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Implementation of the Evidence-Based Medicine to Korean Medical Schools

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한국의과대학에서의 근거-중심의학 도입방안 연구

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의학의 패러다임을 전환시킬 수 있는 새로운 교육방식으로 관심을 모으고 있는 근거-중심 의학 (Evidence-based Medicine)을 소개하고 이를 한국 의학 교육에 적용하기 위한 방법은 무엇인지 살펴보았다.

근거-중심 의학의 핵심 내용은 기존 의학에서 중요한 임상 결정이 주로 병태-생리학적 원리나 개인의 체계화되지 못한 임상 경험, 상급 의사나 권위적 전문가의 지시 혹은 자문, 때로는 직감이나 직관에 근거하여 이루어지는 것을 비판하고, 체계적으로 축적된 개인의 임상 경험 위에 입수 가능한 임상 연구 결과들을 탐색하고 평가하여 얻어진 최선의 근거들을 추가하여 이를 바탕으로 임상 결정을 내려야 한다는 것이다. 근거-중심 의학에 대한 부분적 비판이 없는 것은 아니지만, 그 근본 취지와 방법에 대해서는 대부분의 의학교육자가 찬성하고 있으며, 실제로 근거-중심 의학의 동조자가 급속히 확산되고 있는 것이 최근의 추세이다.

미래의 의사들인 의과대학생들의 기본 학습 자세로 근거-중심 의학을 정착시키기 위해서는 의과대학 교육이 시작되는 최초 시점부터 이를 적극적으로 교육해야한다. 이를 위해 임상-전 저학년 교육과정에 기본적인 의학통계 (biostatistics), 정보 탐색 및 평가 (medical informatics & critical appraisal), 그리고 임상 결정 방법론 (clinical decision making) 등 근거-중심 의학을 실행하기 위한 예비과정이 개설되어야 한다. 이러한 예비과정은 정규 학과목으로 개설하는 것이 바람직하며 가능하다면 학교 내에 근거-중심 의학을 교육할 주관 부서나 위원회를 설치하는 것이 좋을 것이다. 또한 근거-중심 의학은 임상 과정 및 졸업 후 전공의 과정 및 보수 교육에 이르기까지 단계별로 교육되고 실시되어야 한다. 임상 과정 이후의 과정에서의 근거-중심 의학은 각 임상 과별로 실시하는 것이 효과적이며 임상 전 근거-중심 의학을 교육하는 학교 차원의 기구와 임상 각 과 간의 긴밀한 협력이 매우 중요하다.

Key Words: Evidence-based medicine, Implementation, Medical education, Curriculum

1. Description of the problems

Evidence-based medicine (EBM) was offic introduced in 1992 by the Evidence Based Medi Working Group1 and is rapidly gaining suppo worldwide.[2]

The Cochrane Collaboration, a multi-center, international project that attempts to synthesize all randomized controlled trials of health care interventions, now consists of an international consortium of workers who construct an ever-enlarging database by contributing their

own randomized trials (including non-English-language trials and negative reports), discoveries of unpublished trials, and meta-analyses. The collected information extends through all branches of medicine, and the resulting comprehensive reviews, called the Cochrane Library, are distributed on CD-ROM and through the Internet (http://www.cochrane.co.uk). The journal Evidence-Based Medicine began to be published from 1995 by the American College of Physicians and the British Medical Journal Publishing Group. Several other journals for other specialties, including Evidence- Based Health Policy and Management, Evidence- Based Cardiovascular Medicine, Evidence-Based Nursing and Evidence-Based Mental Health, are being published or will be published.[2]

Many medical schools and hospitals are teac EBM skills to undergraduate medical student residents, and the numbers are increasing so ra that Sackett, who is one of founders of EBM, cla that teaching the practice of EBM is now the i of how, rather than whether.[3] However, EBM novel to Korean medical society yet. There is report of Korean medical schools or hospi teaching or practicing EBM. To the present aut knowledge, no Korean medical school has the co of bio-statistics, literature searching skills or c appraisal skills in their undergraduate curriculu EBM is really a paradigm shift in medical prac and an essential requirement to prepare fu physician as the advocate of EBM claims1, Ko medical schools should no longer ignore it, should seriously consider the need to implement EBM to their curriculum. So it would be meaningful approach to try to answer follow questions.

1. Should we or should we not introduce EBM the medical education in Korea?
2. If we should introduce EBM, when will be best time? During the undergraduate curric or during the resident training course? Pre-clinical years or clinical years?
3. If we introduce the EBM to undergraduate c culum, what can be the most desirable met to do it? Who should control the EBM cour Department or central unit? How can we m the best of it?

2. Should we introduce evidence-based medicine?

1) In favor of evidence-based medicine

Sackett and his colleagues defined EBM follows[4]:

Evidence-based medicine is the conscient explicit, and judicious use of current best evid in making decisions about the care of indivi patients. The practice of EBM means integra individual clinical expertise with the best avai external clinical evidence from systematic resea

The advocates of EBM proclaim it as a "parad shift" as they believe that it will change the wa medical practice fundamentally. They criti conventional medicine as “autocratic”, “auth tarian,”[5] or “eminence-based”[2] medicine, in w clinical decisions are usually made on the basi intuition, common sense, unsystematic pers experience, anecdotal evidence, or help fr authority. They claim that the seniority or ran physician plays a major role in clinical decis making in conventional medicine. They also p out that conventional medicine usually recogn pathophysiologic rationales (untested pathoph logic reasoning) as sufficient grounds for clin decision making, that may in fact be incorr leading to inaccurate predictions about

performance of diagnostic tests and the efficac treatments.[1]

Conventional medicine is based on the bio-me model that reduces all diseases to structural or biochemical dysfunction. Within this framework, causes are perceived as leading inevitably rather than probabilistically to their consequences, and chance and ambiguity have a very small role in explication of pathophysiologic mechanisms and in diagnostic reasoning. However, it is now undeniable that diseases result from multiple factors rather than from single cause and there is much uncertainty in the development and progress of disease. There are false-positives and false-negatives in diagnostic tests, and most treatment methods have both risks and benefits. The changing patterns of medical practice also affect clinical decision making process heavily. For example, patient's autonomy is emphasized more than ever, and his/her preference becomes an important factor in the clinical decision making.

The managed care system and concerns abou and efficient distribution of medical resource influence clinical decision-making. Clinicians m know how to balance their duty to maximize health of populations at the lowest resource These changes in the context of clinical pra require physicians to refer to the most up-to clinical trial data in their decision making proce

However, the pattern of conventional clin practice fails to meet this basic requirement making decision based on the best avail evidence. According to the direct observation Covell et al.,[6] general physicians usually identi up to 16 needs for new, clinically important in mation in a typical half-day of practice. Howe only 30 percent of these information needs were in the clinics and offices where the clinici worked, and most of this knowledge was obta not by searching textbooks and journals bu asking colleagues. This study shows that m important clinical decisions are made on the bas physician's own intuition, reflection on past periences or unverified opinions of senior physicians.

Proponents of EBM believe that it is the strategy to meet the changing needs of contemp medicine. Contrary to conventional medicine, decision makings in EBM are dependent on "best available" clinical evidence from system research. The systematic research here usually m randomized controlled trial.[7] The advent proliferation of randomized controlled trials over last 30 years and the development of meta-ana as a method of summarizing the results of a nu of randomized trials made the practice of E possible.

2) Against evidence-based medicine

Ever since the introduction of EBM, it has ra much criticism. Some critics claim that it pays much attention to epidemiology and not enoug clinical experience and reasoning. Others call "fad" with no evidence to support its use.[2] But m serious criticism has its finger on the evidences EBM uses.[8]

Criticism 1. Clinical practice is as much art as science: Evidence-based medicine pays too much attention to epidemiology

In introducing EBM, its advocates stron emphasized the use of scientific evidence suppo by systematic research, and devaluated prev clinical experience. This gave an impression only scientific evidence and clinical guidelines ba on that scientific evidence should be the main, if the only, determining factor in clinical decis

making. Naturally, this brought many refutat Kenny[9] argued that "clinical practice is not a sci but an endeavor that uses science. Good scienc necessary but insufficient for good prac Scientific knowledge is not the only relev knowledge; scientific and biologic goods are not only goods taken into account. Clinical practice is both science and art." Establishing a good doctor- patient relationship, understanding of the psychological and social factors that may affect the clinical course or outcome, and anticipating and solving the problems of non-compliance and other obstacles against successful practice are components of clinical practice as an art. Critics of EBM worry about possible neglect of the art component by over-emphasizing so-called scientific evidence.

As a response to this criticism, advocates of E contended that these views represent a misu standing of the philosophy and intent of EBM. T explained that systemic reviews are meant no replace clinician decision making but rather enhance it.[10,11]

Levin quoted Haynes that "Maybe we should called it 'evidence-in-support-of-medicine'. . . we are trying to say is that medical decisions sh based on the physician's clinical experience as as any tests ordered, on the patient's wishes preferences, then using the best evidence f research to guide our choices. . . I don't th anyone in his or her right mind would argue ag paying attention to evidence from research. . . M of the criticism have to do with our hubris, s and conviction."[2]

Criticism 2. Limitations and flaws of the evidence

If the above criticism stemmed from misun standing, as the advocates of EBM claim, criticism of Feinstein and Horwitz went directl the problems of evidence itself.[8] They pointed that the evidence of EBM has following proble

1. There is not enough evidence to practice E Evidences of EBM are supplied by randomi trials. However, randomized trial is not possible the prophylactic therapy of "risk" factors and m other clinical decision making issues. In some pathophysiologic principles, randomized trial would be inappropriate or unethical. The proponents of EBM said that "if no randomized trial have been carried out, we must find the next best available evidence and work out from there."[12] However, if we include other researches such as basic science researches, EBM may lose much of its novelty as an inductive, probabilistic approach to medical practice.

2. The data of randomized controlled trials do include many types of treatment or patients see the real clinical practice. Many randomized t enroll a restricted population confined to pati expected to be highly responsive to treatment. too frail and too healthy patients are often excl from randomized trials.

3. Most randomized trials omitted "soft" data as the types of symptoms, severity of sympt auxometry (rate of growth) of illness, and severi the co-morbidity produced by concomitant assoc diseases. These soft data usually plays importan in the real clinical decision making process.

4. Randomized trials often omit clinical det that may be crucial for many therapeutic decis Among those details are responses to prev therapeutic agents, short-term response to remedial therapy, ease of regulation when the of therapy must be "titrated", difficulty in c pliance with therapy and reasons for non-compli psychic or non-clinical reasons for impa

functional status, the social support system ava at home and elsewhere, the patient's expectation desires for therapeutic accomplishment, and pati psychological state and preferences.

5. There can be a significant lag time in diffu and uptake of new evidence. Meta-analysis randomized trials may take long time; yet m clinical decision-making need latest informa immediately.

6. In certain areas, there can be overwhelming information (evidence), and there may be a lack of consensus among the clinicians. Moreover, inappropriate use of evidences by guideline providers (for example, the Cochrane collaborators) or consumers of information (clinicians) may result in wrongful clinical decisions.

3) Evidence-based medicine: an essential 'add-on' course

Regarding EBM as a "paradigm shift" may b hubris or over-conviction by the proponents o Much of the criticism on EBM may be a reactio the annoying style of the EBM propone Importance of clinical experience and ba pathophysiologic principle should not be ignored devaluated. It is also true that much of the evid in EBM has a flaw to be a gold standard and t is not enough evidence in many field of clin medicine. Nevertheless, we cannot deny the nee EBM as a new and appropriate method of practic rapidly changing context of clinical medicine. core concept and basic skills of EBM such acceptance of uncertainty, regular consultatio original literature, efficient evidence searching the overwhelming amount of information, critical appraisal of evidence to make a cor clinical decisions are of crucial importance for clinical practice in the coming century. T limitation and flaw of the evidence itself can solved by the rapid development of research meta-analysis methodology.

It may be too radical to change the wh curriculum to EBM format, but it should be essential "add-on" course in medical education to prepare future physicians.

3. When should we introduce the evidence-based medicine?

According to the Norman and Shannon's re article, it is more effective to teach EBM undergraduate medical students than to reside Instruction in critical appraisal skill can resul sizeable gains in knowledge among undergrad medical students (mean gain 17.0 %; stan deviation [SD] 4.0 %). However, the effect of s instruction is much smaller among residents (gain 1.3 %; SD 1.7 %). Furthermore, there is indication that the instruction in critical appr skill results in a change of residents' behavior respect to the critical use of the literature.[14] Nor and Shannon pointed out the course credit intensive evaluation in the undergraduate cr appraisal course may explain the difference knowledge gain between two education lev Although, it is more effective to teach EBM du the undergraduate level, their review also indic that there is no evidence that the gains in know demonstrated in undergraduate courses can sustained into residency and practice and event translated into improved patient outcome. Nor and Shannon suggested the integration of EBM essential and continuing component of undergrad and postgraduate program to get larger and sust effects.

According to Sackett and Parkes, critical appr is just one element of EBM process.[3] The practic

Table 1. 5 Processes of EBM Practice

1. Convert the need for clinically-important information a diagnosis, prognosis, therapy, and other clinical and he care issues into answerable questions.
2. Track down, with maximum efficiency, the best evide with which to answer them.
3. Critically appraise that evidence for its validity (closenes the truth) and usefulness (clinical applicability).
4. Integrate the results of this appraisal with our clin expertise and apply the result in our clinical practice.
5. Evaluate our performance.

EBM requires a much larger process that be with the patient and involves asking answe questions, finding the best evidence, assessin integrating the results of that assessment wit patient's unique biology and expectations, evaluating one's performance[4] (Table 1). To these multiple requirements, EBM should be ta at multiple stages in pre-clinical, clinical, postgraduate curricula, and should be incorporates into the everyday function of the clinical teams in which learners gain the knowledge, skills, and attitudes that shape their clinical performance.

Basic bio-statistics and efficient litera searching skills can be successfully taugh pre-clinical years. Skills to convert information n to answerable clinical questions and critical appr skills may be best taught at the end of pre-clinical years to minimize time gap betw knowledge gain and practice. Clinical practice EBM, including the application of the best avail evidences to patient problem and performa evaluation, should be continuously exercised du the clinical and postgraduate years.

4. How to introduce evidence-based medicine?

1) Centralized vs. departmental control of EBM course

Norman and Shanon show that all the sch reviewed in their article run EBM programs than 18 hours, and the main format of teachin short burst of classroom instruction. In resid programs, weekly journal club or seminar is most popular form of EBM.[13] However, as Sac pointed out, more intense and continuous EBM program is required to get better and sustained effect.[3] The course credits and intense evaluation are also required to get more knowledge gain from the EBM course.[13] It means that the EBM course should be a formal and regular part of the undergraduate curriculum, and there should be a school body planning, executing, and evaluating the EBM courses.

The EBM courses should be delivered in diffe formats and different phases of undergrad curriculum. Basic skills to practice EBM, such biostatistics, literature searching skills, and cr appraisal skills, should be taught as a reg semester long course during the pre-cli curriculum. And clerkship courses should pro students plenty of opportunities to exercise E

with real patient problems. As a result, the w EBM course requires a heterogeneous team faculty. Basic EBM skills should be taught by team of faculty who specialized in the med informatics, biostatistics, decision analysis or h service research (i.e., librarians, epidemiologists pre-clinical years. And the real practice of E should be taught and guided by the clerk directors of each discipline in clinical yea Communication and cooperation among the clinical and clinical faculty is essential to ensure smooth transition from the theory to practice of EBM. Organizing the EBM committee with all faculty engaged in EBM education (faculty of the pre-clinical EBM course and clerkship directors) can be an effective solution to promote such communication and cooperation.

2) Preparation for the successful imple-mentation of EBM

Schneider and Eisenberg recommended a num of prerequisites or preparation to ensure a succe introduction of EBM.[15] They are:

1. A foundation in basic computer literacy sh be a requirement of entering medical students.

2. Applied medical informatics should be in duced early in the curriculum to increase fu physician's familiarity with the basic inform tools of practice (including computerized med records, retrieving computer-based knowl resources, and understanding the basics of Internet).

3. An evidence-based curriculum should inc training in health evaluation sciences (such cost-effectiveness analysis, decision analysis, h service research, and basic statistics knowledge) an emphasis on practical approaches to draw inferences from databases and using data understand the health of populations.

4. The curriculum should introduce a qua improvement paradigm that includes system ana process, and outcome assessment modules introduces methods for critical self-assessmen behavior modification.

5. Interdisciplinary team approaches to lear and studying should be incorporated into the e years of medical school to facilitate broa system-based thinking, conflict resolution, management skills.

6. The training of medical informaticians should be a priority for medical educators.

7. Academic medical centers should take on important role of evaluating the software tha applying the medical knowledge base to practice ensuring that it is sound.

8. Research and teaching about methods ensuring confidentiality and security of electr records and communication should be incorpor into medical education.

Only an exhaustive preparation can guarante successful implementation of EBM. Medical sc should prepare hardware and software neede EBM well ahead of the implementation of EB Securing enough number of computer terminals, speed Internet connections, electronic and tradit databases, and training of medical informatician part of this preparation. Especially, the trainin medical informaticians is of great importance as usually teach literature searching and inform management more effectively than many clin faculty.[16] Making rooms for EBM course in alre crowded medical curriculum may be a challenge curriculum planner should solve. Reduction of existing lecture hours should be seriously consid

3) Pre-clinical EBM course

Dorsch et al. introduced a ten-week cri appraisal course for third-year medical stu

taught cooperatively by library and clin department (Department of Medicine) facul Although this course is provided in the clerk course and students meet only once a week fo weeks, its learning objectives can be a g reference in preparing pre-clinical EBM course. course consists of two different parts. First, stu learn the information searching skills with the of library faculty. The learning objectives in this are as follows:

As a result of the course, students will be able to:

1. Plan strategy for identifying sources of in mation in the library
2. Recognize when it is/ is not appropriate to Index Medicus, Current Contents, Scien Citation Index, Medline, the library's card online catalogs.
3. Use Medical Subject Headings to constru search.
4. Find, using indexes and listings, review art on a clinical topics.
5. Find, using indexes and listings, resea studies on a clinical topics.
6. Use Grateful Med software to retrieve art on a clinical topic from selected database.

Second part of the course, instruction in read evaluating research methodology, and statis analyses in published articles, is provided by me faculty. Through this course, students will be ab

1. Select a small number of quality journals read on regular basis.

A) Screen out poor or unimportant articles examining the title, author(s), research abstract, and a key methodological point.

B) Critically appraise any articles that are interest.

2. Evaluate the worth and usefulness of clinical information.

A) Understand and use the concepts of "g standard", sensitivity, specificity, positive negative predictive values, pre-and pos probabilities, and the likelihood ratios w examining an article on a new diagnostic

B) Understand the importance of an incep cohort, referral pattern, patient follow development of objective outcome crite "blinded" assessment, and adjustment extraneous prognostic factors in an articl prognosis or the clinical course of the dise

C) Understand the relative importance of the nine tests for causation.

D) Understand the importance of random ass ment, measurement of clinically import outcomes, patient follow-up, clinical statistical significance, Type I and Typ errors, power, and the feasibility a generalizability of an article on therapy.

5) Practice of EBM in clinical years

Once students have been exposed to the b principles of EBM, it can be best learned thro practice with ongoing feedback from the faculty residents during clerkship courses. Various for of EBM are being adopted in clerkship. Stud morning report, lunch conferences, weekly stu seminars, and evening sessions are among approaches in use. In these formats, students us practice five basic skills of EBM.

1. Building a good question.
2. Carrying out an efficient, thoughtful search evidence.
3. Choosing the best resources from the rese output.
4. Critically appraising the evidence.
5. Applying what has been learned to the pat

In practicing EBM in real patient care, buildin good question is the most important step. The s

question should pertain to clinical decisions piv to optimal care of the patient, and the group d not know, or disagrees about, evidence-b answers to the questions. A feedback and guid of faculty and residents are very important. ensure intensive and continuous practice of E during the clerkship course, faculty in the E committee (especially, faculty who are engage pre-clinical EBM education) should closely co- with clerkship directors who are responsible fo introduction of EBM and student evaluation in own discipline. And in this process, as any other implementation processes of new educational methods, the will and support from the dean and chairmen of department will be very important.

5. Conclusion

Although there are criticism on the advoca style of EBM proponents and some shortcoming the available evidence, it is undeniable that E can be a very useful and effective method to pra medicine in the rapidly changing context of clin medicine. Medical schools in Korea should activ introduce it to their curriculum to educate fu physicians. There can be many possible method introduce EBM to undergraduate curriculum in t of the duration of course, time of introduct operating body, and so on. Non-regular, short- courses are most widely adopted format of E education in North America and Europe. Howe literature review shows that an intensive continuous EBM course is required to ensure m knowledge gain and sustained change in the beh of clinical practice. Course credits and for evaluation is a useful strategy to enhance know gain. In this paper, I propose following solution the best way to implement EBM course to Ko medical schools.

1. EBM should be introduced in medi curriculum as early as possible. A foundation computer literacy should be a requirement entering medical students, and basic bio-statistic literature searching skills should be taught pre-clinical years.

2. EBM course should be extended over the en undergraduate and post-graduate course. Stu should learn the basic skills and exercise of EBM multiple levels of medical curriculum.

3. Pre-clinical EBM course should be a par regular courses and should be taught by faculty who are expert in medical informatics, biostatistics, clinical decision making or critical appraisal. Course credits and formal evaluation is a useful strategy to maximize the educational impact.

4. There should be a central school body plann executing, and evaluating the pre-clinical E courses. Practice of EBM during clinical years be controlled by the clerkship directors of e discipline. To promote communication and coop tion among the faculty of the pre-clinical E course and clerkship directors, organizing the E committee can be an effective solution.

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