



# Teaching Evidence-Based Ophthalmology (EBO)

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## Introduction

Over the last years it the amount of biomedical information published has reached an unstoppable progression. One ophthalmologist fully dedicated would only reach a very little proportion of the information published, during his working day. Testing if the studies' conclusions are generalizable and applicable to his environment would also require knowledge and basic skills, to systematize and interpret the scientific literature. Today it has become increasingly crucial that ophthalmologists be able to make clinical decisions based on the best levels of evidence (1,2):

- (I) Turning their information necessities into questions that from which they can get answers (that is, formulate the problem);
- (II) Locating, in the most efficient way, the best Evidence to answer these questions, which may come from physical examination, laboratory measurements, published literature or other source of information;
- (III) Carrying out a critical (that is, weighted) evaluation of the evidence to determine its validity (closeness to truth) and usefulness (clinical applicability);
- (IV) Implementing these evaluations' results into their clinical practices; and,
- (V) Evaluating their performance.

Therefore, the practice of Evidence-Based Ophthalmology (EBO) not only requires reading scientific articles, but also reading the right articles at the right time and then modifying the physician's behavior in light of what has been found. All the information searched and critical evaluation will be futile, if similar effort is not made towards the valid application of the evidence and in the measurement of progress towards the objectives.

## What advantages does EBO provide to patients and doctors?

There are many advantages described for patients and ophthalmologists coming from the practice of EBO, that could be summarized as (3,4):

- (I) Advantages for ophthalmologists:
  - ❖ It facilitates the integration of medical education with clinical practice and allows the updating of knowledge in a routinely fashion;
  - ❖ It can be learnt and practiced by physicians at any training level;
  - ❖ It improves comprehension of scientific methodology, and the passage of passive readers of medical articles to critical readers, allowing the selection of those articles that are methodologically correct;
  - ❖ It increases confidence in decisions, which are taken both from a clinical aspect and from the field of health management, reducing uncertain daily decisions, and bringing patient care as close to the best clinical investigation results as possible;
  - ❖ It increases physician's capability to use sources of bibliographic information and reading habits, exploiting the current possibilities of information search with the new information and communication technologies;
  - ❖ It facilitates a better distribution of health resources.
- (II) Advantages for patients:
  - ❖ Clinical practice variability reduction;
  - ❖ More effective access to health care benefits;
  - ❖ It offers an opportunity for additional and

operative communication with patients' doctors to discuss the pros and cons of each diagnostic and/or therapeutic option and to convey their real participation in making decisions that affect them.

### How is EBO practiced?

Greenhalgh (5) published an article in the *British Medical Journal* proposing an 8-stage model of a checklist to assess the weight that EBO had on the clinical practice of health professionals:

- (I) Have clinical, psychological, social and other problems been identified and prioritized, taking into account the perspective of the patient?
- (II) Has a sufficiently competent and complete exploration been carried out to establish the probability of differential diagnoses?
- (III) Have additional problems and risk factors been considered that may need timely attention?
- (IV) If necessary, has evidence been sought (in systematic reviews, guidelines, clinical trials and other sources) concerning the problems?
- (V) Has the integrity, quality and strength of the evidence been evaluated and taken into account?
- (VI) Has a valid and relevant evidence been applied to this particular set of problems in a way that is both scientifically justified and intuitively reasonable?
- (VII) Have the pros and cons of the different options for the patient been presented in a way that he/she can understand, and have the patient's preferences been incorporated in the final recommendation?
- (VIII) Has a review, reminder, referral or other additional assistance been arranged if necessary?

All ophthalmologists should know the principles of Evidence Based Medicine (EBM) and have a critical attitude to their own practice and what the evidence provides. Without these professional skills, it is not possible to provide the best possible practice (6).

### The lack of information in Medicine and Ophthalmology

For a correct joint decision making it is required that ophthalmologists and patients identify and integrate the most relevant evidence. However, the authors of the "Evidence Manifesto" (7) reflect on the fact that patients health care may be affected by serious defects in creation,

disclosure and implementation of medical research.

Ophthalmologists and patients often do not recognize the importance of this problem and how it can profoundly affect the levels of health care they provide or receive. According to published data in the literature, between 20% and 50% of all health services provided in the United States of America (USA) could be inadequate, wasting resources and/or not improving the health status of patient's health (8-12). Although there are many causes for this problem, the majority can be attributed to the poor information quality that doctors and patients rely on to make decisions about the health services they provide or receive.

The lack of information in medicine and ophthalmology includes 4 problems fundamentally (13):

- (I) Many published medical researches do not have sufficient evidence quality, does not offer improvements in health outcomes for patients or is not useful for doctors when making decisions;
- (II) Most doctors are not aware of this problem;
- (III) Even if they are aware of this problem, most of them lack the necessary skills to evaluate the reliability and usefulness of the published evidence;
- (IV) Patients often lack accurate relevant information on evidence at the time of decision making in health.

### In what sources of information do ophthalmologists trust?

A survey was conducted to obtain information regarding the sources ophthalmologists rely on to incorporate new medical knowledge into their practice, that was mainly distributed to USA physicians (14). Most of the respondents preferred recommendations from consensus of their most prominent academic colleagues, as well as leaders' opinion.

Regarding authorship of a journal article, ophthalmologists selected a superior opinion leader, or any opinion leader trained at a university. Overwhelmingly, they preferred articles in a subspecialty journal or in a high-impact, multi-specialty publication. Journals were considered the most important source of information, while a conference in a large congress was also highly qualified.

### Educating in EBM to get the most reliable application of evidence to clinical practice

The authors of the "Evidence Manifesto" reflected on the possible measures to obtain more reliable Evidence. Among the recommendations that stood out was to encourage the

next generation of leaders in medicine to acquire skills to evaluate and apply the best available evidence to the patient's care. Therefore, they also considered it a priority to educate professionals, political representatives and public in EBM. High-quality and important research must be understandable and informative for a large audience, however, most of the currently published research is not aimed at a non-specialized public, it is often poorly constructed and is based on lack of training and orientation in this area. To make fair and informed judgments about the value and relevance of the evidence, people should have access to research and have the proper skills to make informed decisions that support their own health (7).

### **What is the evidence that postgraduate teaching of EBM changes anything?**

It has been published by a systematic review of teaching EBM in postgraduate settings (15) that standalone teaching improves knowledge, but has not effects on skills, attitudes or behavior. On the contrary, all these improve by clinically integrated teaching. Only two randomized controlled trials (RCTs) support these results.

The authors explain that clinically integrated teaching of EBM is likely to bring about changes in attitudes, skills and behavior. Changes in attitude would be beneficial for patient care, due to patient's behavioral changes. They suggest the importance of integrating and incorporating teaching of critical appraisal in daily clinical practice. Moreover, the importance of availability of resources and facilities should include teaching as a "real time" event with the objective of teaching EBM skills and improving care with the best evidence. Only when real time teaching is not possible, traditional teaching settings, such as journal clubs, can be adapted to actual clinical problems. In other words, this process is not an academic exercise, but how doctors obtain and provide information of care.

One of the objectives of EBM is to combine the best research evidence with clinical abilities and patient's preferences, including as a final objective to improve care. Not only changes in knowledge and skills would be necessary, but changes in attitudes and behavior would also be required. As it was explained before, although it requires considerable effort, teachers of critical appraisal should bring teaching out of classrooms into the clinic. The authors suggest for future studies to examine the results as long-term outcomes, because learning outcomes can deteriorate over time.

### **A hierarchy of effective EBM teaching and learning**

A hierarchy of different teaching strategies was introduced by Khan and Coomarasamy (16). They suggest that interactive classroom-based activities would bring about better learning outcomes compared to didactic but clinically integrated and standalone teaching. Multiple different strategies are explained in the literature, that could be used by EBM teachers, who should try to find how to best use them. Teaching and learning EBM can be associated to different efficacy levels to improve knowledge, skills, attitudes and clinician's behavior. To solve this, based on educational evidence, the authors of this review propose a hierarchy of teaching and learning methods for EBM:

- (I) Level 1: Interactive and clinically integrated teaching and learning activities.

Interactive teaching is supported by substantial empirical evidence. It has been proved that clinically integrated EBM teaching is more effective than classroom teaching, as it interrelates and unifies clinical subjects with clinical epidemiology. Professionals of EBM should aim for interactive and integrated learning, because it seems to be the most effective way to learn. It is reflective of practice, it allows identifying testable solutions, as well as it allows re-evaluation for further reflections and continuous learning.

- (II) Level 2: (a) Interactive, classroom-based teaching, or (b) didactic, but clinically integrated teaching.

These include working in interactive formats such as small groups, role plays and case discussions. The key of effective training is the activity, being the defining feature of interactive learning. Additionally, teaching can be clinically integrated. When teaching is turned into an interactive format there is a probability of greater educational benefit. E-health is proposed as a future development, an emerging field to teach and learn medicine via video teleconferencing.

- (III) Level 3: didactic, classroom, or standalone teaching.

Traditional teaching activities probably are not effective enough to improve clinician's performance and patients' health outcomes. All these traditional learning activities may have particular benefits, but unless they include interactive activities, their value is limited. The absence of interactivity encourages

superficial learning (rote and regurgitation).

### Educational interventions to improve people's understanding of EBM

Nowadays it is very easy to find information about health, although the quality of this information is variable. There is not a clear way to evaluate claims about health interventions, which makes people's health decisions misinformed and sometimes unsafe. Cusack *et al.* conducted a systematic review with the primary objective of identifying and assessing studies of educational interventions designed to improve people's understanding of concepts needed for the evaluation of claims about the effects of health interventions. In the short-term, people's knowledge and skills can improve due to the educational interventions, although the effects on confidence, attitude and behavior are not clear enough. Several studies were at moderate risk of bias. There is a need to improve quality of studies as well as measurements of long-term effects to improve the confidence in estimates of the effects of educational interventions with the objective of improving people's understanding the essential ideas for evaluating health intervention demands (17).

### Conclusions

Clinical decisions should be based on the Evidence. As it has been shown the EBO provides many advantages not only for patients but also for doctors. Furthermore, all ophthalmologists should know and put into practice the principles of EBM to provide the best possible care with the best evidence.

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### References

1. Sackett DL, Rosenberg WM, Gray JA, et al. Evidence based medicine: what it is and what it isn't. *BMJ* 1996;312:71-2.
2. Sackett DL, Rosenberg WM. On the need for evidence-based medicine. *Health Econ* 1995;4:249-54.
3. Bonfill X, Gabriel R, Cabello J. Evidence-based medicine. *Rev Esp Cardiol* 1997;50:819-25.
4. Rosenberg W, Donald A. Evidence based medicine: an approach to clinical problem-solving. *BMJ* 1995;310:1122-6.
5. Greenhalgh T. "Is my practice evidence-based?". *BMJ* 1996;313:957-8.
6. Dawes M, Summerskill W, Glasziou P, et al. Sicily statement on evidence-based practice. *BMC Med Educ* 2005;5:1.
7. Heneghan C, Mahtani KR, Goldacre B, et al. Evidence based medicine manifesto for better healthcare. *BMJ* 2017;357:j2973.
8. Chassin MR, Galvin RW. The urgent need to improve health care quality. Institute of Medicine National Roundtable on Health Care Quality. *JAMA* 1998;280:1000-5.
9. Kerr EA, McGlynn EA, Adams J, et al. Profiling the quality of care in twelve communities: results from the CQI study. *Health Aff (Millwood)* 2004;23:247-56.
10. McGlynn EA, Asch SM, Adams J, et al. The quality of

- health care delivered to adults in the United States. *N Engl J Med* 2003;348:2635-45.
11. Skinner J, Fisher E, Wennberg JE. The Efficiency of Medicare. National Bureau of Economic Research; 2001 July.
  12. Olsen LA, Saunders RS, Yong PL. The Healthcare Imperative: Lowering Costs and Improving Outcomes: Workshop Series Summary. In: Yong PL, Saunders RS, Olsen L, editors. Washington, DC: National Academies Press (US), 2010.
  13. Ioannidis JP, Stuart ME, Brownlee S, et al. How to survive the medical misinformation mess. *Eur J Clin Invest* 2017;47:795-802.
  14. Stewart WC, Stewart JA, Nelson LA. What data sources do ophthalmologists trust?. *Evid Based Med* 2017;22:205-7.
  15. Coomarasamy A, Khan KS. What is the evidence that postgraduate teaching in evidence based medicine changes anything? A systematic review. *BMJ* 2004;329:1017.
  16. Khan KS, Coomarasamy A. A hierarchy of effective teaching and learning to acquire competence in evidenced-based medicine. *BMC Med Educ* 2006;6:59.
  17. Cusack L, Del Mar CB, Chalmers I, et al. Educational interventions to improve people's understanding of key concepts in assessing the effects of health interventions: a systematic review. *Syst Rev* 2018;7:68.

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