



Research Article

EVIDENCE-BASED MEDICINE IN DEVELOPING COUNTRIES

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ARTICLE INFO	ABSTRACT
Received 05 th January, 2015 Received in revised form 08 th February, 2016 Accepted 10 th March, 2016 Published online 28 st April, 2016	Serious consideration of health care indicators is of utmost importance in developing countries that usually suffer from the lack of advanced facilities to access the latest medical achievements. The fulfillment of this objective depends on using the most up to date, reliable and relevant resources in different areas of medicine. One of the most important resources in this field is the evidence-based medicine databases that aim to treat, improve care, increase longevity and improve the lives of patients. The present study discusses the role of evidence-based medicine in developing countries and underserved deprived regions. The results can be an effective step in the development of medical care in these areas.
Keywords: evidence-based medicine, health care, developing countries, Medical records	
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INTRODUCTION

One of the most important development indicators in each country is the promotion of public health. Healthy labor will lead to productivity and overall growth of a country. This requires early diagnosis of diseases and provision of appropriate and up to date treatment choices. On the other hand, the rapid growth of medical knowledge along with ineffectiveness of traditional methods in accessing, evaluating and using health information have created a gap between the theoretical research and clinical practice, and in particular, generates a difference in performance. Hence, there is a high need for update medical data using firm evidence to eliminate this gap and improve health care delivery. This is possible through the use of evidence-based medicine or EBM approach. This method includes the search processes, selection, critical evaluation and using information or evidence and guarantees the accuracy and effectiveness of decisions and clinical actions by physicians[1]. But is it possible to use this method identically in all countries?

It is obvious that different countries due to the various infrastructures and the level of development have different levels of facilities and equipment. It has also created a significant gap between developed and developing countries. Not being equipped with modern technologies and information systems to access timely and reliable medical databases, health

care centers of underserved countries are faced with numerous problems in the treatment of patients living in these countries. Problems such as limitations, deficiencies, and shortcomings impede providing appropriate clinical services that are considered a threat to patient health[2]. To resolve this problem it is necessary for clinicians to use valid scientific evidence in order to draw an appropriate and relevant answer to the many questions that arise during their clinical practice. This is possible by employing evidence-based medicine (EBM) approach because it provides access to the newest and most relevant research and medical evidence. Targeted effort is done purposefully towards making clinical decisions based on research and this leads to treatment, longevity and improving the lives of patients[3].

One important step in implementing the EBM could be sharing evidence-based medical databases and providing the essential possibilities for physicians to search them directly or indirectly. The latter case i.e., indirectly, means that the experts who are known as "medical librarians" or "informationists" can help, even remotely, the general physicians who, due to the large number of patients referred to them often do not have enough time to use the information databases immediately [4].

In this study, the necessity of using evidence-based medicine, executive obstacles in implementing and appropriate solutions for utilizing the remote clinical information services. The results

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of this study and other similar research can help to identify procedures and effective methodologies available to reduce potential knowledge gaps, medical errors and mortality caused by it, and ultimately to increase the quality of health services by improving the clinical decision-making in developing countries. This is a library research in which the keywords relevant to the topic of research were searched deeply and purposefully in databases and information resources. Then, according to the research objectives, the gathered information was analyzed and interpreted logically.

Evidence-Based Medicine Approach

The discussion about evidence-based issue was first raised in 1980 at McMaster University in Canada; though the beginning of the evidence-based medicine is likely attributed to the ancients[5]. Nevertheless, Medical interventions aimed at testing the effectiveness have been taken into consideration in "qanoon" Ibn Sina (Avicenna's work) in the eleventh century [6,7] Despite its initial plans being mainly related to the medical field [8], it is now accepted as a new approach [9] and has been used in nearly all fields of health care and policy.

Using both quantitative and qualitative evidence, this approach focuses on bridging the gap between the two areas of research and practice [10,11] and plays a significant role in reducing medical errors. Since these errors are very important in the field of health [12], and their incidence in the diagnosis of the treatment methods and medication is considered to be a threat to health and causes irreparable damages to the health of the patients [13], the influence of evidence-based practice in reducing them is unavoidable. Since the early 1990s, numerous definitions for this approach have been provided. Despite the diversity in their descriptions, they are not fundamentally different. What all these definitions referred to is that all of them use the best available scientific evidence to make clinical decisions [1] and enhance the quality of patient care [14].

Integrating the external evidence obtained from the systematic investigations of medical experiences and expectations of the patient makes this decision easier. Therefore, the desirability of clinical outcomes from the patient's perspective, the direct and indirect costs of a disease as well as diagnostic and therapeutic interventions are best combined. In a new definition of evidence-based medicine offered by Sackett, it is also referred to as a systematic approach to problem solving and has the ability to integrate the best available research evidence with clinical expertise and patient values [15]. However, performing this approach requires skill in efficient searching for medical information resources, critically appraising and locating them [16], with the aim of utilizing the patients preferences and simultaneously expanding the knowledge base of clinical staff [17]. These skills will be completed with the determination of relevance rate of retrieved information with a particular disease and making a decision about how to cure that disease [18].

The Types of Studies, Evidence-based Procedures and Resources

A variety of clinical questions raised in the health care process include questions related to therapy, etiology, diagnosis, prognosis, prevention, clinical trials, and cost. Considering the type of question in evidence-based medicine is very important

and can help to determine the best type of study design. For example, if the domain of a question is related to the treatment, the proposed research for it will be RCT, cohort, case control and case series. The types of questions along with the best proposal study for each type is shown in [19] (table 1).

Table 1 types of questions and the best proposal study

Type of Question	Suggested best type of Study
Therapy	RCT>cohort > case control > case series
Diagnosis	Prospective, blind comparison to gold standard
Etiology/Harm	RCT > cohort > case control > case series
Prognosis	Cohort study > case control > case series
Prevention	RCT>cohort study > case control > case series
Clinical Exam	Prospective, blind comparison to gold standard
Cost	Economic analysis

This table was a part of a tutorial entitled: *Introduction to Evidence Based Medicine*. Chapel Hill, NC: Health Sciences Library(19). With getting permission from the site: <http://guides.mcclibrary.duke.edu/ebmtutorial>.

The best study is one in which there is the least likelihood of bias i.e. the study that is the most reliable, as any type of bias in a study may have an impact on the conclusion in terms of compliance with reality. The outcome of such study may be inaccurate or untrue.[20], Then each study is less biased, its results are more effective and subsequently more accurate and valuable. Of course, we can obtain a closer estimation of truth by controlling the bias .[21].

Despite the important differences among the types of studies mentioned above, they have a similar structure that has been shown in PICO pattern and the diagram of critical appraisal tool for epidemiological studies. This pattern is composed of four parts: 1) Patient, 2) Intervention, 3) Comparison and 4) Outcome. For implementing the practice of evidence-based medicine successfully, after analyzing the question in terms of Pico and determining the best type of study, it is necessary to perform the following specific steps:

Changing information requires answerable questions in order to facilitate the search; Searching systematically and retrieving the most effective evidence available to answer questions; Critical evaluation of the evidences retrieved in terms of Validity, Utility, Clinical relevance and Applicability; Applying the results in evaluating the medical practice; Performance appraisal[22,23].

Physicians and other clinical staff should identify problems and make efforts to meet them by checking their performance after each cycle of evidence-based medicine. The clinical decision is the final result of a procedure which includes clinical reasoning, problem solving, awareness of the expectations of the patient and the health care system. This procedure is always associated with uncertainty, so there is usually no correct answer. EBM can solve a part of the uncertainty in decision making by using explicit knowledge obtained from research and combining it with tacit knowledge of the clinical expertise. It is important to note that all aspects should be considered in using the results of a reliable clinical study directly. The proper design of the clinical question, finding the most appropriate documentation in the shortest time, confidence in the credibility of the obtained

evidence and using the results of clinical evaluation [23] are all well implemented.

The report of scientific studies has been organized in databases in different levels for easy and quick access. These levels are represented in order of priority. The reason that studies are placed into

a hierarchy is that those at the top are considered as the “best evidence”.[24,25].

The levels of evidences are clearly shown in the pyramid below.

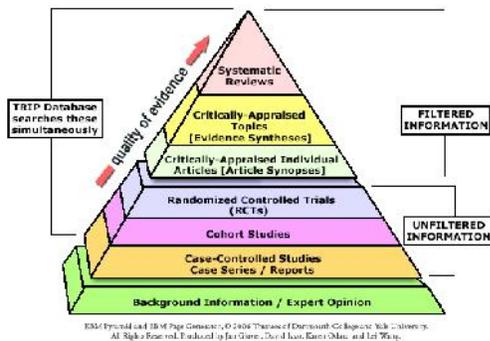


Figure 1 EBM Pyramid and Resources

With obtaining permission from the authors: Sackett DL, *et al. Evidence-based medicine: how to practice and teach EBM* (24)

Systematic reviews are the highest ranked (at the first level), while background information/ expert opinion are ranked lowest (at the seventh level). As seen in this pyramid, the other levels between these two extremities, from the second to the sixth levels are respectively: evidence syntheses (critically-appraised topics), article synopses, RCTs (Randomized Controlled Trials), Cohort studies and case series/Report. So, as we move from bottom to top, quality of the evidences increases and they will be more and more reliable and applicable.

Since Cohort studies are of prospective nature and there is a great deal of control on the data gathering and follow-up to make them as complete and accurate as possible, they can be very effective in specific circumstances. Also, to limit the bias for known variables such as age and pattern or treatment type, groups can be coordinated [26]. The importance of the case-controlled studies that begin with a group and can provide a rapid “response” to a specific question is slightly less than cohort ones. [27].

Hence according to the sort of study design, we can put it on a level in evidence hierarchy. Although Recognizing the differences between study designs is a crucial factor in determining the level, there are also some arguments in definite diagnosis of each study level. For example, “whether well-constructed observational studies compared to RCTs lead to similar conclusions?” [26]. whereas other researchers maintain that observational studies contain better capacity to over or underestimate treatment effects.

There are also other recommendations in the field of the hierarchy of evidence among which we can refer to a simpler

system of ABC recommended by the US Government Agency for Health Care Policy and Research (AHCPR). In this system A requires at least one RCT, B requires accessibility to well-conducted clinical studies but RCTs in the body of evidence are not necessary and C requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities [28].

However, what is important in the debate of hierarchy of evidence, is consideration of the values and preferences of the patients in clinical decision making. [28,29] that surely should be integrated into the clinical experiences of physicians.

One of the principle components of evidence-based medicine for the critical appraisal is guidelines. They are designed to improve the quality of health services and health promotion as well as preventing the imposition of additional costs. They help the physician to make appropriate clinical decisions, in facing certain conditions [30,31]. For example, in cases such as monitoring of cholesterol, preventive vaccination, etc., in which the populations are homogeneous, they are useful recommendations for physicians [32]. But in spite of their benefits, they have also some serious disadvantages that should not be neglected by the physicians [33, 34].

One of their disadvantages is related to trials, including randomized or non-randomized ones. This is a very important problem, because many guidelines are based upon trials in which the study population is homogeneous. The aim of these types of studies is just to answer a certain question that concerns an obviously pre-defined cohort [35] hence it deals with a specific population. Consequently, since the results of trials are originated from homogenous patients, applying them is difficult. Because in daily clinical practice the patients are inhomogeneous with complex and various conditions [36] where meta-analysis of different sub-populations, in addition to the initial analysis. Therefore the conclusions obtained from them, are probably not representative of reality [32]. Additionally, in some cases such as randomized trials, the results are usually presented as a percentage (%) reduction in events to show the highest impression and this may be unrealistic, that is a very small difference may be represented as a large percentage. In the existing guidelines, however, there are no instructions about how to use them along with the physician’s clinical experience in treatment of a patient in clinical practice [32].

Another problem is related to the members of committees who usually lack the adequate clinical experience, while the formation of the guidelines is based upon their viewpoints.

Finally, due to the analytical and detailed nature of most guidelines, it is very difficult for the clinical physicians to use. Also, some required procedures to produce guidelines delays their publication long after a clinical trial has finished and this problem is very important. [32]

EBM resources

There are several resources and databases in which physicians can search for evidence based medicine and satisfy their clinical information needs, among which we can refer to ACP PIER,

CINAHL Nursing & Allied Health Database, BEST BETS, Trip, UpToDate, OVID, Clinical Evidence, Cochrane Database of Systematic Reviews and Dynamed as being the most important and commonly used databases. They have been produced to help clinical practitioners in decision-making during the clinical care. These are most commonly found in the form of handbooks or manuals, many of which are now available in mobile-friendly formats[29].

Regarding the type of information, resources can be divided into two groups: primary and secondary resources. Primary resources are those that can be used to search for original information sources in the field of medicine such as MEDLINE, while these secondary resources including Pubmed, are based on primary resources. They are works that summarize, evaluate, interpret, and combine the evidence derived from primary resources and present them in the form of systematic reviews, meta-analysis, and topics related to critical evaluation and guidelines[30].

Evidence-Based Medicine in Developing Countries as a Necessity

The status of public health and treatment in developing countries, in spite of their low level of health services, like any other country had always been one of the major concerns. But rapid growth of medical knowledge along with inefficiency of the traditional approach has resulted in different practice of physicians in all aspects of delivering health care services. Moreover, it has led to a situation in which the latest medical achievements are not used by clinical practitioners hence, physicians and other clinical staff urgently need medical information to improve their practice[9,10]. The evidence-based medicine approach is very helpful for them to fulfil this need. Accessing the best evidence for clinical decision-making can provide remarkable aid to physicians in early detection of disease symptoms, reducing medical errors and finally promoting the health care quality [11,13].

Given the critical importance of health, patients are more willing to tolerate the costs related to the field of health care. Increasing evidence-based clinical care in countries with low and middle-income will bring substantial health achievements, while providing ineffective healthcare services will intensify the poverty and deprivation of the patients in these countries.

In many developing countries, the bulk of health care expenditures continue to be shouldered by individual patients or their families. Additionally, the incorrect prescriptions written by physicians who are unaware of the latest medical achievements causes an additional expense resulted from inconvenient versions and unnecessary tests on less affluent patients. For example, all over the Philippines, resting electrocardiogram (ECG) test is routinely done in asymptomatic patients to screen for coronary artery disease. The test alone costs approximately US\$5.00, enough to provide three full meals for a family of 5. A careful appraisal of the evidence would have revealed to practitioners that resting ECG's are fraught with high false negative and false positive rates. These problems make it virtually useless as a screening instrument for the disease. Careful review of the evidence reveals that resting electrocardiogram (ECG) test is an

unnecessary test to screen for coronary artery disease. As the above example illustrates, the evidence-based medicine practice could save millions of dollars in terms of health expenses in developing countries(26). Since that experience alone is not enough to improve the quality of care, using evidence-based medicine in terms of function, mission, and goals that will follow can save considerable amounts of money in the costs of patients in these countries.

Although evidence-based medicine would make invaluable contributions in physicians practice, it is the patients that will benefit from it ultimately. Because reducing overloads of the health care costs allows him/her to spend their modest income on more essential needs like food and shelter [37,38]. However, when talking about the implementation of evidence-based medicine in developing and deprived countries, due to the many obstacles in the way of using it in these countries, often the following questions will arise, "Why should the approach be implemented in developing countries?" "Is there a possibility of using it in these countries?" "What are the needs and means of evidence-based medicine in developing countries?" and "Do physicians working in these countries use the articles retrieved for the treatment with the same confidence of physicians working in the developed countries?" Providing informed and appropriate responses to these questions requires being aware of the existing problems and obstacles that these countries are faced with along their route of training, implementation, and using the evidence-based medicine approach. So this section of the study deals with the most important obstacles that have been identified in this area:

The disappointing attitude of the developing countries towards the developed countries in this respect that innovations and new achievements of the developed countries are completely useless and expensive for them;

Limited sources: in many developing countries, in addition to severe limitation of health care resources, problems such as unreliable drugs, shortage of employees, poor laboratory support, large numbers of patients, lack of drug regulation, economic regulations pertaining to pharmaceutical companies and other similar cases have intensified these limitations.

Possibly ineffective or harmful treatment, suspended physicians and ownership of the equipment or hospital facilities being influenced by pharmaceutical companies and foreign experts; The health care costs burdened by individual patients or their families who are forced to compete for obtaining the extremely limited resources[2];

Problems related to education and the use of evidence-based medicine in developing countries due to resource constraints including lack of time for physicians to attend educational workshops in evidence-based medicine by thinking that if they attend in these workshops they cannot be present at their workplace and thus lose their daily wage.

Providing incomplete information to the healthcare personnel in developing countries as well as not having up to date information and the lack of evidence-based content proportional to the cost and applicability in resource poor conditions;

7. Lack of investment in biomedical research in developing countries in terms of delivering and organizing research results and also in terms of matching resource information to end-user products that are easily accessible, readable, reliable, and relevant to the conducted researches in developing countries.

Lack of facilities to access computer and to perform searches in medical databases along with the reduced capacity of practitioners to conduct a systematic review;

due to the variety of patients in developing and developed countries, resolving the problems and limitations related to applicability and generalization of accessible evidence-based results primarily involves the provision of appropriate health facilities and infrastructure for continuous access of physicians to the results of the latest available developments in the field of medicine in order to apply effective treatment decisions. For this purpose, after being informed of any of the aforementioned obstacles and reviewing the existing strategies to overcome them, the feasibility of implementing this approach can be addressed- in which the facilities, infrastructure and the actual conditions of the environment where the evidence-based practice is to be implemented will be studied and then the favorable conditions for this purpose will be provided.

For example, to overcome the limitation of access to library facilities, after careful examination to find evidence, it is necessary to create an algorithm for retrieving articles in order to facilitate the use of different published articles. In this algorithm the effort to retrieve papers at first starts with the three libraries in the country and from there goes to three multinational companies and finally to individuals in the other countries that can access library facilities. Through this system, 80% of resources and articles can be retrieved [73]. For investment, establishment of technical facilities and necessary computer equipment, the relevant information and communication technologies such as information networks, sharing and access to evidence-based databases, teaching facilities to hold workshops with the aim of becoming familiar with the databases and learning the search strategies and retrieving information from them, attracting health professionals interested in research and clinical activities in this field and finally the future administration and planning of evidence-based development projects according to the defined levels of developing countries.

Levels of Evidence-Based Medicine Implementation in developing and disadvantaged countries

According to what was mentioned, if the necessary infrastructure is created, it is hoped that the evidence-based programs will be implemented in developing countries. The collaboration division belongs to The Cochrane Collaboration of Libraries which has centers in Brazil, China and South Africa, and poor countries are encouraged to participate in research related to this area. Hence, there is an increasing number in the systematic reviews related to developing countries [39]. Also, now Evidence-Based Medicine due to its worldwide importance has been emphasized by different disciplines all around the world, including Iran [40]. It is used in their educational programs and policy health system.

Anyway, the implementation of evidence-based medicine in developing countries is performed in four levels:

Appraising aimed at raising awareness about effective interventions and potential achievements using knowledge-based research on policy and practice. For this purpose, the activities related to the production and publication of systematic reviews in a variety of professional journals as well as linking systematic reviews may be done.

It is necessary to provide auxiliary facilities for training physicians, nurses and other health care staff to ensure the implementation and monitoring of guidelines and dissemination of evidence-based medicine education [41].

Target groups and responsible people in implementation of evidence-based medicine aimed at identifying the target groups and people with particular roles in the implementation. The essential actions in this level consist of identifying the target groups such as Ministry of Health (MOH) policy makers, advisors, professional groups, managers responsible for public health, transmission of systematic review results and their application in practical fields.

Certainly, in developing countries, physicians cannot use the retrieved articles on the treatment of patients with the same confidence as used by physicians in developed countries; unless all of these studies are specifically repeated in the target country, which is also impossible. In the case of effectiveness trials, the applicability is the important issue that is considered from different aspects [42,43]. It can be helpful to the clinical staff to be informed about the outcome of a trial being applicable to a particular case, and the time of decision making about repeating these trials. In order to perform evidence-based medicine on retrieving and evaluating systematic reviews in developing countries, the Jama diagnostic tests which have sensitivity and accuracy and are available to all health care providers can be used. However, it is recommended that: 1) the systematic reviews that - from search to publish- usually take two years or more to be performed by their own country; 2) a series of clinical questions, as a base for future researches be created or formulated; 3) the clinical areas neglected before, such as maternal health and childhood, infectious diseases, blood pressure, diabetes, heart disease, etc. be taken into particular consideration.

Pilot and innovative projects aimed at supporting particular selected projects, to evaluate the potential methods that are used for changing the practice which seems contrary to the current evidence. Activities in this area include identifying those colleagues interested in pilot development projects for the use of research findings and reliable evidence-based medicine to improve practice. Among this evidence, we can refer to systematic reviews by which one can ensure that changes made by project participants in policy and practice are controlled.

National or organizational policies for evidence-based medicine aimed at encouraging national governments, institutions or evidence-based medicine providers by applying control systems effectively. The activities include cooperation with government agencies at the national level to promote national policies for

the procurement of evidence-based guidelines and working with the management systems [38].

As was mentioned, the implementation of the above levels will be feasible only if the infrastructure and essential equipment exists in developing countries. The minimum budget needed to implement these levels include a computer with Internet access, holding Introduction workshops to databases and creating enthusiasm in the executive directors for providing necessary facilities for search and using evidence-based databases. But when a country has no facilities to perform an efficient search for resources, how can existing information resources be pursued to answer clinical questions? When conducting an exhaustive search for retrieving the medical evidence is fruitless and the library is still lacking the required resources including books and journals, how can one solve the clinical problem and make decisions based on medical evidence? In countries where there is not even the smallest computer facility to access the databases and perform a search for medical information resources, how can physicians and other clinical staff gain immediate use of the evidence-based databases to find appropriate answers for their clinical questions?

Although one cannot ignore the existing problems and limitations, since the investment in the field of health care is a very beneficial and valuable [37], these constraints should not lead to the alternative ways for offering appropriate solutions aimed at using the effective methods available being overlooked, specifically the approach discussed, i.e., evidence-based medicine for use in the health promotion of people living in poor countries. One of the most important ways to eliminate the barriers that impede the access and use of evidence-based medicine resources by physicians working in developing countries is to take advantage of the expertise and skills of those who are called "clinical informationists".

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