of education should therefore, demystify man's relation with the creator, ultimately finding an optimum extrapolation towards the service of mankind or in other words, provision of essential healthcare for the mankind. Education is one of the most important factors in the economic development of any country.

India, since the early days of independence, has always focused on improving its education system, more so the medical education due to its direct impact on health & life. The seventh five-year plan dictates, "Human resources development has necessarily to be assigned a key role in any development strategy, particularly in a country with a large population like India"[1].

Education in India means the process of teaching, learning and training of human capital in various categories of schools and colleges aimed to improve and increase knowledge, which results in skill development, thereby, enhancing the quality of the human capital, much pivotal in nation building.

Demystifying The Cog Of Indian Medical Education System:

In 2018, a major reform in the Indian healthcare system was attempted when the parliamentary standing committee report on health and family welfare highlighted the inadequate

availability of trained and qualified doctors to teach as well as practice healthcare for the benefit of the Indian population. It focused on the sub-optimal doctor-population ratio of 1:1655 as against 1:1000 as prescribed by the WHO, highlighting that, for a population of 1.3 billion, there weren't enough doctors, and the deficiency was grossly pronounced in the rural India where more than 69% of the population lived. The deployment of the doctors was 3.8 times more for the urban population where not more than 31% of the population lived, thereby, skewing the basic dictum of accessibility and affordability of essential healthcare towards the negative denominator away from the masses.[1,2]

As per an estimate by the Ministry of Health, at present, India has 554 medical colleges that annually provide 82,950 MBBS seats. It is estimated that by the year 2024, India would achieve a ratio of 1.03 doctors per 1000 population, a basic mandatory requirement as per the global health monitoring body, the WHO.[3]

But merely opening new medical colleges and increasing the number of seats is just not enough if there is no corresponding improvement in the teaching, training, hiring and augmentation/ alteration in the education delivery system of the country. The imminent challenge for the medical education system in the country is that, despite the presence of nearly 600 medical colleges, including few of the prestigious institutes of national repute, only handful of them feature in

the top list of global medical colleges, therefore questioning the rational & reliance of the existing system of medical training and education. (<http://medicaldialogues.in>>health)

Need To Keep Up The Pace:

Medical science is a rapidly evolving science with advent and introduction of newer modalities of treatment every day. Even this alarmingly rapid pace of evolution in treatment methodologies, at times, falls grossly behind in its overall ability to tame the ever-changing and dynamic spectrum of newer illnesses that the mankind is regularly exposed to. So, in order to be actually effective, the medical education system in India should not only evolve and grow rapidly with paralleled pace but also be tailored concurrently during its evolution process by incorporating newer teaching modules and modalities being practiced globally, resulting in establishment of a highly responsive and reliable health care delivery system in the country.

Vital aspects of medical education including concepts like communication skills, decision making, leadership quality, team approach and empathy encompasses only a trivial section of the present day medical school curriculum. With an increase in the present days' incidences such as violence on medical professionals and professional negligence mandate the requirement of inculcating these virtues in the current medical education system.[4]

Medical education module has to be tailored as per the need and expectations of the country, especially oriented and designed to perform effectively in rural and suburban areas. Country needs medical setup to the tune of inclusive yet hybrid to have a wide canvas of amalgamation of preventive and curative medical system and that too, enveloping basic and advanced research with ultimate outreach up to remotest and most underprivileged demography.[5] This is the utmost vital mandate of the medical education system to ensure that the medical students should be well versed with some basic competencies to practice the acquired clinical skills in a proficient manner independently, being rightly known as entrustable professional activities (EPA).[6]

The newer modalities of medical education should be able to generate interest and enthusiasm among medical students and encourage them to inculcate the acclaimed philosophy of medicine, besides imparting the adoption of problem-solving approach towards the promotive, preventive & curative dimensions of clinical medicine and also propel their commitment towards genuine research and innovations. The newer education modalities should also focus on the restructuring of training curriculum to directly address the need for better understanding of the tropical, communicable, and epidemiological aspect of diseases prevalent in the Indian subcontinent. Newer education system should be able to train medical professionals in the diversity of the components like humanitarian, geographical, socioeconomic concern, application of artificial intelligence, tele-medicine, financial and human resource management courses. Hence, vertical, horizontal, inter and intra-disciplinary integration is a very essential tool to promote and establish an effective tailor-made medical education and health care system in the country.[7,8]

Newer Models Of Medical Education In India:

With the technological advancement, modern state of art teaching has broken all the physical barriers, making teaching and learning practically a seamless and boundary-less affair. Few of the formidable developments towards this is the enabling virtual teaching/ training, creation of knowledge bank and campus wise knowledge pooling/sharing networks, propagation of Competency based medical education (CBME) and practice of Team based learning (TBL)with an emphasis on strengthening problem solving skills.[9]

Primarily, CBME is a learner driven process, with teachers as facilitator in the whole process of knowledge exchange. The biggest advantage is that it allows a learner to acquire the desired skills at their own pace. As a definition, competency refers to the habitual and judicious use of various attributes required to improve the health of an individual patient and the community. In general, competency incorporates varied dimensions like knowledge, skills, and attitudes in differing combinations. Towards this, Competency based undergraduate curriculum has been propagated for adoption by all the medical colleges from the 2019 academic year in India.[10] Major highlights of this system are the introduction of a foundation course (FC); early clinical exposure; concurrent program incorporating essential patient care elements like attitudes, ethics and communication; emphasis on small group learning methods; and a horizontally aligned and vertically integrated method of teaching-learning loop.[11,12] The hallmark of this model is that it does not prescribe any modality or particular learning strategies or fixed predetermined formats for training, but it focuses on the envisioned outcomes. On the other hand, Team-based learning (TBL) provides an active, structured form of small group learning that can be applied to large classes. TBL is defined as "an active learning and small group instructional strategy that provides students with opportunities to apply conceptual knowledge through a sequence of activities that includes individual work, teamwork, and immediate feedback". TBL was originally designed by Professor Larry Michaelsen in 1980s, in the United States of America, for use in business schools in response to increasing class sizes and his concern about the effectiveness of learning from lectures to large groups.[12,13,14] The major advantages it accrued were that it provided the opportunity to continue teaching in a manner that was engaging, catered for a large number of students, provided immediate feedback, involved students in decision making, and promoted active small group and class discussions, besides going beyond the simple transfer of content towards the application of knowledge through conceptual integration and problem solving. In recent years, TBL has gained popularity in medical and healthcare education as a resource efficient, student-centric teaching, without the need for large numbers of tutors, which gives it an edge over the Problem based learning (PBL).[14]

Table 1: Key components of Inter-professional team-based learning (TBL) (Student accountability is achieved through these specific steps of TBL)

Sr. No.	Key components/ Target	Action /outcome
1	Carefully formed & managed teams	Students assigned to teams using a transparent process
2	Frequent & timely feedback	Answers are discussed immediately, with clarification provided by the facilitators.
3	Problem-solving	Teams are required to use their collective knowledge, clinical reasoning, ethical views, skills & values to solve complex clinical problems that apply to real life situations including the healthcare delivery.
4	Student peer evaluation	Peer evaluation provides an incentive for students to positively contribute to group problem solving & learning, & helps to ensure student accountability, besides initiating the process of giving & receiving constructive feedback, which is an important professional skill for health professional students to learn.

Implementing strategies for CBME & TBL: Formulation of action plan, Training, Communication and Teamwork:

Implementation of CBME & TBL processes and incorporating all its elements is a tedious process of change, and therefore, a challenging event for any organization and the very first bottleneck is to address the inertia to move into a newer system of teaching-learning-patient care-feedback loop. It is a well-known fact that the resistance to change is naturally inherent in human nature. The process may be perceived as a redundant entity and just an unnecessary increase in workload, pegged up by the lack of motivation to inculcate.

(a) Adoption of this new system of education in the medical institutions requires careful planning from the administrators, medical educators, and the curriculum committee members, as this is an effort and resource intensive long-term programme; impregnated with the inherent challenges of sustaining the change. In one of the researches published by Shaifaly M Rustagi et al, out of 58 faculty members involved in the study, 87.9% were aware about the CBME but only 51.7% felt that better doctors would be produced as a result of its implementation.[15]

(b) The key areas in implementation of CBME include getting everyone on board and modifying the organizational vision, form an implementation team and sensitize all the stake holders, explaining the relevance of the newer model i.e. how it differs from the conventional approach of teaching-learning, the significance of adopting them and the benefits it would have on the overall ability of a professional to provide an accepted healthcare, essentially an acceptance or a bedding-in process for the intended vision.[16]

(c) The necessity of teamwork and a multi-disciplinary approach for implementation, understanding that they are based on rational, evidence-based-medicine supported by adequate and appropriate technological and scientific knowhow cannot be over emphasized.

(d) One of the major bottle necks of adopting a new teaching system, CBME, TBL and likewise, across an organization, is the concurrent trepidation of losing the small gains or turning back to the pre-existing traditional medical education system if substantial and visible achievements are not attained despite proportionate efforts within acceptable timeframe. Hence, sustainability of any newer policies and their subsequent, effective and productive implementation remains the most challenging task. Therefore, identifying midterm gains, though smaller, and intermittent and critical evaluation of the process is a highly crucial step towards cementing and sustaining the process of reforms.[17,18,19]

(e) Horizontal and vertical communication bottlenecks are common in most healthcare teaching facilities. Unidisciplinary training and education having all together separate verticals are unlikely to achieve goals and trends of the 21st century. Though, the main pillars of various streams like medical, engineering, humanities and commerce will continue to be there as prominent disciplines, yet, the integration of medical equipment with engineering, electronics and biomedical sciences has definitely formed a bridge among these disciplines.

On the same way, intra-disciplinary integration of medicine, surgery, pathology, psycho sociology, dentistry, occupational medicine and nursing sciences is very crucial and essential component to make medical education more effective and crisp thus resulting in a better healthcare delivery system in the country. Early longitudinal integration of clinical practice in medical education system is highly beneficial to improve quality of health care and develop caring attitude among medical students as well as galvanise their learning process.[20,21]

(f) It is high time that we adopt Multidisciplinary approach where educators from different disciplines synchronise teaching and contribute pearls of their disciplinary knowledge in medical education. On the same way, horizontal integration of Interdisciplinary resources will augment learning process by providing a cohesive platform. Similarly, trans-disciplinary approach will be able to develop an infrastructure of overall and creative learning without restricting the gains within the stream of post graduate medical education. Hence, a well carved-out action plan incorporating step-by-step events in great details with anticipated timelines, smooth process of transition while adopting the systematic approach and working together in a multi-disciplinary team, which in itself requires tremendous effort and a paradigm shift in mindset, instituting training programmes for the medical teachers aimed at improving their capabilities to carry out teaching in the newer format are all inescapable prerequisites.

(g) Finer details that require focus are the objectives of the curriculum, its content, organization of content and learning experience, intent of the teacher-learner, availability of resources like the number of qualified faculty, finances, and the available infrastructure, expertise available to affect the change in assessment process, existing method of assessment, proposed plan for assessment, evaluation process, and feedback mechanism intended to bring out the actual impact of the revised model on the healthcare delivery.[22]

(h) To develop the best of core competencies, the health care and medical education system must focus on patient-centric care as most significant goal. To achieve this, an interdisciplinary team of medical educators must inculcate ethos of evidence-based practice knitted with the judicious application of informatics, qualitative and quantitative gains, into the mindset of health professionals. Dynamic shift is very much envisaged to achieve best standards in research and transform medical professionals into a perfect health leadership with a singular country centric goal.[23]

(j) There is a need of enhancing teamwork culture in training. This includes sharing expertise and learning from each other. Likewise, a medical intern can definitely learn nursing techniques like administering intra venous injection from trained nurse in the ward. On the same manner, operation room technician may be a better mentor to impart training in operation protocols pertaining to sterilization, maintenance of equipment and surgical instruments. Similarly, occupational therapists, grief and organ donor counsellors and clinical psychologists have tremendous role to play in enhancing teamwork culture as well as transforming medical students into perfect medical professionals. Hence, skill based transfer of technology is highly significant and needs formulation of training module. On the same way, medical education and training needs to focus to ensure a methodology to break the barriers of interdisciplinary education system. Issues like influence of the dominant culture of specialization and inadequate interdisciplinary medical education concept and infrastructure persist and need to be dealt with.

Integration Of Basic And Clinical Sciences:

Integration of basic and clinical sciences during entire spectrum of the undergraduate medical courses has been widely accepted in developing countries. This interdisciplinary integration leads to enhanced learning process in diagnostic and clinical skills of the undergraduates.[24,25] This interactive, simultaneous co-teaching augments better understanding of the subject and enhances the application of basic sciences in the clinical practice. Interactive sessions by different sub-disciplines of medicine on the subject make an effective comprehension of course content, remove duplication as well as provide a useful platform to engage

students in the process of critical analysis of the disease to attain logical and sound knowledge by cross communications and exploring different approaches to solve the problem. We need to identify and explore this flip of courses in class curriculum in each and every subject and focus not only on the integration of basic sciences, but also, to engage further in very broad perspectives.[26]

Training In Management Of Human Resources And Financial Aspects:

The importance of human resource management, financial aspects of socio- burden and responsibility of medical professionals towards rural, suburban and under developed sections of the society cannot be undermined.[27,28] Therefore, for overall development of medical students, an induction capsule comprising of guest lectures delivered by experts from management, human resources, humanities and finance management will be of great help. These lectures may be augmented by incorporating problem solving short projects and exercises among small groups as useful tools.

How To Develop And Improve Communication And Soft Skills In Medical Undergraduate And Postgraduate Students:

The communication skill is a fine art and is as important as the knowledge of medicine and clinical acumen. Professionalism, an integral part of standard medical practice, warrants soft skills and effective communication along with knowledge, competence and ethics. [29,30] It is needless to stress that effective communication skill is one of the most powerful tools to not only develop a highly impressive understanding among medical professionals and paramedics but also, equally crucial to develop a very strong bridge of understanding and trust among all stake holders including patients and their relatives.[31]

American Medical Colleges Cincinnati Association has recognized certain components considered to be mandatory to all interactions between clinician and patient. The vital components include – building rapport and relationship, discussion, gathering information, understanding the patient's perspective, sharing information, reaching agreement on problems and plans and providing closure to the problem. These can be amalgamated into the existing medical curriculum and taught to the medical graduates during the communication training program.[17,18]

Artificial Intelligence, Virtual/ Online Mode In Medical Education

Artificial intelligence module in health care and medical education system comprises of overall integration of advanced digital technology in all the spheres of medical education and health care delivery system.[32] The online application of digital technology including smart phones, web video camera systems have shown remarkable efficacy to access, assess and provide solutions to medical issues even in far remote areas.[33,34,35]

Virtual classes are more interactive and can be clubbed as a useful tool prior to class room lecture. This flip and chip (pre lecture online video and initiation of lecture) [36-39] and the online inverted classroom model (OICM) [40] has proved to be highly effective. Indeed, the web based lectures and symposiums have provided a huge platform and unique opportunity to medical students to interact with peers anywhere in the globe and learn from any resources available.

Role Of Simulators On Enhancing Medical Training And Competence:

The rapid advancement of science and application of highly complex technology in the field of medical practice as well as

well lack of resources and infrastructure has adversely influenced the process of imparting training to medical students and paramedics. Virtual patient simulators are very effective and highly beneficial tools to train students. Virtual simulators enhance skill capability and confidence of the individual student without compromising patient's safety.[41, 42] This further reduces the burden on infrastructure, thereby reducing the cost of the training in long run. Simulators act as interactive tools prior to the induction of medical students into real time patient-centric clinical medicine. Virtual simulators having three dimensional digital presentations have proven to be very attractive designs in learning process. Simulators definitely augment affectivity of textbooks and clinical practice to transform medical students into competent and confident professionals. [43] In addition to general application of simulators in case of virtual cadaveric dissection, general clinical practices in obstetrics, nursing and pathology, virtual and robotic simulators and operating microscope have been found to be very effective tools to impart training in various surgical sub disciplines including Orthopaedics, Ophthalmology, ENT, Cardiothoracic, Neurosurgery and Urosurgery.[44-49] Simulators have been used in interventional cardiology and radio diagnostic fields also.[50] Hence, there is a strong need of formal integration of training on simulators in the curriculum of medical undergraduate and postgraduate teaching as a prerequisite to their induction into real time clinical training.

Training And Preparedness Of Health Care System To Handle Large Scale Disasters And Natural Calamities:

Natural and man-made disasters are global challenges. The world has faced and is still combating the worst ever pandemic of COVID 19 in the recent past. Explosion of nuclear technology, military activities in space, chemical, biological, radiological and nuclear warfare related threat deserve due attention as well as impose necessity to train and prepare medical professionals and health care systems to handle such newer challenges.[51,52] In most of the countries, natural disasters are handled by the military. Medical professionals in military services are trained to tackle CBRN incidences. Their exposure to military environment makes them more efficient and resilient to deal with disaster.[53,54]

However in case of mass destruction or pandemic like situations, civil establishment in medical field needs to act in full swing. Hence, well-planned and specially designed strategies are the need of the hour. It is highly imperative to sensitise medical undergraduates and paramedics to handle mass scale destruction and health casualties in case of occurrences of massive disasters [55].

The recent COVID-19 outbreak exposed the vulnerability and pitfalls of medical education and healthcare systems especially at the time of huge crisis and disaster. The training of medical postgraduates in various subjects has witnessed an unprecedented crisis. This has resulted in significant gaps in their training schedule. The mere absence of clinical and class room training was a major setback and has grossly interrupted the rapport between teachers and students.[56,57] Pandemic has adversely affected mental health of the medical students and staff. Interruption in clinical training, postponement of exams imposed dark shadow on the career progression of the medical students. Loss of employment and financial crisis was another major issue faced by medical staff and students. Hence, adequate counselling and assessment of lacunae in training is must to fill above mentioned gaps. Though artificial intelligence and web interactions have emerged as a good tool, however, it can act as a complimentary approach and cannot substitute and undermine the personal interactions between students and mentor. Direct and comprehensive interpersonal rapport and interaction among all the components of health care and

medical education including patients is an absolute necessity of medical education and health care setup. COVID 19 pandemic has exposed various shortfalls in the health infrastructure, preparedness and effective implementation of policies to brace with the need of the future. Hence there is a definitive need to learn from this pandemic and relook into the preparedness modules to meet with future challenges in the health care system. [58,59,60]

CONCLUSION:

Medical education in India is indeed a rapidly evolving entity, being congruently propelled by the necessity to adapt itself to the advent of newer modalities and concepts of medical science and technology for the containment of ever widening and dynamic spectrum of illness, which pains the mankind as a whole. The only way in which it can keep up its pace is by adopting newer and scientifically approved modalities of imparting the medical education like the much-acclaimed CBME, TBL etc. The process of implementation of CBME and TBL is a challenging task, and thus, requires team effort and a system based approach from all the involved stakeholders with communication and leadership being the backbone. These modalities provide positive contributions to pedagogy within healthcare education, helping to prepare students for the demands of increasingly complex healthcare systems and also extend dimensions to medical professionals to adopt and engage the concept of social and national commitments, crisis management, disaster and financial management of the health care system while maintaining global standards in clinical care.

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