REVIEW OF LITERATURE

Medical Education-Historical Perspectives

Medical Education system in Britain and on which modern Indian Medical Graduation course is based, was developed chiefly as an apprenticeship system. Initially, this mainly comprised as general rule of the transmission of skills of the physician teacher to the student without involving a substantial understanding of the underlying theory. There existed no real structured system of Medical Education and training until the first half of 19th century when a revolution in Medical Education lead to several important reforms and improvements in the system. During this period, the growth of knowledge of basic sciences in health viz., Anatomy, Physiology and Pathology resulted in the understanding of patho-physiologic basis of various disease processes. This resulted in the wide acceptance of scientific methods as valid proofs of every subject content which lead the universities to establish or introduce Medical Sciences as an integral part of their teaching agenda.¹

The hospitals, which were until this time, the places for caring for the poor, were transformed by the adoption of the new valid scientific knowledge and methods into the sacred places for the management of diseases.

Concomitantly hospitals automatically got transformed into training places wherein bedside teaching occurred and hospitals became invaluable components of Medical schools wherein structured Medical training could be carried out.
The final outcome of all of the above influences is the familiar and time
tested ‘Traditional’ British Medical Education Structure, (which is conveniently
being followed until this time in India) with teaching of basic medical sciences
viz., Anatomy, Physiology and Biochemistry in the preclinical phase as a
prerequisite to clinical training, which occurs in the hospitals, in the subsequent
years of medical training.

The “Traditional” undergraduate course ............ Need for change

The traditional existing medical undergraduate program in the country
though not tailor made to suit the Indian requirements has proven to be robust
and capable of producing well trained doctors who have been accepted as
proficient physicians everywhere across the Globe. However there is increasing
concern that the ever changing needs of the society necessitate newer reforms
from time to time in the medical undergraduate curricula so that the novice
physician is able to meet the challenges faced by the medical profession.

The organization of the UG curriculum into rigid preclinical and clinical
phases has potentially undesirable consequences. In the preclinical phase students
fail to appreciate the clinical relevance of their basic science teaching. This could
carry over into clinical phase of training, where students may regard wrongly that
the actual much basic science knowledge is not essential because of their inability
to think critically.6
The challenge created by explosion in the Information and Communication Technology (ICT):

With the increasing availability of Medical information to everybody through information technology (internet) in the recent years the doctor-patient relationship has got transformed. Patients no more consider doctors as Gods as in earlier days but consider themselves as partners with the doctors in their treatment process. The physicians will have diminished role as the main provider of health care and interpreter of medical knowledge for his / her patients. To relate effectively to patients equipped with abundant and up to date information on their medical problems, the clinician would always need additional knowledge and treatment skills of the underlying medical issues and context and a greater capability to critically evaluate, analyze, interpret and infer the data.

Needless to say the physician must be thoroughly familiar with tracking down the recent and relevant information from the internet as a part of self directed lifelong learning process.

Increasing Importance of effective communication skills:

The changed scenario of patients considering themselves as partners in the treatment process, the expectation of the patients of their doctors is ever increasing. Patients want to discuss across the table, with the doctors, not only about their medical problems, outcome, side effects but would also like to put forth their unique values, expectations, moral and ethical issues etc, for consideration in arriving at optimal clinical decision.
In order to meet up to these challenges the physician would need to address these issues at each individual patient level and it is quite essential that the doctors are able to communicate effectively as sympathetically with patients and their relatives.

**MEDICAL EDUCATION IN INDIA- CHALLENGES**

Medical Education in India, today stands out as one of the largest educational systems on the globe producing largest number of medical graduates. In the decade to come, India is expected to cater to the global demands of supplying the trained medical human resource to the entire globe along with other three countries viz., Brazil, Russia and China. In view of this, the capabilities and competence levels of Indian Medical Graduates are viewed critically by scholars all over the world and has earned both admiration and also criticism. Hence it is the responsibility of the regulating council viz., Medical Council of India (MCI), to bring in curricular reforms so that the new Indian Medical Graduate fits and gets absorbed or accepted into the global health system.\textsuperscript{7,8}

Education is largely a matter of perception based on which we need to construct the ideal education logistics by defining precisely the goals, objectives and contents of the curriculum. The reformed curriculum needs to be implemented in a phased manner and the outcomes of the measurable objectives needs to be reviewed in both formative as well as summative assessments.

The medical education that are imparted, must vary in scope, quality and quantity according to different factors mentioned below.
Review of Literature

1. The state of socio-economic development of the region where the graduates will function
2. Geographical preponderance of health problems peculiar to the region.
3. Health problems that are consequent to international travel.\textsuperscript{9}

It is an accepted fact that our medical colleges have been producing graduates who are not well equipped to tackle the health care needs of the Indian society. The drawback of the system is overemphasis on acquiring/gathering knowledge rather than attaining skills.

The existing curriculum includes:

1. Large body of scientific content as theoretical knowledge.
2. No classification of curricular content into “must know” “useful to know” and nice to know” areas.
3. No much emphasis on subject like medical ethics, behavioural sciences communication/managerial skills etc.\textsuperscript{10,11}

The existing curricular design, which stresses teacher centered, didactic, discipline specific, lecture based approach and the system is haunted by a mismatch between what is taught in a medical college and actual skills those are needed by doctors to provide health care service.\textsuperscript{12}

Where does reform end?

A system that is driven by perception of educators and the socio cultural ambience of the society, the reform is an endless process. Abraham Flexer is credited with earliest advocacy reforms in Medical Education in his historic
report, wherein he emphasized scientific rigour and standardization in Medical Education and persistently identified people oriented principles in support of his advocacy.13

The present system of medical education in India dates back to the establishment of the medical colleges in Kolkata, Mumbai and Chennai in the later part of 19th century by the Government of India. Their syllabi and training were modeled on those of the Universities of London and Edinburg, and Indian degrees were automatically accepted for registration by the General Medical Council (GMC) of Britain. The Medical Council of India came into existence in 1934 to upload uniform standards for medical colleges in all provinces and accord recognition to medical qualifications from institutions in India and abroad. In 1975, the Srivastav Committee, advocated reorientation of medical education in accordance with national needs and priorities and recommended establishing a medical education commission to implement reforms. In 1986, the Bajaj Committee repeated the call for an educational commission for health sciences because they felt that although medical school faculties were effective in their clinical specialties, they were deficient as educators.14,15 In 1993, Kacker and Adkoli, in a private study, advocated linkage between curricular goals and the actual curriculum, and suggested extensive reforms. These recommendations were echoed in 2004 by Majumdar et. al in a government-commissioned report in which he emphasized the need for political commitment and leadership for an evidence-based medical education. Finally, in 1997, the Medical Council of India published its Regulations on Medical Education, which sought to integrate scientific knowledge acquired from various departments and disciplines into a
single instructional entity with vertical and horizontal integration. The MCI Regulations look sound and impressive on paper, but, have failed to elaborate the methodologies for the integration proposed. The principal failure of the MCI’s control mechanism is well-known by now. One of the main reasons why the regulations have failed to produce doctors equipped to tackle first contact problems of the Indian populace, whether rural or urban, is that the student never received appropriate hands-on first contact care training on the subject, the bare necessity for becoming a basic doctor which is the principal goal of the MCI’s regulations.\textsuperscript{16,17}

**REFORMS IN UNDERGRADUATE MEDICAL EDUCATION BY MEDICAL COUNCIL OF INDIA.**

The Government of India recognizes ‘Health for All’ as a national goal and expects medical training to produce competent “Physicians of First contact” towards meeting this goal. However the Medical education and health care in India are facing serious challenges in content and competencies.\textsuperscript{18}

Curricular reforms to systematically address these issues and develop strategies to strengthen the medical education and health care system are needed, so that Indian Medical Graduates match or better the International Standards.

1. To assess and evolve a road map for medical education relevant for India in the changing contexts.

2. To evolve a broad policy regarding the emphasis, duration and curricular changes that would be adopted as implementable strategies to make medical education in India comparable to global standards.
3. To evolve strategies and futuristic plans. So that medical education in India is innovative and is able to prepare undergraduates to perform in the changing scenario of medical science.

4. To institute immediate solutions and propose medium and long-term strategies to the existing medical education in a steady phased manner.

**Improving the quality of training:**

Apart from restructuring the undergraduate medical program (MBBS) and introducing a foundation course focusing on communication, basic skills and professionalism the innovative new curriculum has been structured to facilitate horizontal and vertical integration between disciplines, bridge the gap between theory and practice, between hospital based medicine and community medicine. Other innovative measures aimed at improving the quality of education include, early clinical exposure, ‘**Student Doctor**’ method of training, introduction of electives, emphasis on skill development and training, secondary hospital exposure and adoption of contemporary education technologies viz., skill lab, E-learning and simulation. The expected outcome of all of the above measures is to create a new generation of medical graduate of global standard viz., - “Indian Medical Graduate” who will possess the necessary competencies (knowledge, skill and attitudes) to assume his or her role as a health care provider to the people of India in both rural and urban settings and also the world.

In order to fulfill the above goals the doctor must be able to function in following roles appropriately and effectively, as a
1. Clinician

2. Leader of the health care team/system

3. Communicator

4. Lifelong learner

5. True professional

Competency based training would include designing and implementing medical curriculum that focuses on the desired and observable ability in the real life situations.

In order to accomplish the above goals to create a globally acceptable “Indian Medical Doctor”, the medical student needs to master a set of competencies at the time of graduation from the MBBS Program.

Competencies:

1. Clinician who understands and provides preventive, promotive, curative, palliative and holistic care with compassion, by being able to:
   - Demonstrate medical knowledge
   - Elicit record history
   - Perform physical exam
   - Demonstrate effective clinical problem solving skill
   - Maintain patient records
   - Choose/interpret appropriate diagnostic tests
   - Prescribe/administer appropriate therapy based on scientifically valid evidence
   - Refer patients correctly for tertiary care.
2. Leader and member of Health care Team/system who is able to
   - Work effectively with other professionals
   - Recognize and function responsibility in a primary and secretary health care setting
   - Educate and motivate other members to maximize health care delivery advocate health promotion, and healthcare quality improvement.

3. Communicator with patients, families’ colleagues and community respecting everybody’s values and professionals to make shared clinical decisions.

4. Life Long learner committed to continuous improvement of skills and knowledge and who is able
   - To perform self assessment
   - To apply new knowledge and skills
   - To introspect and utilize experiences to enhance personal and professional growth
   - To search and critically evaluate medical literature
   - To apply the new scientific, evidence based information to patient care
   - To develop research question and be familiar with basic, clinical and translational research
   - To select an appropriate career

5. Professional who is committed to excellence, is ethical, responsive and accountable to patients, community and profession and be able:
- To demonstrate selflessness, integrity, responsibility, accountability and respect
- To maintain professional boundaries between, patient, colleagues and society.
- To manage ethical/professional conflicts.
- To abide by ethical/legal codes to conduct and practice
- To demonstrate a commitment to the growth of the medical profession as a whole.

**Changed Scenario of Patient Doctor Relationship**

Gone are the days when doctors used to be considered as Gods by the patients. In the changed scenario of the present day health care system the patients’ expectations of a doctor have changed drastically as well as dramatically. The patients always want the best and the evidence based medical care, at an affordable cost, which is available elsewhere in the world. With the explosion in information and communication technology throughout the world, the patients have accessibility to the same medical/scientific literature as that of a doctor. Patients are becoming more literate about their ailments. They already know why it has happened and what is the best available method of investigation and the cure for the same. They are also well aware of the prognostic aspect of the disease process. Patients would like to be active partners in the clinical decision making process.

Hence the doctors have to be on their toes always, be updated all the time about any disease process and also to be in a position to offer the best evidence
based, patient care. Doctor should be competent throughout his / her career to incorporate the findings of new scientific/medical research into his / her practice. In other words, he / she should be capable of translating the findings of a new scientific research into medical practice thereby offer an updated evidence based medical care, to his/her patients.

SAFE DOCTOR

For many years primary requirement of core medical training could be summed up by referring to the development and production of a “Safe Doctor”. But today the general consensus of a “Safe Doctor” also means the ability to interact with the patient in a perspective manner. Patient’s don’t feel safe and may not even be safe if doctors either fail to communicate or do so in such an insensitive way that their advice goes unheeded. Hence some aspects of humanities have been included in the core medical curriculum as electives in several Universities across the world. By doing so, medical students are exposed to critical analysis of ideas as exemplified in such disciplines as philosophy, classics and law. Moreover introduction of medical humanities as a core part of the curriculum offers a double benefit, because it not only provides individual differences between the students but also allow them to think critically about the variety of career, which can arise from basic training. Medical graduates can go off in a wide range of directions, which require different skills for example some will have expertise in medical sociology, medical archeology or anthropology, some will specialize in medical issues in arts, literature, history or theology.
Hence to accomplish, the students need to think critically and various modes of instructions (such as EBM) in the early part of the medical program, are desirable, to produce a doctor contemporary to society needs.\textsuperscript{19}

GLOBAL MINIMUM ESSENTIAL REQUIREMENTS (GMER)…….

COMPETENCE BASED MEDICAL EDUCATION:

\textit{Half of what you'll learn in medical school will be shown to be either dead wrong or out of date within five years of your graduation; the trouble is that nobody can tell you which half—so the most important thing to learn is how to learn on your own.}

\textit{Dr. Dave Sackett: “Father of EBM”}

- \textit{Education would be so much more effective if its purpose were to ensure that by the time they leave school every boy and girl should know how much they don't know, and be imbued with a lifelong desire to know it.}

-- \textit{Sir William Haley}

Medical doctors are now members of a Global community in a Global village. Linked by a Global language, Revolution in Information and Communication Technology and Rapid Air Travel, Globalization has penetrated into each and every part of human life including the medical field. Now the question that has to be answered is 'What kind of physician does this global village need now?' Medical profession has always been considered as a global profession and medical knowledge, research and education have no national
boundaries. Furthermore, many aptitudes of physicians are universal, such as the doctor-patient relationship. This relationship, with its implied obligations by the physician and the patient, does not vary by time or place and it is a universal part of any good medical education program.\(^{20}\)

Over the past few years, several national and international groups have proposed recommendations to improve the quality of international medical education and adapt it to the rapidly changing global situation. One such important initiative was a meeting organized jointly by the World Health Organization (WHO) and the Educational Commission for Foreign Medical Graduates (ECFMG) in 1994 in Geneva. This meeting brought together 28 experts from 20 countries to discuss the topic: *Towards a Global Consensus on Quality Medical Education: Serving the Needs of Populations and Individuals*. The focus of this conference was undergraduate medical education, which laid the foundation for future professional life. At the conference, there was agreement that since many competencies required to be possessed by physicians across the world were identical, the goal of producing global medical education standards would be fully justified. It was agreed that besides general core competencies such as a medical knowledge and clinical skills there are other competencies specific to medicine such as Communication skill, Teamwork, Critical reasoning, Ethics, Self-assessment and Self-Directed Learning(SDL) which are equally important. Since a global profession cannot be a reality without a set of core competencies that define what a physician is, regardless of where he/she is trained, it was suggested that a process be put in place, including the
formation of an international expert group to develop global recommendations on
the core competencies, core curriculum, and evaluation methods.

A very active role on the international education scene was also
undertaken by the Association for Medical Education in Europe (AMEE) in the
form of a global forum for research. This forum has led to many innovative
initiatives in medical education. In addition, in late 1999, the World Federation of
Medical Education (WFME) started to develop a set of standards to be used for
the global accreditation of medical schools (World Federation for Medical
Education Task Force, 2000). This set of international standards addressed the
process of medical education and focused on the structure and function of
medical schools, including educational procedures, duration of programs,
facilities, number of staff available for instruction, and other resources necessary
to provide educational experiences for students.

With the growing globalization of medicine and the emerging concept of
a 'global profession of physicians', the issue of the essential competencies that all
physicians must possess becomes very sharply focused. If defined, these
competencies would help indicate what teachers are supposed to teach, what
students are expected to learn and what educational experiences all physicians
must have. In addition, mechanisms to assure that all graduates of medical
schools possess these competencies at graduation, must be developed.²⁰, ²¹

In 1999, the China Medical Board of New York created the Institute for
International Medical Education (IIME), which was entrusted with the
responsibility of defining the 'minimum essential competencies' that all medical
graduates must possess, if they wish to be called physicians. The first phase of the project devoted to defining the 'Minimum Essentials', began in 1999 with the establishment of the IIME. The core committee consisting of 17 experts in medical education from around the globe, was constituted. The Global Minimum Essential Requirements (GMER) were to include the knowledge, skills, professional attitudes and behavior that each graduate should possess at the time of graduation from medical school regardless of where he/she is trained. The Core Committee defined the minimum essential core competencies and grouped them under seven broad educational domains. These domains were identified through a review process involving literature searches, obtaining input from unpublished sources and from educational experts, and by a pooling of the experience and expertise of the committee members. Every existing major published listing of standards, outcomes and processes of medical education was incorporated into reference materials for the committee.22.
The seven domains that emerged from these deliberations included the following:

1. Professional Values, Attitudes, Behavior and Ethics
2. Scientific Foundation of Medicine
3. Clinical Skills
4. Communication Skills
5. Population Health and Health Systems
6. Management of Information
7. Critical Thinking and Research

The meaning of each domain may be found in the 60 learning objectives those were defined to cover each one of them.
The importance of the two domains called *Scientific Foundation of Medicine* and *Clinical Skills* is well understood and universally accepted since they have always created the foundation for effective medical care. The remaining five domains, while acknowledged as being important, have not been 'codified' or defined to the degree included in the IIME effort.

There is no doubt that the domain entitled *Professional Values, Attitudes, Behavior and Ethics*, which reflects the essence of medical and public opinion, is essential to the practice of medicine. Many of the daily complaints against physicians and medical services relate to this area. Physicians must be prepared to meet the consequences of the rapid advances in biomedical sciences and also in information technology, without losing the traditional values that have guided medicine for thousands of years.

No one doubts the importance of *Communication Skills* as an essential tool for all physicians. This follows since effective communication is necessary to create an environment in which mutual learning occurs among patients, their relatives, members of the healthcare team, colleagues and the public. Communication is essential if the physician is to understand the context of the patients' beliefs and cultural values.

The selection of *Population Health and Health Systems* as one of the essential domains reflects the growing conviction that it is no longer sufficient to understand only the patho-physiological basis of a disease, how it affects an individual and the diagnosis and management of the same. With a background of the knowledge of global epidemics of HIV/AIDS, tobacco, terrorism etc, there is
a need for the physician to understand the health of the population at large and to possess the skills of defining and following the guidelines/protocols for the management of these epidemics.

The domain 'Management of Information' is justified by the fact that the practice of medicine and the management of a health system, now and even more in the future, depends on the effective flow of knowledge and information. Therefore, physicians need to know how to use modern communication and information technology to access and manage medical information. They also have to understand the capabilities and limitations of information technology, and be able to use it for medical problem solving and decision making.

Finally, 'Critical Thinking and Research', as a priority domain, reflects the need for critical evaluation of existing knowledge, technology and information. This is essential if a physician is to be able to solve health problems. In caring for individual patients, physicians must apply the principles of Evidence-Based Medicine in making decisions about the utilization of limited medical resources. Graduates have to learn how to critically evaluate various data and information and understand the role of research in quality medical practice. This is especially true since the medicine of today will not be the medicine of tomorrow.

Advances in genetics, immunology, neuroscience and proteomics are transforming the face of medical practice. Educators face the challenge of how to prepare trainees of today for tomorrow's medicine. It is clear that the continued acquisition of new knowledge, technologies and skills will be required. Hence,
graduates have to be committed to lifelong learning and they have to know how to go about such learning in this new information age. In addition, they have to be aware of their own limitations, be ready for regular self-assessment and peer evaluation and be willing to undertake continuous self-directed study.

In a nutshell, any new medical graduate after complete of his MBBS course should be in a position to function as a self directed lifelong learner and be a competent professional throughout his/her career; necessary curricular reforms be brought in the undergraduate medical curriculum.

It is to be noted that the concept of 'GMER' does not imply a global uniformity of medical curricula and educational processes. Medical schools should adopt their own particular curriculum design, but in so doing they should first assure that their graduates will possess the core competencies stated in the GMER document and second, the competencies necessary to meet the unique health care needs of the area they serve.

The acceptance of the 'Essentials' and the incorporation of them into curricula are not in and of themselves likely to change graduates' competencies unless they are linked to an evaluation process. The assessment of the learning outcomes expressed in 'GMER' should ensure that educators will focus on these outcomes when they are planning educational programs and that students will try to acquire them before the time of evaluation.
Critical Thinking (CT)\textsuperscript{24}

CT is purposeful, self regulated reflective judgment, focused on deciding what to believe or what to do. It has also been described as Cognitive Engine Driving, Thoughtful Problem Solving and Reflective Decision Making. CT results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based.

CT is essentially a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in one’s personal and civic life. While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon.

Characteristics of CT:

- CT is being skeptical, without being cynical.
- CT is being open minded with out being wishy-washy
- CT is being analytical with out being nitpicky
- CT is being decisive without being stubborn.
- CT is being evaluative without being judgemental
- CT is being forceful without being opinionated

P Facione, Pearson Education, 2011

The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal bias, prudent in making judgments, willing to reconsider, clear about
issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. It combines developing CT skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society.\(^{25}\)

**Measurement of Critical Thinking Ability:**

The Critical Thinking Disposition Inventory is a measure which estimates one’s overall disposition towards critical thinking. A person may be positively and strongly disposed towards seeking to solve the problems and address questions using reflective judgement (Critical Thinking) or ambivalent towards that approach or even negatively disposed and hostile toward it.

**Truth Seeking**

It is the habit of mind of always desiring the best possible understanding of any given situation. Truth-seekers ask hard questions; they don’t ignore relevant details; they strive hard not to let bias or preconception color their search for knowledge and truth. The opposite of truth-seeking is bias, which ignores good reasons and relevant evidence in order not to have to face difficult ideas.

**Open-mindedness**

It is the tendency to allow others to voice views with which one may not agree. Open-minded people act with tolerance towards the opinion of others,
knowing that often we all hold beliefs which make sense only from our own perspectives. The opposite of open-mindedness is closed mindedness and intolerance for the ideas of others.

**Analyticity**

It is the tendency to be alert to what happens next. It is the habit of striving to anticipate both the good and the bad potential consequences or outcome of situations, choices, proposals, and plans. The opposite of analyticity is being heedless of consequences, not attending to what happens next when one makes choices or accepts ideas uncritically.

**Critical Thinking Self Confidence**

The tendency to trust the use of reason and reflective thinking to solve problems is reasoning self confidence. The opposite is the tendency to be mistrustful of reason to consistently devalue or be hostile to the use of careful reason and reflection as a means to solving problems or discovering what to do or what to believe.

**Systematicity**

It is the tendency to approach problems in a disciplined, orderly, and systematic way. The opposite of Systematicity is the habit of being disorganized. The person who is strong in Systematicity may or may not actually know or use a
given strategy or any particular pattern in problem solving but they have the mental desire to approach questions and issues in such an organized way.

**Inquisitiveness**

It is the intellectual curiosity. It is the tendency to want to know things even if they are not immediately or obviously useful at the moment. It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the application of that new learning is not immediately apparent. The opposite of inquisitiveness is indifference.

**Judiciousness also called Maturity of Judgement:**

Cognitive maturity is the tendency to see problems as complex rather than black and white. It is the habit of making judgement in a timely way not prematurely and not with undue delay. It is the tendency of standing firm in one’s judgement when there is reason to do so, but changing one’s mind when that is the appropriate thing to do. It is the prudence in making, suspending or even revising judgement. The opposite of cognitive maturity is cognitive immaturity characterized by being imprudent, failing to come to closure in a timely, stubbornly refusing to change one’s mind when reasons and evidence would indicate one is mistaken, or foolishly revising one’s opinions willy nilly without substantial reason for doing so.

**Critical Thinking as an Educational Outcome: An Evaluation of Current Tools of Measurement:**
To ensure the continued quality of nursing educational programs and make nursing education more accountable for producing a knowledgeable and competent professionals, student-oriented outcome criteria were added to the National League for Nursing accreditation process. Critical thinking, communication, and therapeutic nursing interventions are designated as required outcome criteria in Criterion 20 by the Council of Baccalaureate and Higher Degree Programs. “this outcome reflects students' skills in reasoning, analysis, research, or decision-making relevant to the discipline of nursing.” Critical-thinking abilities based on quantitative measurement always have been a concept, valued by nursing education, but there is little evidence in the literature that this concept has been instilled in students. Because critical thinking has been viewed as abstract, there is concern over defining this concept and how nursing programs will measure students' critical-thinking abilities. Jones and Brown surveyed deans and directors of baccalaureate and higher degree programs who were accredited by the National League for Nursing to examine how critical thinking was perceived. Critical thinking was found to be prevalent in most programs, but the definitions and interpretations of the concept were limited and contradictory.

**Relationship between Critical Thinking and Clinical Judgment:**

The relationship between critical thinking and clinical judgment has been tested, and studies provide practically no evidence of congruence between the two. But it is to be noted that investigators had used different measures of clinical judgment. The CT assessment tools have been employed as the measure of general problem-solving ability. Hamilton, through the use of a CT assessment tool (viz. WGCTA), concluded that the relationship between nursing diagnosis
Review of Literature

and critical thinking was strengthened by the process of teaching critical thinking along with nursing content. Scoloveno and Polifroni, in their respective dissertations, reported a positive influence of nursing education on critical thinking and clinical judgment. Holzemer and McLaughlir studied nurse practitioners to assess the validity of two types of clinical simulation tests that assessed clinical problem-solving skills. There was not a significant correlation between scores on the WGCTA and scores on either simulation assessment. There are several theories that address the multiple processes involved in making clinical judgments. Although making clinical judgments involves the use of logical reasoning as well as critical thinking, performance-based measures of clinical judgment may be measuring a different construct than more general measures of critical thinking of critical thinking.25

**Measurement of Competencies (General and Core C)**

Six general competencies as defined by Accreditation Council for Graduate Medical Education (ACGME), which is responsible for accrediting all U.S clinical residency and fellowship programmes as per their consensus outcome project.26,27

1) Patient care
2) Medical Knowledge
3) Practice /Problem Based Learning and Improvement (PBLI)
4) Interpersonal and communication skills
5) Professionalism
6) System based practice
ACGME-Competencies /Attitudes

The peer reviewed literature provides no evidence that current measurement tools can assess the competencies independently of each other. Because further results are unlikely to be successful, the authors recommend using competencies to guide and co-ordinate specific evaluation efforts, rather than attempting to develop instruments to measure the competencies directly.

ACGME Out Come Project (1999) (10 year plan)

Long term goal: of the OCP is to develop a new model of accreditation based on defining outcomes linked to the six general competencies. Further more because the OCP was created in conjunction with American Board of Medical Specialties, there is the potential of this model of certification to be extended to ongoing accreditation of US physicians throughout their careers.
Phase-1

Define six general competencies thought to be common to physicians training in all specialties by consensus.

a. To define specific behaviour that would reflect the general competencies
b. To define appropriate measures of the general competencies.

Phase-2 (July 2002 to June 2006)

Sharpening the focus and definition of the core competencies and assessment tools.

Phase-3 (July 2006 to June 2011)

To achieve full integration of the core competencies and their assessment with learning and clinical care.

The exception to the challenge of measuring competencies seem to be “Medical Knowledge” which is generally measured with written exams, in which the examiner answers a series of standardized questions that assess factual knowledge.

Further more it has been shown that in large sample of physicians’ paper and pencil’ tests of knowledge have significant relationships to later markers of quality of clinical care.\textsuperscript{28,29} Thus these measures which reliable assess medical knowledge also seem to be valid predictors of important later clinical behaviours. Much of this success seems to be a reflection of the way that medical knowledge
is composed of a very large series of identifiable facts and relationship among facts, the veracity of which can be independently assessed.

By contrast the other 5 competencies reflect in varying degrees, personal attributes of trainers rather than knowledge of objectivity derived from information. Furthermore the relative values of these attributes are more socially and culturally, determined than are the abilities comprising ‘Medical Knowledge’. Thus to date, these competencies have proven considerably more challenging to quantify in a reliable and a valid way. For instance ‘professionalism continues to defy a clear operational definition despite several decades of attempt to derive one. The inherent challenges of measurement and psychometric analysis pose additional layers of uncertainty.

In her systematic review of measurement of professionalism Arnold concluded that “inter-rator agreement on humanistic terms can be particularly low” even if raters could agree on how to judge particular items relating to such a high order construct as ‘professionalism’ relationship amongst items seem unstable; depending on the measurement tool chosen, a purely empirical definition professionalism may contain as few as three subscales or as many as seven or eight. 

Thus at measurement level the meaning of “professionalism” becomes mired in the technical minutiae of psychometric analysis, irrespective of any philosophical beliefs about the nature of construct itself.

It will remain a challenge to develop objective measures that correspond neatly to these generalized educational constructs. In addition to disagreements
over theoretical issues, measurement of actual human behaviors is subject to a host of non theoretical biases and technical challenges, including the well known psychometric problems of method variance, observer biases expectation and contextual effects, logistic constraints and random errors.

Curriculum Development for Medical Education

Figure: A six-step Approach to Curriculum Development
This study involves a curricular reform of undergraduate medical education and it is quite appropriate to discuss the “six step approach to curricular development as advocated by David Kern based on generic approaches to curriculum development set forth by Taba, Tyler, Yura and Tories, and from the work of mcGaghie and Golden who advocated linking curricula to health care needs. Underlying assumptions are four fold. First, the educational programs have aims or goals whether or not they are clearly articulated. Second, medical educators have a professional and ethical obligation to meet the needs of their learners, patients and society. Third medical educators should be held accountable for the outcomes of their interventions. And fourth, a logical systematic approach to curriculum development will help achieve these ends.

A Six Step Approach.

Step-1: Identification of the Health Care Problem that is addressed by this study and General Needs Assessment.

A complete problem identification requires an analysis of the current approach of the patients doctors, the medical education system and society in general to addressing the identified need. This is followed by identification of an ideal approach that describes how patients, practitioners, medical education system and society should be addressing the need. The difference between ideal approach and current approach represents general needs assessment.
Many doctors are not in a position to offer optimal patient care because of deficiencies in their Knowledge, Skill and Behaviour as regards offering Evidence Based patient care.

Patients as already discussed elsewhere in the study, want to be active partners in the clinical decision making process and question each and every action of a doctor. They ask the doctors about the available alternatives for the clinical decision that has to be taken for their clinical problem. With, the inclusion of medical profession under the purview of consumer protection act, legal implications of the concerned issue have to be kept in minds as there have been increased number legal suits against the doctors by the patients for not providing the expected or optimal health care. If one analyses the situation, the main reason for the current scenario cannot be anything else than the fact that doctors are not self directed learners and are not in a position to practice Evidence Based Medicine and offer optimal health care to the patients. So the general need of the patients and society at large is to have a medical practitioner who is a self directed learner and is able to keep himself updated always to offer the updated patient care. In order that a firm foundation is laid down to develop competence for the practice of Evidence Based Medicine in the medical students, it needs to be taught to the medical students the moment they are exposed to the clinical environment and the same needs to be incorporated in the curriculum in the early part of the undergraduate program. So that the medical student has the longest opportunity to metamorphose himself into a self directed learner by the time he / she completes his / her MBBS degree.
Step-2: Targeted Needs Assessment Solution for the Problem

Targeted needs assessment is a process by which curriculum developers apply the knowledge learned from the general needs assessment to their particular learners and learning environment. Specific needs can be identified assessing the difference between ideal and actual characteristics of their environment. In order to have a medical practitioner who is a self directed learner and who is capable of offering an updated, best evidenced medical care, he/she needs to understand the principles of practices of Evidence Based Medicine. In order that he/she needs to be taught and trained in this regard during the course of his/her undergraduate medical training.

- Efforts are being made for inclusion of EBM in UG Medical Curriculum by several Regulating Councils, Universities
- Medical Education requires ongoing Curricular development to incorporate new scientific knowledge and competencies.
- Research is essential for growth and development of medical science and Translation of Research into practice is essential for improvisation of health/patient care.

Step-3: Goals and Objectives

Once the needs of targeted learners have been identified, goals and objectives for the curriculum can be written starting with broad general goal, then moving to specific measurable objectives. Objectives may include all the 3 domains viz., cognitive, psychomotor or attitudinal one for the learner; process objectives related to the conduct of curriculum or even health/patient care.
outcome objectives. The development of goals and objectives is critical and determine curricular content and learning methods and help to focus the learner, needs.

**Step-4: Educational Strategies**

Once objectives have been clarified, curricular content is chosen and educational methods are selected those are most likely to achieve educational objectives. Apart from traditional teaching, through didactic lecturers, other methods of teaching which accelerate the process of learning like hands on training, problem based learning; small group activities can be optimally utilized.

**Step-5: Implementation**

Implementation of a curriculum has several components: obtaining approval of apex academic bodies, obtaining political support, procuring resources, identifying the barriers for implementation, piloting the curriculum, phasing in the curriculum, administering the curriculum, refining the curriculum over successive cycles. Implementation is critical to the success of a curriculum.

**Step-6: Evaluation and feedback:**

It is desirable to have both individual assessment of the performance of a learner and also the curriculum (program evaluation). It can be both formative as well as summative evaluation can be used not only to drive the ongoing learning of participants and the improvement of a curriculum but also to gain support and resources for a curriculum.
In practice, curriculum development does not usually proceed in sequence one step at a time; rather it is a dynamic interactive process. For a successful curriculum, curriculum never really ends, as illustrated by the circle. Rather curriculum evolves, based on evaluation results, changes in resources, changes in targeted learners and changes in the material requiring mastery.

How Learning Occurs

“The long standing assumption has been that if one knows a body of knowledge, one can teach it. This assumption has been questioned in recent years and more systematic efforts to prepare graduate students are being undertaken”

Ideas on how humans learn are explored by psychologists.

One of the powerful explanations put forth by a group of the theorists known as ‘Behaviorist Associationist Approach’ (BAA) has been accepted by many in the past several years. Some of the principles of this theory are that people learn through associations and that a given stimulus will produce a response. Learning is viewed as the building up of habits of association. Repetition, especially followed by positive reinforcement promotes learning. Many of the approaches in college teaching such as behavioural objectives, hierarchical curricula, and objective testing are the legacy of BAA.
Another theory known as Cognitive Approach (‘CA’) has been favoured by some recently as an explanation for how people learn in settings such as college environments, where knowledge is complex and process is as important as recall of facts. Cognitive psychologists focus on memory reasoning and tasks such as critical thinking and problem solving. They are most interested in how learners construct meaning as they encounter new information and try to fit it in with what they already know. These theorists describe learning as a process of accommodating new information into existing frame works that the learner has established for fitting pieces of information together. At times new frameworks must be constructed as well.
In conceiving an education strategy it is quite essential to commit to satisfying the following assumptions that underlie Adult Learning Theory or Andragogy.

1. Adult learners need to know why they need to learn something before undertaking to learn it.
2. Adults prefer responsibility for their decisions and desire to be viewed as capable of self-direction.
3. Adults accumulate a greater volume of experience, which represents a rich resource for learning and necessitates individualization of learning strategies.
4. Adults become ready to learn things when they need to know them in order to cope effectively with real life situations.
5. In contrast to children’s subject-centered orientation to learning, adults are life-centered (or task-centered).
6. While adults are responsive to some external motivators, their most potent motivators are internal.

Based on the review of the above model a list of optimal learning conditions for medical curriculum can be enumerated:

- Self initiation
- Self direction
- Realistic learning solutions
- Internal motivators
- Problem centered organization
- A variety of resources and
- Opportunity to receive and offer feedback.

Evidence Based Medicine (EBM) has been accepted as a “new paradigm” the practice of medicine within a short period of its definition in 1960s at MC Master University, Canada. It has further established itself as a very useful tool of “Self directed learning”. It does not need to be emphasized that EBM needs to be taught in the medical colleges in order to create a ‘Competent Physician’.  

Although no EBM specific curriculum can be tracked down in the literature, several related journal clubs and critical appraisal seminar have been reported. The review reveals seven attributes favoured by teachers of EBM.

Small group, Learner centered format for seminars.

1. General medicine as opposed to sub speciality faculty
2. One on one resident faculty opportunities
3. Immediate clinical relevance
4. Residents as both educators and learners
5. Integration of EBM into main stream of clinical work and
6. Faculty role modeling of EBM

**Inclusion of EBM in Medical Curriculum :**

It did not take a long time for the medical educators to realize that EBM needs to be taught to all the medical professionals for improvised patient care and better more so if during the course of their medical training in the medical school. EBM curriculum was developed, implemented and evaluated for medical
Review of Literature

residents as early as 1995 in Yale University based Primary Care Internal Medicine Residency Program. The impact of EBM Curriculum based on androgogy was studied in improving EBM behaviour and EBM skills, in medical residents. An intervention in the form of 7 week EBM curriculum in which residents worked through steps of EBM for their own patients. Based on adult learning theory, the educational strategy included a resident directed tutorial format, use of real clinical encounters and specific EBM facilitating techniques for faculty. The study inferred that an EBM curriculum based on adult learning theory improves residents EBM skills and certain behaviors. Further the description of each phase of the curriculum, analysis of the results/experience in the study and demonstration of the effectiveness of EBM can guide medical educators involved in EBM training.35

In a similar context Witten/Herdecke University, Germany has implemented (2003) EBM Curriculum for medical students that is closely related to problem based learning and clinical rotations within the scope of six year medical reform curriculum. Starting with first semester, students will be able to acquire necessary skills to search medical databases, to critically review the information retrieved according to EBM standards, to gather evidence for answering diagnostic or therapeutic questions during their clinical education and to ultimately participate in the development of clinical guidelines during their last year.36

The distinct advantages of integration of evidence based teaching into clinical practice has been documented in a Review by Richards, where in 23 relevant studies on EBM were identified from well established data sources viz
Medline, Embase Cochrane Controlled Trials Register etc. Studies were chosen for inclusion if they evaluated the effects of postgraduate evidence based medicine or critical appraisal teaching in comparison with a control group or baseline, before teaching, using a measure of participants’ learning achievements or patients’ health gain outcomes. The review concluded that stand alone teaching improved knowledge but not skills, attitudes or behaviour. Teaching of EBM should be moved from class rooms to clinical practice, to achieve improvements in substantial outcomes.\(^{37}\)

University of Frankfurt was probably the first University who had the credit of integrating the EBM in the medical education program for undergraduates. The mandatory clinical training program in EBM for third year medical students consisted of 4 day seminar which included, lecturers, small group teaching based on internet search of information as well as on the critical appraisal of studies that deal with therapeutic and diagnostic problems, self evaluation of the information retrieval process. The Frankfurt project showed that EBM can be easily implemented in medical undergraduate courses.\(^{38}\)

In an another study two educational programs viz. directed and self directed teaching of EBM were compared. One intervention was based on computer assisted, self directed learning (self directed intervention). Whilst the other was organized as workshops based on social learning theory (directed intervention). Both educational interventions consisted of 5 half day sessions. The primary outcomes were knowledge about EBM and skills in critical appraisal. A secondary outcome measured attitudes to EBM.
Outcomes were compared on an intention-to-treat basis using stratified Wilcoxon rank sum test.

The trial and the associated qualitative evaluation suggested that self directed computer assisted learning may be an alternative format for teaching EBM. However further research is needed to confirm this and investigate alternative educational models.$^{39}$

The medical education system in Japan was reviewed in the year 2007. Several deficiencies were identified which were the root cause for the traditional failure of the Japanese medical education. The Japanese medical graduates were found to be reluctant to seek global experience. There was failure to incorporate globally accepted innovations like PBL and EBM in the curriculum. A total neglect of EBM in Japanese health care was also noticed. Keio University in Japan realized the situation and committed to achieve international recognition as a centre of excellence in medical education and health care by inculcating clinical skills and critical thinking in its medical graduates through incorporation of PBL and EBM in medical curriculum. The view suggested that wider implementation of the above said initiatives will enable Japanese health care and Japanese physicians to occupy rightful place of respect in the global health care market, comparable to the widespread international recognition given to Japanese medical researchers.$^{40}$
Each Competence is Addressed by EBM

<table>
<thead>
<tr>
<th>Competence</th>
<th>Component of EBM</th>
</tr>
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<tbody>
<tr>
<td>Medical Knowledge</td>
<td>Demonstrate investigatory and analytic thinking approach to clinical situations</td>
</tr>
<tr>
<td>Patient Care</td>
<td>Make clinical decisions based on patient preferences, up-to-date scientific evidence and clinical judgment Use ICT to support patient care decisions</td>
</tr>
<tr>
<td>Practice Based Learning and Improvement</td>
<td>Locate, appraise, and assimilate evidence from scient. studies Apply knowledge to the appraisal of clinical studies Use ICT to manage information.Access on-line sources</td>
</tr>
<tr>
<td>Systems Based Practice</td>
<td>Practice cost effective health care and resource allocation that do not compromise quality of care</td>
</tr>
<tr>
<td>Professionalism</td>
<td>Demonstrate respect, compassion and integrity Demonstrate sensitivity and responsiveness to patients’ values</td>
</tr>
<tr>
<td>Interpersonal/Communication Skills</td>
<td>Create and sustain a therapeutic and ethically sound relationship with patients</td>
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</tbody>
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Curriculum Objectives for Evidence-Based Medicine

Skills

1. Participants will demonstrate the ability to pose a focused, answerable question when faced with an uncertain clinical scenario.
2. Participants will demonstrate the ability to conduct an efficient literature search on MEDLINE.
3. Participants will demonstrate the ability to critically appraise the published report of a clinical study.
4. Participants will demonstrate the ability to incorporate their evaluation of ‘the evidence’ into their decision making for individual patients.

Behaviour

5. Participants will increase their use of evidence from clinical research to help solve the clinical problems they encounter.

Attitudes

6. Participants will appreciate the advantages of practicing EBM.
7. Participants will find the EBM curriculum to be a valuable educational experience.
SEMINAR ON EBM

The write up detailed below gives a comprehensive account of the entire course on EBM intervention that is conducted for the Group-I.

Various modes of instruction viz., brain storming sessions, group activities, interactive lectures etc., have been used in conducting the course on EBM spread over several sessions.

‘Good judgment comes from experience;
and often experience comes from bad judgment’.

-Unknown

Introduction:

The knowledge and skills, obtained during the course of study in the medical school, are insufficient for any physician to be competent throughout his career. The practicing physician, even today is largely dependent to make clinical decisions on his obsolete knowledge and expertise derived from unsystematic clinical observations made during his training period, which can be as old as his medical course itself. Knowledge and skill need to be updated periodically with the findings of new scientific/medical research. The new scientific research has to be translated in to clinical practice from time to time for improving the patient care provided to the community. Patient’s values are rarely acknowledged and current practices are often outdated, with the result that the patient rarely gets the best currently available care. What is the Solution? How to make a physician to provide the best available medical care to all his patients? It is exactly 30 years
since Archie Cochrane uttered the following words that sparked the “Evidence Based Medicine” movement: “It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all randomized controlled trials”\(^4^2\). Today the practice of EBM has grown into the most popular paradigm or tool of translation of research into practice. The application of principles Evidence Based Medicine (EBM) can help us with this daunting task of offering the ‘Best’ patient care that challenges us today.

**Definition:**

EBM is an approach to caring for patients that involves the non-conscientious, explicit and judicious use of the clinical research literature combined with an understanding of pathophysiology, clinical experience, and patient preferences to aid in clinical decision-making. EBM de-emphasizes (but not eliminates) intuition, unsystematic clinical experience and physiologic reasoning as sufficient grounds for clinical decision-making and emphasizes the systematic evaluation of evidence from clinical research.\(^4^3\)

EBM has thus been defined as the optimal integration of the best research evidence with clinical expertise and patient values.\(^4^4\) Best research evidence is generally derived from patient-centered clinically relevant research. Clinical expertise would include the ability to use the mastered clinical skills and past experiences to evaluate the unique health state of the patient, assess the risks and benefits of potential interventions, and incorporate the personal values and expectations into clinical decision making. The unique preferences, concerns and
Expectations brought to the clinical encounter by an individual patient represent the third component to be integrated into the clinical decision making process. Triangulation of these three elements results in the forging of an alliance between clinicians and patients for optimizing clinical outcomes and quality of life.

Ever since the introduction of EBM more than 4 decades ago, more and more number of physicians, have been accepting it in their practice day by day. Along with its increasing acceptance and popularity, this new paradigm of medicine has undergone subtle but noticeable changes (the process continues) because newer thoughts and innovations are constantly being added to it by the new users. EBM continued to evolve, to address a number of issues including scientific underpinnings, moral stance and consequences, and practical matters of dissemination and application, thus turning out to become less pretentious and more practical.\(^{45}\)
Goal of EBM:

Initial goal of EBM was to minimize the use of non-documentary knowledge and reasoning in clinical practice but however no time was lost to realize the importance of the deemphasized factors and there were suggestions to include the non-documentary evidences also in the practice of EBM. Thus, EBM got evolved (after several philosophical debates) beyond its initial (mis)conception, that it might replace traditional medicine. As a result the focus got shifted to integrating patho-physiologic knowledge, clinical expertise and patient preferences in making decisions regarding the care of individual patients. This shift marked a critical but necessary step of recognising the value of alternative forms of medical knowledge and reasoning. EBM is now attempting to augment rather than replace individual experience and understanding of basic disease mechanisms. As a result, the evidences automatically got classified into External evidence and Internal evidence; external evidence means the one tracked down from valid literature and the internal one means the one existing within the clinician in the form his expertise, pathophysiological understanding of a disease and also his intuition. Now EBM is also defined as the - explicit use of valid external evidence combined with the prevailing internal evidence.46 Dissemination and incorporation of valid clinical research findings in to medical practice towards improvisation of patient care, is the ultimate goal of EBM.

How does one practice EBM?

A clinician who wants to practice Evidence Based Medicine (EBM) must be able to understand the patient’s circumstances or predicaments, (including
issues such as social supports and financial resources) to identify gaps in his medical knowledge and frame questions to fill those gaps, to conduct an efficient literature search, to critically appraise the research evidence and to apply that evidence to patient’s care.

This whole process has been divided into five simple steps, which if followed systematically can bring out a very successful outcome and a desired improvement in the patient care. 44

Now let us understand the principles and practice of EBM by taking an example of a clinical dilemma encountered recently in our KLE Dr. Prabhakar Kore Hospital and MRC Belgaum, and how we solved the same making use of a five step approach of practice of Evidence Based Medicine.

Clinical Scenario

A 12 years old, only male child of a school teacher was admitted with a h/o accidental ingestion of Organophosphorus compound 4 hours back.

On admission the patient was comatose but haemodynamically stable. The clinician used his past experience, knowledge, skill and expertise and treated the patient with an infusion of atropine, but inspite of that the patient started developing respiratory paralysis in the next 2 hours. Again the clinician used his expertise, anticipated the respiratory paralysis and put him on ventilatory support. He was being mechanically ventilated. Now, the consultant understands the gap in his knowledge and he identifies the same. The consultant wanted to administer
Inj Pralidoxime but was not sure of the dosage and the mode of administration (a single bolus dose or an infusion). So the need has arisen.

In this clinical scenario, there is a need for information of finding out an appropriate therapy for O.P poisoning.

The Five-Step Approach for Practicing EBM:

Step 1- Framing a Proper, Pertinent, Focused, and Answerable Question: The first and foremost step in the practice of EBM is to convert the need for information into a patient focused, pertinent, relevant and answerable question. This need for information may be related to find the optimal critical care management (Therapy) in the presence of a specific disease process, or to find out the possible sequela, (and their management) or to predict the outcome or to Diagnose a clinical problem or to answer a query put forth by a patient or a patient’s relative to know the course (Prognosis) of a clinical condition. A very useful tool (PICO model) that could be adopted in the process of formulating a proper/pertinent/focused question has been described.44,46

PICO Model - 4 Criteria system:

‘P’ --- Patient Problem: How would I describe a group of patients similar to mine?

In this clinical situation it is a male pediatric patient (12 years) who has developed organophosphorous poisoning following its ingestion.
‘I’ --- **Intervention strategy**: Which main intervention, prognostic factor or exposure am I considering?

Here the intervention is the therapy with Pralidoxime in optimum dosage.

‘C’—**Comparison**: What is the main alternative to compare with the intervention?

Here in our patient, it is the dosage of pralidoxime i.e small dose vs big dose and it is the mode of administration (methodology). i.e Single bolus dose Vs Infusion.

‘O’--- **(Outcome)**: - What can I hope to accomplish, measure, improve or affect?

In this scenario, recovery from OP poisoning and decrease in morbidity and mortality would be the primary concern of the clinician. The physician would be interested in reducing the chances of the patient going into intermediate syndrome. He would be looking for evidence for minimizing mortality, duration of ICU stay, the need and duration of ventilation, time to recover from unconsciousness, the odds of developing intermediate syndrome and infections.

**Additional criteria to be considered while framing the question:** In addition to the four PICO criteria, there are two additional considerations in formulating the question.

**Type of Question:** How would I categories this question? Is it related to etiology, diagnosis, therapy or prognosis?

In this example the question is about the therapy of OP poisoning.
**Type of Study:** The other consideration is the type of study that will answer a therapy question. Various study designs provide specific answers. The accompanying tables 1 and 2 provides the guideline for choosing the type of study design for each category of questions.

**Table 1** showing Type of Question and the corresponding study Design

<table>
<thead>
<tr>
<th>Type of Question</th>
<th>Suggested best type of Study → in decreasing order of importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy</td>
<td>RCT → Cohort → Case Control → Case Report/Series</td>
</tr>
<tr>
<td>Diagnosis / Clinical Exam</td>
<td>Prospective, Blinded comparison with a Gold Standard</td>
</tr>
<tr>
<td>Etiology/Harm</td>
<td>RCT → Cohort → Case Control → Case Report/Series</td>
</tr>
<tr>
<td>Prognosis</td>
<td>Cohort study → Case Control → Case Report/Series</td>
</tr>
<tr>
<td>Prevention</td>
<td>RCT → Cohort → Case Control → Case Report/Series</td>
</tr>
</tbody>
</table>

**Table 2** showing type of Question pertaining to a clinical encounter

<table>
<thead>
<tr>
<th>Type of Question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>how to select and interpret diagnostic tests</td>
</tr>
<tr>
<td>Therapy</td>
<td>how to select treatments to offer patients that do more good than harm and that are worth the efforts and costs of using them</td>
</tr>
<tr>
<td>Prognosis</td>
<td>how to estimate the patient's likely clinical course over time and anticipate likely complications of disease</td>
</tr>
<tr>
<td>Harm/Etiology</td>
<td>how to identify causes for disease (including iatrogenic forms)</td>
</tr>
</tbody>
</table>
Ours is a therapy related question and will be answered by RCT study designs.

So we can formulate a question related to therapy and RCT’s

The pertinent, answerable focused question is:

In the drug therapy of: --- Categorizes that this is a therapy question.
OP poisoning: ---- Patients problem
In a 12 years old male: --- Categorizes the type of patient } ______ P
Administration of Pralidoxime ______ Intervention} ____________ I
Singly dose Vs Infusion and Small Vs Big Comparison} ____________ C
Good outcome / Recovery is understood or hidden Outcome } _____ O

So our Question is:

“In the drug therapy of Organophosphorous poisoning, in a 12 years old male child, whether Pralidoxime should be administered as a single bolus dose or as an infusion and in what dosage to prevent the chances of development of intermediary syndrome?”

Step 2 - Searching the Literature: The second step in the process is to locate the ‘best’ evidence to answer the question. The clinician has two basic choices for finding the evidence. He may search through the ‘traditional’ print resources like textbooks or journals or ‘browse’ online electronic databases. What is of paramount importance is of answering the question in the shortest possible time and in the most efficient manner. Manually searching through voluminous literature is an unenviable task requiring immense periods of time, a commodity
that is in limited supply given the potentially life threatening situation that the patient is in. Browsing the online electronic medical databases seems the most logical option to pursue. There are a number of online information resources that the clinician may tap to find the evidence. These include: textbooks, journals, patient profiles, practice guidelines issued by specialty boards, EBM reviews, and databases of indexed publications.

‘Medline’ a premiere biomedical database published by the National Library of Medicine, USA is the most popular (probably because it’s free) and most exhaustive database. Citations may be retrieved by author’s name, Medical subject headings, and text words from titles or abstracts.

There are several search engines that enable the clinician to browse this database. ‘Pubmed’ service hosted by the same agency has several additional features and is probably the most versatile search engine for exploring Medline. This search offers a number of ‘browsers’ (Clinical Queries, MeSH etc) for searching the information. Additionally it also permits narrowing down the search by application of limits (type of publication, language, age group, period of publication etc)

Using the MeSH browser and restricting the search to publications in English and with abstracts available of Randomized Controlled Trials it was possible to locate the following article which appears to be the ‘best’ evidence to answer our question.

Johnson S, Peter JV, Thomas K, Jeyaseelan L, Cherian AM : Evaluation of two treatment regimens of Pralidoxime (1gm single bolus dose vs. 12 gm

**Step 3 - Critical Appraisal of the Literature:** To know whether the evidence got is the best available evidence or not is the next step. The critical appraisal of the article is an important step in the whole process. It is essential that clinicians must master the skills of critical appraisal of the literature, if they are to apply evidence-based medicine to the daily clinical problems they encounter. Most busy clinicians do not have hours to spend critiquing an article. However, they do need a brief and efficient screening method of determining whether the information is valid and applicable to their practice. By applying this ‘Fast Track’ appraisal it is possible to approach the literature confidently and base clinical decisions on evidence rather than hope! The critical appraisal of literature involves 3 stages: 1. Screening for initial validity and relevance; 2. Determining the intent of the article; and 3. Evaluating the validity based on its intent. Validity of the literature pertains to determining the closeness to the ‘Truth’. Different kinds of errors can creep in during the conduct of a study.47 There are many ways/methods of eliminating these errors in the study like: Blinding, Randomization, using placebo-controlled groups, minimizing loss to follow-up of patients, and treating the data by appropriate statistical analysis etc. The clinician should ascertain whether the authors have used these methods to minimize the errors in the study or not.

The article that was tracked down is a prospective randomized placebo controlled clinical trial of Pralidoxime in two similar groups of patients. (Control group-low dose and study group-high dose) Block randomization is used to give
equal chance to all the patients to participate in the study in either arm of the trial. The investigators were not blinded to the two groups which if done would have made the results even more valid. The 72 patients who entered the trial were properly accounted for at the time of analysis and are attributed to at its conclusion indicating proper follow up in all the patients. The article is quite relevant to the clinical problem as it addresses the clinical scenario that is confronting the clinician. The intent of the article is to evaluate two treatment regimes of PAM in the management of OP poisoning. The next thing to determine is the strength of the outcome. How large was the treatment effect? The incidence of intermediate syndrome and the ventilator requirement was significantly higher in the high dose group. This was an equivalence study designed to show that the low dose was as effective as high dose. The results attain higher significance as the low dose group fared better than high dose group, even though the research hypothesis was in the reverse direction.

Step 4 – Integrating the Evidence with Clinical Expertise and Patient Values: EBM, by definition, is the optimal integration of best research evidence with clinical expertise, and patient’s biology and values.

The best-documented critically appraised research evidence is already with the clinician. The physician has already exercised his expertise arising from prior knowledge and past experience in treating his patient by starting an infusion of Atropine, and putting the patient on mechanical ventilation. He now has to take into consideration the patient values also.
Lastly, the study is quite beneficial to our patient; because the treatment effect is quite precise in bringing down the risk of prolonged ventilation, intermediate syndrome, time required to regain consciousness, the cost of therapy, and the duration of ICU stay. PAM is a very expensive drug requiring considerable amount of money. It is imperative for the clinician to find a cost-effective and yet effective treatment. Patient’s father, being a primary school teacher with limited earnings, cannot afford the exuberant cost of large volumes of the drug. Hence, the outcome of this research study is very much relevant and beneficial in solving the clinical dilemma taking into consideration the patient values also.

**Step 5 – Evaluating the Process:** Once the therapy is administered the clinician needs to evaluate the previous four steps. Was he able to formulate a focused question? Was he able to devise a precise search strategy for locating the evidence? Did he use the most appropriate resource? Were more pertinent resources like practice guidelines available to him? Did the ‘evidence’ work in his patient? The final step is to reassess the strategy and take it onwards from there. The clinician should document the outcomes of the application of the evidence and based on his experiences and those of his colleagues should be able to develop management protocols. Beyond this he must also collaborate with professional bodies in developing practice guidelines. This last step completes the feedback loop of EBM.
Benefits of EBM:

1) The greatest advantage of EBM is that it will minimize the errors in patient care, reduces the cost of treatment to the patient, and most importantly it optimizes the quality of patient care.

2) Further, the skills learnt in practicing EBM are the very same ones needed for being a lifelong, self-directed learner. If EBM is incorporated in the undergraduate medical curriculum, it helps the medical student (at the conclusion of his course) to inculcate the competencies needed for being a competent professional.

3) The habit of accessing literature on a daily basis is the best guarantor of ensuring advancement of knowledge and keeping abreast of scientific progress.

Limitations in adopting EBM:

There are three major challenges in adopting EBM. First and foremost, technology and online information resources must be available to the clinician. Research-based evidence is generated at an exponential rate, yet it is not readily available to clinicians. When it is available, it is applied infrequently. The sheer volume of research-based evidence is one of the main barriers to better use of knowledge. The problem is compounded by the inability of clinicians to afford more than a few seconds at a time in their practices for finding and assimilating evidence.\footnote{48}

This issue seems to be resolving due to the rapid pace at which information technology revolution is occurring. Personal Computers are
Review of Literature

becoming cheaper, Internet rentals are declining and a number of health portals and databases are offering free access to electronic journals and periodicals. This will enable a practitioner to collect evidence on a daily basis sitting at home and or at his clinic.

The second challenge for the clinician lies in learning the skills required for accessing the medical literature and finding the best evidence from that. Once the evidence has been located, he must be able to determine the validity of the evidence found. This will require an understanding of the epidemiological study designs and concepts of biostatistics. Readers must take personal responsibility for judging the validity and clinical importance of the medical literature. Though the medical educators had embraced EBM since its introduction as an innovative approach to medical education the task of teaching clinicians the basic skills of EBM, remains challenging.  

The most important challenge in adopting EBM is an attitudinal one. A systematic review of studies examining the information-seeking behaviour of physicians found that the information resource most often consulted by physicians is textbooks, followed by advice from colleagues. The textbooks we consult are frequently out of date, and the advice we receive from colleagues is often inaccurate. [7] Change in attitude will take place only when there is realization that clinical performance depends upon regular updating of knowledge and does not merely accrue by years of clinical experience.

Other potentially negative impacts of EBM are
1. That evidence may be viewed as static rather than dynamic. Guidelines are increasingly influencing medical practice, yet these guidelines require frequent review and revision to incorporate new literature. The use of out-of-date guidelines may be associated with decreased quality of care compared with the use of more recent evidence.

2. Clinical observation and experience are placed last in the evidence hierarchy with the randomized controlled trial held as the standard for clinical intervention. The hierarchical discourse of medical knowledge produces opposition rather than collaboration between researcher, clinician, and patient. Alleviating perceptions of dominance and creating connections produces cohesion within medical communities. Evidence to practice and practice to evidence redefines EBM as a circular integration of best research evidence, clinical expertise, and patient values.\textsuperscript{50}

3. No amount of empiric evidence can tell us what we ought to do in any particular situation as decisions regarding what ought to be done are value based. The necessary gap between clinical research and medical practice means that evidence can never directly dictate care; evidence cannot tell us when it is best to ignore the evidence. The current boundaries of EBM are generally defined in relation to obstacles to the development, dissemination and incorporation of medical evidence and approaching EBM from a philosophical perspective may allow a more rigorous delineation of promises and pitfalls of EBM.\textsuperscript{51}
Relevance of the EBM to the Developing World:

Most of the reviews produced to date address health conditions that are priorities in the developed world and not the major health concerns of the developing world.\textsuperscript{52} Lots of doubts are being expressed about the relevance, suitability and transferability of the evidence evolved in the developed countries for application in the developing countries. There is a definite ground for these doubts and what we need is, not the “best” evidence but the most “appropriate evidence”. Most effective treatment as per an RCT conducted in an affluent country may not be the most effective treatment when provided in the developing world and it is quite essential to know which interventions work, which do not work, and which are likely to be harmful.\textsuperscript{53} This is especially important in situations where health problems are severe and the scarcity of resources (like the ones needed for the practice of Critical Care) make it vital that they are not wasted.\textsuperscript{54}

Special considerations for the practice EBM in various specialities:

1. Because of the paucity of valid, randomized clinical trials to help the practice of Evidence Based Medicine, in Critical Care areas like operating rooms, casualty departments, ICUs, CCUs, etc, many clinical decisions have to be made based on pathophysiologic reasoning or evidence obtained from studies on animals, healthy volunteers, or observational studies focusing on physiologic (arterial blood pressure, heart rate, pulmonary artery occlusion pressure) or patient (mortality, morbidity, functional status) outcomes. EBM sees evidence broadly. There is always
Evidence; however, it is often unsystematic or physiologic. Dispersed literature sources and insufficient clinical research data enhance the need for evidence-based practices in specialities like Anaesthesiology, Critical Care, Emergency Medicine etc., whereas the need to make critical decisions under the pressure of time challenges the application of EB practices in these specialities.

2. Literature Sources: The Database pertaining to any specialised branch of Medicine is dispersed across multiple speciality or subspeciality journals, as well as basic science journals. This diversity increases the need for efficient methods and search engines to access and search relevant literature.

3. Both the breadth of knowledge required for the practice of EBM and the diverse sources of Medical literature in many specialities not only demand efficient access and but also efficient critical appraisal strategies for evaluation of relevant literature.

4. Need for Rapid Decisions: The need to make rapid clinical decisions in the above mentioned specialities may complicate the application of EBM especially when, the best external evidence found may not be in agreement with the internal evidence. In case of conflicting internal and external evidence, clinicians may have several options. They may change their mind and align it with the external evidence. They may determine that the external evidence is not sufficiently convincing and remain with the original decision. Or, they may choose to discuss with the patient the
conflict between the internal and external evidence in a manner that enables the patient to take part in the decision making process. This last approach is recommended because patient preferences are considered as essential component of the evidence-based decision making process and decisions often need to be made in the practice of EBM in specialities dealing with emergency situations, in the absence of clear research findings.  

46. In the ICU, decisions are routinely made faster than on a general medical ward, and there are few data regarding whether EBM can be applied practically where rapid decisions are required. There is some data suggesting that EBM treatment and diagnostic protocols may be used effectively even in the treatment of acute processes such as acute respiratory distress syndrome. Without such protocols, practical applications of EBM in ICU will be limited to problems we see repeatedly. There are facilitations like a self sufficient EBM trolleys containing the portable computer with an internet connection, which can be wheeled in any critical areas.

6. In procedure-oriented specialties such as Surgery, anaesthesia, obstetrician etc, the skill of the provider and hospital-level factors may affect risk and should be considered in the risk/benefit analysis.

**Final Word:**

The promise offered by EBM of not only in providing the patients, an updated, improved and optimal clinical care but also in equipping the
undergraduate medical students to metamorphose into a competent professional, has to be exploited by all the practicing physicians and also the medical educators.

The competencies those are going to be strengthened day by day when one practices EBM on day to day basis are essentially the competencies those are needed to be possessed by a self directed lifelong learner.

Failure to accomplish this, runs the real risk of producing a medical graduate who cannot help but offer an out dated and non optimal patient care.