Ann Natl Acad Med Sci (India), **50(3&4):** 123-134, 2014

Medical Education: A Re-evaluation of Current Problems and Possible Way Ahead

K K Deepak
Centre for Medical Education & Technology
All India Institute of Medical Sciences, New Delhi

SUMMARY

In this article the author analyzes the contemporary issues of medical education. He puts forth the plausible solutions focussing on four core issues namely- Objectivity in assessment, quality in high stake entrance examination, question banking and faculty development. Several of these issues are linked with quality of the faculty. These issues can be resolved with gradual, consistent and substantial efforts by administration, faculty and students. The author proposes that in the residency program, there should be structured course covering pedagogic skills, scientific research tools and professionalism. So far as the strategy for curriculum reforms is concerned, the issue has been taken up by Medical Council of India under 'Curriculum Implementation Support Program'. It includes four components- foundation course, early clinical exposure, integrated teaching and skills training. There should be institutionalized system for curriculum and assessment reforms. There is a need to develop a policy to strengthen our selection procedure/entrance exams. In order to improve the standards of medical education we must have functional Medical Education Units in each medical college.

Key words: Medical Education, Objective assessment, Entrance exam, Question banking, curriculum reforms

---

Correspondence : Dr. K.K. Deepak, Professor of Physiology, Prof. In-Charge- Centre for Medical Education & Technology, Nodal Officer-AIIMS, National Knowledge Network (NKN), All India Institute of Medical Sciences, New Delhi-110029.
Email: kkdeepak@gmail.com, Phone: Off. 011 91-26593583, Mobile 9868397129.

DR. B.K. ANAND ORATION delivered during NAMSCON 2012 at the Anna Centenary Library Convention Centre, Kotturpuram, Chennai.

Medical education has always been a challenge for academicians. It is not very easy to incorporate changes in the system according to contemporary needs. Under the aegis of the Medical Council of India (MCI) regulations, Regional Training Centres (RTCs) and Medical Education Units (MEUs) have been set up across the country. These Medical Education Units face their own problems to deal with various issues. In fact, this article re-evaluates the contemporary issues in the light of current status. The author also puts forth the plausible solutions. It is not possible to address all the issue related to medical education. Therefore, the author has taken up those issues where he has contributed to the development of medical education. The article focuses on the following issues:

1. Objectivity in assessment
2. Quality in high stake entrance examination and question banking
3. Faculty development and capacity building
4. Vision for Medical Education

1. Objectivity in assessment :

Objectivity in Assessment is an essential component of medical education. In order to maintain this objectivity it is very important to understand the dynamics of curriculum and its relation to assessment.

Contemporary societal needs actually shape the Curriculum. For example malnutrition, infection and water borne diseases occupy special significance in our UG curriculum. A curriculum determines how the learning objectives of syllabus will be framed and executed. Teaching influences the learning in a conventional set up. Learning is always assessed in the examination. What has surprised medical educationists is the fact that assessment drives learning (1). Therefore, a student focuses on what is actually being assessed in an examination. In such a scenario a part of curriculum and societal needs fall apart from the teaching-learning process. It has been observed that learning is also influenced by a hidden curriculum. The hidden curriculum is not taught but learned and emulated by students. What the students emulate influences to a great extent the health care delivery system of our society. This serves as important variable in teaching learning process.

There are several ways in which assessment may be improved. The formative assessment which is conducted periodically at short intervals can be improved by structuring the contents of assessment in detail. After each formative assessment a detailed explanatory feedback should be provided to each student, possibly soon after the assessment. It is advisable that a model answer should be provided to the students. For effective and objective summative assessment a teacher should be very clear about his role- a role like a judge. In general, the quality of any assessment is improved by proper structuring, blue printing, adequate coverage of contents, paying attention to validity and keeping a track of reliability.

Objective Structured Clinical Examination (OSCE) and Objective Structured Practical Examination (OSPE) have been used to enhance the objectivity in assessment for last three decades. OSPE is pre-clinical version of OSCE since pedagogically both are same. According to Harden and Gleeson (1979) "The clinical competence to be tested is broken down into various components …. Each components is assessed in turn and is the objective of one of the stations in the examination…..At procedure station, the student's skill is assessed. The examiner uses a check list to record the performance……" (2). It is noteworthy to mention here that we started OSPE at AIIMS in early 80s for the first time in the country, soon after the introduction of OSCE by Harden and Gleeson in 1979 in Dundee. Since then OSPE has passed through different evolutionary phases in terms of its research, development, application and creating a system for usage of OSPE.

Nayar et al (1986) have reported that OSPE score on two consecutive occasions showed consistency. A significant correlation coefficient of 0.81 has been reported (3). Soon after this study we investigated students' attitude towards OSPE since OSPE was naive to our system at AIIMS. In our study, the students reported that it is a valid examination. It is a reliable method of conducting the practical examination. It facilitates the learning process for the students. It is more challenging and stressful than the conventional practical exam. The students further opined that it assesses an entirely different set of skills as compared to the conventional practical examination. **Figure 1** shows students' attitude towards OSPE as measured on Osgood's differential scale. On the whole OSPE has high acceptability by students (4).

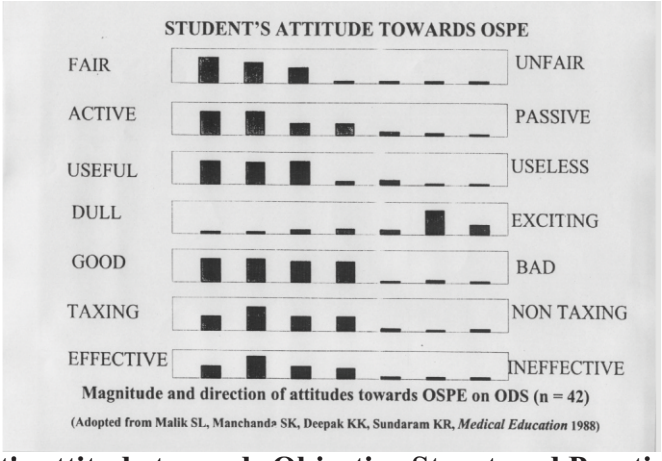

Figure 1. Student's attitude towards Objective Structured Practical Examination (OSPE) as measured on Osgood's differential scale (ODS) scale. (Data reproduced from article published in Medical Education in 1988, with permission) (4)

Figure 2 depicts a typical lay out for OSPE examination. In OSPE several practical task based questions are prepared that can actually be performed and answered in short duration i.e. 4-5 minutes. During the OSPE examination the skill learned are actually demonstrated by the students. The tasks which seek demonstration of psychomotor skills are called *procedure stations*. One example of procedure station to assess skills of recording blood pressure in humans is given in **Table 1**. The other types of stations which assess cognitive skills like interpretation of graphs, calculation of values and knowledge related to psychomotor skills are called *question stations*. In formative internal assessment we use 12-16 OSPEs in department of Physiology at AIIMS. In final summative assessment a total number of 25 to 30 OSPE stations which require about 120 minutes are arranged.

In the department of Physiology at AIIMS we have more than 500 OSPEs, generated out of a self sustaining system to create OSPEs. Figure 3 flowchart provides the detailed steps involved in preparation of OSPE questions and checklists. We implemented the administrative measures to improve objectivity in the professional examination at the level of institute. This was done by doing a situation analysis of objective practices like OSPE/OSCE and structured viva-voce examination across all UG and PG professional examinations and initiating administrative steps to implement appropriate measures.

The system of OSCE and OSPE brought revolution in assessment process. As the OSCE/OSPE are composed of several quantifiable units of information, the item analysis can be easily performed. Therefore, it is easy to compute the reliability. About 25-30 OSCEs (requires

Table 1: Q. Record the blood pressure of the subject provided
Check list for the examiner for observing and scoring the recording the blood pressure

Sl No.	Component of task performed	Score	
		Yes	No
1	Deflation of cuff	(.2)	(0)
2	Tying the cuff	(.4)	(0)
3	Identifies the site of auscultation	(.2)	(0)
4	Raises pressure up to 200 mmHg	(.4)	(0)
5	Releases pressure slowly	(.4)	(0)
6	Correct recording	(.4)	(0)
Total score		(2)	(0)

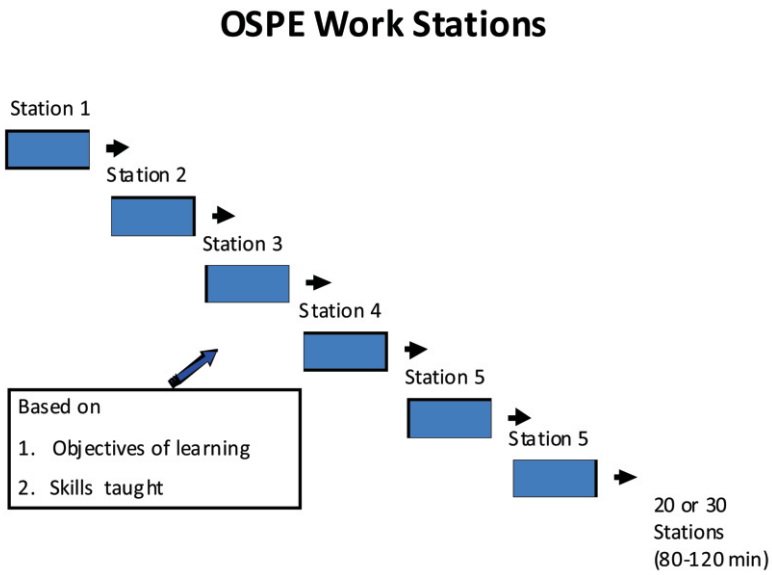

Figure 2. A typical lay out for Objective Structured Practical Examination (OSPE) examination. In final summative assessment a total number of 25 to 30 OSPE stations are arranged.

about 120 min of exam) would normally carry the acceptable reliability from pedagogical point of view. The OSCE/OSPE has brought objectivity, transparency and assurance of wide coverage of contents. The face validity of OSPE has been reported to be high by the students (4).

OSPE has certainly influenced the teaching-learning process in medical education. It has been reported that it

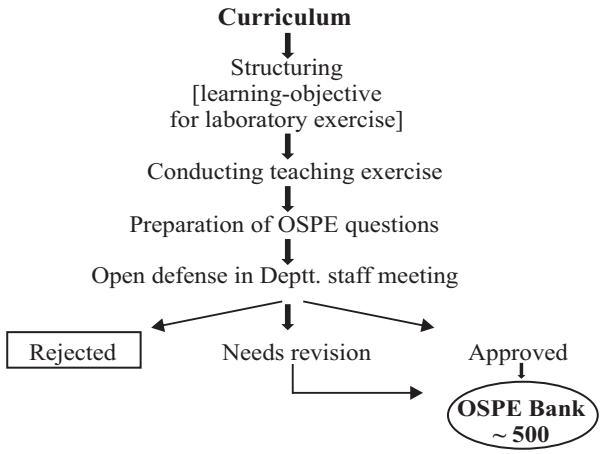

Figure 3. A system for preparation, editing and pre-validation of Objective Structured Practical Examination (OSPE) questions and checklists. Adapted from: Deepak, 1993 (5).

increases seriousness at study and improves attendance of students. After the introduction of OSPE the teachers have become more conscious of their own performance. OSPE also helps in giving a structured feedback. Therefore, OSPE has emerged as a successful instrument for practical examination in terms of objectively, reliability, practicability and validity (4, 6).

2. Quality in high stake entrance examination and question banking :

Conducting an entrance test is a challenging task. Howsoever robust and strong a system may be, some elements may find loopholes in it. It is a worldwide phenomenon and our country is not an exception.

The problems of conducting an entrance examination are three fold: paucity of MCQs (quantity deficit), poor quality MCQs (quality deficit) and operational issues (procedural deficit). These factors impose big challenges in conducting a perfect entrance test. However, there are the ways to control these problems. So far as the paucity of questions is concerned the author in the capacity of Sub-Dean (Exams) at AIIMS created a system for yielding high quantity of MCQs. Instead of entrusting the preparation of MCQs to the heads of the Departments, the MCQs were actually collected directly from the faculty members. By using this method even if one faculty gives 12 Questions a year, one can comfortably collect 3000 good quality items after rejecting 50% at pre-validation level from 500 faculty members (7). Even in a medical college (having faculty of 150 members) it is not difficult to collect good items by creating an ongoing system. Like any examination work, a small token of remuneration for it is always helpful.

To improve the quality of MCQs one needs to initiate faculty development program. It is known that the quality of a question is directly related to academic excellence and pedagogic skills of the faculty. An item review (pre-validation, judgemental analysis) by a group of faculty always helps to improve the quality of an item (8). The next point refers to operational issue. The operational issue is how to generate and maintain a question bank. In our education system several question banks are available with various stake holders. Students maintain their personal banks. There are community banks in students' hostels. Considering the commercial interests, several books on MCQs and web based question banks are also available. Some web-based resources are freely available in public domain and some are available by paying a cost. MCQ banks do exist at institutional level, national and international level. They are called item banks (9,10).

It is a moot question, ideally how many items a bank should have. For medical sciences while preparing a question bank one should pay attention to a large number of learning objectives. There are 21 medical subjects taught at undergraduate level. To assess 21 medical subjects effectively, each subject may

have 2000-3000 items. It gives nearly 40,000 items which may cover the entire UG syllabus. If we calculate the number of items, we reach the same figure of nearly 40,000 items in accordance with system/organ based curriculum (integrated curriculum). In author's opinion this figure approximates the critical number of questions. There is a possibility to collect this number of questions in an item bank. This opens two avenues- first, by pooling resources, one can generate question bank with critical number of questions. Secondly, if a question bank is having critical number of questions, it may be made available in open domain (Open Question Bank). Pedagogically speaking, if a student can answer successfully the desired number of questions presented randomly, he can be declared successful. The concept of 'open question banking' is new. It can be successfully maintained and operated by using computational technology. Question paper can be given to students either by 'random question generation' or by 'criterion based manual selection'. From the question bank the reasoning and recall items can be mixed to generate a question paper. Therefore, the selection of question may be based on certain pre-defined criteria. After each examination if the questions are returned back to the bank, item analysis and appropriate editing of question is a must. Item analysis is the analysis of the responses of the students appeared in the examination. This analysis is also called 'post-validation' of items or psychometric analysis.

An attempt of cheating in an examination is a social evil. How aptly the Honourable Judge at Bombay High Court expressed his opinion with reference to a leakage of exam paper: “The bad element may be small in number, but they are active” (11). Over the years the methods used in cheating attempts have undergone a gradual change. Advanced communication technology has influenced these methods a lot. Accordingly, the methods to detect leakage and catch the culprit have also advanced. For example in the latest attempts to leak the question paper students have used miniaturised hardware to capture the image and used latest cordless communication technology (12). There is an urgent need to nullify such attempts by using high end technology like mobile jamming or advance ones. In order to prevent such attempts, not only we have to change process of our examination, but we need to explore psycho-social interventions as well. There is a serious need to do documentation of such events and develop a research evidence base for a sound strategy for prevention.

3. Faculty development and capacity building :

Before I re-evaluate the current issues in medical education it will be worthwhile to look at the continuing problems. The continuing problems of medical education include too much of rote learning, inadequate and non uniform clinical exposure, and deficient assessment practices. The newer

problems are related to commercialization of medical education. This problem is an off shoot of change in the mind set of stake holders namely corporate sector, students and faculty. Several of these problems can be solved by having a robust system for faculty development.

India is a big country. There are more than 335 recognized medical colleges in our country. To arrange the faculty development programme to all the faculty at continuous intervals is a mammoth task. To impart training on a regular basis Medical Council of India has established 17 regional training centres (13). If one questions whether all faculty may be trained at RTC level, the answer would be negative. If we take an average of 150 faculty members in each medical college, the total number of faculty would be about 50,500. If we divide them into the batches consisting of 25 faculty members each, the total No. of batches would be more than 2000 batches. If the present RTCs start training these batches, each RTC needs to train 120 batches. If one RTC trains 4 batches every month (one batch every week), it will take two years to complete one rotation. For several reasons, this option is not feasible. Therefore, MCI has evolved a cascade approach to impart training in medical education. In this approach RTCs are entrusted with the responsibility of educating staff at MEUs. The MEUs are supposed to train the entire faculty of a college. Still there are the following problems with this model:

1. Inadequate number of RTCs,
2. Poorly structured MEUs and
3. Lack of logistic resources at MEUs.

Therefore, besides reinforcing the existing cascade system of faculty development, there is need to have parallel support system integrated with cascade system of MCI. There are two suggestions: first, AIIMS, Delhi and upcoming six AIIMS may participate in a nationwide faculty development program. Secondly, scientific bodies and associations also develop a regular CMEs in medical education. There is a need for policy development for these issues at appropriate level. The distance learning modules, using vast capacity of National Knowledge Network (NKN) will certainly be useful for faculty development programs. The efforts of Foundation for Advancement of International Medical Education and Research (FAIMER) in creating the expert database in our country is commendable (14).

4. Vision for Medical Education :

The challenges and problems mentioned in forgoing discussion can be met with gradual, consistent and substantial efforts by administration, faculty and students. Keeping these views in mind MCI has been in the process of bringing sporadic changes in past. It had been a partial success, until MCI decided to bring out a vision document last year. This is called 'Vision Document 2015'(15). This year several rounds of meetings were held to develop a strategy to bring out the long lasting changes.

There are the following main changes/reforms that were proposed in the vision document.

1. Reforms in Entrance test: With the implementation of National Eligibility and Entrance Test (NEET), the concept of single entrance test is a reality now (MCI: Vision 2015) (15).
2. Curricular reforms.
3. Faculty development programs.

The present discussion focuses on curriculum reforms. The strategy for curriculum reforms has been defined by MCI as "Curriculum Implementation Support Program" as CISP. The CISP includes four components- foundation course, early clinical exposure (clinical relevance of pre-clinical teaching), integrated teaching and skills training. The aim of foundation course is to impart formal training in soft skills such as communication, language, group dynamic skills, leadership skills etc. Early clinical exposure has been planned to provide clinical relevance to pre-clinical teaching. In this program the students in preclinical years are exposed to clinical scenarios which help them to understand the significance of basic sciences. The integrated teaching occupies main role in CISP. The integrated teaching aims at integrating contents across basic and clinical sciences in a horizontal and vertical manner. It will result in meaningful and contextual learning, and presumably, it will avoid redundancy and duplication. Our experience over 2 decades and recently held symposium on Problem Based Learning (PBL) points towards the fact that Integrated curriculum is more suitable to Indian conditions than typical problem based curriculum. There have been several cases of failure of PBL in Asian countries (16). For uniform clinical skills training we require the help of computation technology and bio-medical engineering. Through advent of technology it is possible to use computer simulation, haptics and mannequins to provide adequate opportunities for skills training for medical students. These simulation models, besides helping in skills training, can also help in providing opportunity for research. The case in point is that the author developed a blood pressure simulation model as teaching aid (17), which was later used by students in a research project supported by National Aeronautical Space Administration (NASA, USA) (18).

Our country, under the aegis of National Knowledge Network (NKN) has developed a large knowledge network by connecting more than 850 institutions/organizations/colleges (19). More than 150 of them connected organizations belong to medical colleges/institutions. A very high band width connectivity is available with them. It will be of tremendous use in sharing medical knowledge both in real time and in offline mode. The onus of developing material to be used for such networking lies with individuals and individual medical colleges. Through such network synchronized didactic lectures can be shared, consequently creating a virtual classroom. One can develop virtual skill

lab which can be used by students across the country. Since the national knowledge network has immense capacity to store data, it may help to create medical research data base and virtual medical museum as suggested by Dr. SV Raghavan (19).

At AIIMS we have KL Wig Centre for Medical Education and Technology (CMET) which also serves to expand medical education and technology not only for AIIMS but for South East Asian region. Besides its main role of conducting faculty development programs it provides various media related services to the faculty. These services include designing and printing of posters for conference purpose, developing high quality clinical videos and photography, digitization and documentation of medical images. AIIMS has realized its responsibility towards training other staff in the hospital as well. Residents and tutors are pillars of any medical institution. They are future teachers. Realizing this fact, we conduct regular workshops and symposium for them. Other hospital staff members also need training to work more effectively in the health care system. We conduct workshops for them also. The model was followed by many others institution. CMET is also engaged in research to create evidence based medical education. Our future plan is to use high end technology for imparting uniform clinical exposure and teaching (20).

Medical education has tremendous scope for growth and development. In our set up when the residents join the department they are not familiar with pedagogic skills, scientific research tools and professionalism. Thus, I suggest that they should have some structured course/credit hours inbuilt in the residency program. There is a need to develop a policy to strengthen our selection procedure/ entrance exams. There should be institutionalized system for curricular and assessment reforms. In order to improve the standards of medical education we must have strong Medical Education Units with trained manpower in each medical college. These units should be networked using NKN support.

In summary, India has large base for advancing medical education. We represent about 14 % medical institutions of the world and about 37 % in Asia (13, 14). Undoubtedly, ours is the largest medical college network. Therefore, we have an opportunity to take a leadership role in medical education. The efforts of MCI in streamlining the regulating protocols are laudable. Our Government's initiative for starting 6 new AIIMS like institutions is a commendable effort. Some AIIMS like institutions have already started functioning and the rest are ready to start. These institutions may help in imparting faculty development program to several other medical institutions.

Acknowledgement:

The author is grateful to Dr. S V Raghavan, Principle Scientific Advisor, GOI, for discussion on NKN related application to medical education. Author expresses thanks to Dr. BV Adkoli and Dr. Archana Jain for valuable inputs.

REFERENCES

1. Van der Vleuten CPM (2000). Validity of final examination in undergraduate medical training. *BMJ* **321** :1217-1219.

2. Harden RM, Gleeson FA (1979). Assessment of clinical competence using an objective structured clinical examination (OSCE). *Med Educ.* **13**:41-54.

3. Nayar U, Malik SL, Bijlani RL (1986). Objective structured practical examination: a new concept in assessment of laboratory exercises in preclinical sciences. *Med Educ* **20**:204-209.

4. Malik SL, Manchanda SK, Deepak KK, Sunderam KR (1988).The attitudes of medical students to the objective structured practical examination. *Med Educ* **22**:40-46.

5. Deepak KK (1993). Role and methodology of objective structured practical examination for assessment of practical skills. In: Assessment Strategies in Ophthalmology: A panoramic view of assessment techniques in medical sciences. Khosla PR, Garg SP, Talwar D (eds). New Delhi: Ideal Impressions Pvt. Ltd,184-200.

6. Cohen R, Rothman AI, Ross J, Poldre P (1991). Validating an objective structured clinical examination (OSCE) as a method for selecting foreign medical graduates for a pre-internship program. *Acad Med* **66**:S67-S69.

7. Deepak KK (2011). Improved procedure for building and institutional question bank for high stake entrance exams. Proceedings of 6th congress of the Asian Medical Education Association held at Kuala Lumpur, Malaysia on 23-26 March 2011. p 97.

8. Deepak KK, Al Umran KU, Al Sheikh M, Mathew S, Adkoli BV, Al-Rubaish AM. (2010). Regular Feedback on Quality of Multiple Choice Questions Improves Reliability of Undergraduate Theory Examinations. Proceedings of International Conference 2010 : Advancing Quality through Partnerships of Health Professions Education and Health Services Institutions- The Network: Towards Unity for Health, p 142-143.

9. Deepak KK, Al Sheikh M, Al Umran

K, Adkoli BV, Al Rubaish AM (2010). Question Banking: Procedures, Obstacles and Solutions. Proceedings of Saudi International Medical Education Conference (SIMEC): 6-8 April, Jazan, Kingdom of Saudi Arabia, p 36.

10. International Database for Enhanced Assessment and Learning (IDEAL) Available at: http://www.idealmed.org/ (Accessed on 3 June 2012).

11. http://articles.timesofindia.indiatimes.com/2012-05-28/delhi/31876939_1_paper-leak-aipgmee-mobile-phone (Accessed on 3 June 2012).

12. http://www.indianexpress.com/news/paper-leak-no-stay-on-reexam/932767/ (Accessed on 3 June 2012).

13. The Medical Council of India. Available at http://www.mciindia.org/home.aspx (Accessed on 3 June 2012).

14. Foundation for Advancement of International Medical Education and Research. Available at: http://www.faimer.org/education/regional.html (Accessed on 3 June 2012).

15. The MCI Vision Document 2015. Available at: http://www.mciindia.org/tools/announcement/MCI_booklet.pdf (Accessed on 3 June 2012).

16. Khoo HE (2003). Implementation of problem-based learning in Asian medical schools and students' perceptions of their experience. *Med Educ*. **37**:401-409.

17. Deepak KK (1992). Blood pressure simulation model: a teaching aid. *Indian J Physiol Pharmacol* **36**:155-161.

18. Transmural pressure simulator in lower body negative pressure chamber during microgravity Available at: http://bones.ucsd.edu/C9StudentProject.html (Accessed on 3 June 2012).

19. National Knowledge Network (NKN). Available at: http://nkn.in/ (Accessed on 3 June 2012).

20. KL Wig Center for Medical Education and Technology (CMET). Available at : http://www.aiims.edu/aiims/cmet/cmet.htm (Accessed on 3 June 2012).