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Evidence-based radiology for diagnostic imaging: What it is and how to practice it☆

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Abstract Evidence-based radiology is defined as the decision that results from integrating clinical information to select the most appropriate imaging test on the basis of the best available evidence, the physician's experience, and the patient's expectations. The practice of evidence-based radiology consists of five steps: formulating the question, performing an efficient search of the literature, critically evaluating the literature, applying the results of the search and evaluation while taking into account our experience and the patient's values, and evaluating the results obtained within our own practice. In diagnostic imaging, the number of resources available for evidence-based radiology is increasing: apart from books, articles, and web pages on this subject, evidence-based radiology is receiving more attention at diagnostic imaging conferences. The principles of evidence-based radiology will help promote the appropriate use of resources, greatly benefiting patients (decreasing the use of examinations that use ionizing radiation), professionals (less overload), and managers (more efficient use of resources).

PALABRAS CLAVE
Medicina basada en la evidencia;
Radiología basada en la evidencia;
Diagnóstico por imagen;
Criterios ACR;
ALARA

Radiología basada en la evidencia en el diagnóstico por imagen: ¿qué es y cómo se practica?

Resumen La Radiología Basada en la Evidencia (RBE), se define como la decisión que resulta de integrar la clínica con la prueba de imagen más adecuada en base a la mejor evidencia disponible, la experiencia del médico y las expectativas del paciente. Su práctica consta de cinco pasos: formular la pregunta, realizar una búsqueda eficiente de la literatura, evaluar críticamente la literatura, aplicarla a los resultados teniendo en cuenta nuestra experiencia y los valores del paciente y evaluar los resultados obtenidos dentro de nuestra práctica. En Radiodiagnóstico se está incrementando el número de recursos disponibles de RBE, encontrando actualmente libros, artículos, páginas *web*, así como potenciando actividades en congresos de nuestra especialidad. Los principios de la RBE ayudarán a promover el uso apropiado de los recursos, aportando enormes beneficios a pacientes (disminuye el uso de las exploraciones que utilizan radiaciones ionizantes), profesionales (menos sobrecarga) y gestores (uso más eficiente de recursos).

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Introduction

The term ''Evidence-Based Medicine'' (EBM) was created by the Evidence-Based Medicine Working Group at the McMaster University in Hamilton, Ontario (Canada)[1] in the early 90s. This group was proposing to carry out a clinical practice based on the best results of an investigation and to train clinicians the skills to perform an efficient search and a critical appraisal of articles in order to make their research tasks easier. The National Health Service Centre for Evidence-Based Medicine (CEBM)[2] in Oxford, UK, has been the second group to apply this concept.

Although the first articles on critical appraisal[3–5] were published in the Journal of the JAMA already in 1993, it was not until 1996 when Sackett formally introduced the term EBM as ''conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients''.[6]

In recent years we have witnessed an enormous increase in the number of diagnostic examinations using ionizing radiation. Data published in the United States show an increase higher than 600% per decade: from three million computed tomographies (CT) during 1985, to more than sixty million CT in 2005.[7]

Are all these examinations really necessary or could they mainly be avoided? There are increasingly more articles published that state the overuse of diagnostic tests.[8] Unnecessary studies contribute to an increase in health care costs and lead to a rise on the adverse effects that entail ionizing radiations, being this the most important fact in pediatric population.[9–11] Moreover, an unnecessary test can also cause anxiety to the patient, and in some cases, a casual and insignificant finding can lead to other examinations and radiology follow-up that in no case will contribute to increase survival rates or to improve life quality.[12] All of these are moving us away from the principle ALARA (As Low As Reasonably Achievable), which implies that studies must only be performed when really required and using the minimum dose necessary to achieve a diagnostic conclusion.[13]

Although it has taken a few years for the term EBM to be established, it is nowadays a basic pillar in the practice of medicine. The EBM can be used every time there is any doubt on a treatment, diagnosis, intervention or prognosis on a specific patient.

Due to the fact that we are daily under the obligation to make many decisions, the use of EBM allows us to identify, evaluate and apply relevant information so that decisions are made systematically and represent the combination of personal expertise, experience and clinical or radiologic knowledge with the best external evidence revised during the research.[14]

Many of the questions raised by clinicians are on imaging diagnosis: How often should a follow-up CT on a lymphoma in remission be made? Is it urgent to perform a CT to evaluate a patient with a several month history of cephalalgia? In these occasions, clinicians and radiologists must make a team to find solutions to solve individual patients' problems and optimize resources.

It is in this context that we should talk about evidence-based radiology (EBR), which is defined as the decision that results from integrating clinical information with the most appropriate imaging modality on the basis of the best available evidence, the physician's experience, and the patient's expectations.[15] In other words, the purpose of EBR is to select the most effective diagnostic technique taking into account the values and circumstances of a given patient.[16]

Levels of evidence and grades of recommendation

The levels of evidence were set with the aim to help professionals assess the strength or robustness of the results obtained in a research. It is a hierarchical classification according to the scientific rigor of the design of studies. There are five levels of evidence that range from level 1 (best evidence) to level 5 (least solid evidence). From this classification, levels of recommendation are established concerning a specific health care procedure or intervention: A (highly recommendable), B (recommendable), C (not very recommendable) and D (not recommendable).[17]

From one given disease, different types of questions can be raised that can relate to its etiology and risk factors (what causes this disease?), to its frequency (how common is this disease?), to its diagnosis (has this patient this disease? or what is the best test to confirm or rule out the diagnosis of suspicion?), to its prognosis (which one of these patients will develop this disease?), or to its treatment (what is the best treatment?). Different studies will be designed depending on the type of question to be answered.S[18]

Therefore, Oxford's CEBM[2] sets the levels of evidence and grades of recommendation depending on whether the questions to be formulated are regarding treatment, prognosis, diagnosis or economic analysis. Table 1 shows the classification of levels of evidence and grades of recommendation for diagnostic tests.

According to the design of the studies, they can be classified as observational (the researcher is prospectively or retrospectively a spectator of what is happening) and experimental (the researcher controls the factor under study).[19]

Within the observational studies there are the cohort studies, the case–control studies and the transversal or prevalence studies.[20]

Normally, an observational study with an outcome variable (disease determined by a reference test or gold standard) and a predictive variable (test under study) is brought up in order to evaluate diagnostic tests. Therefore, in CEBM's classification (Table 1), the design of study considered the most appropriate in order to compare two diagnostic tests is the cohort study (level of evidence 1b). Although even better than a cohort study is a systematic review (SR) of various cohort studies. A SR performs a systematic search of all cohort studies on a subject, appraises them critically and summarises the outcome according to a set of predetermined criteria.[21] A meta-analysis always includes a statistical treatment of data, whereas a SR may not.

Case–control studies can be applied in radiology although their use is not very extended. Cost-effectiveness studies are increasingly common in our field.[22]