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Evidence-Based Imaging: Optimizing Imaging in Patient Care

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Evidence-Based Imaging: Optimizing Imaging in Patient Care

L. S. Medina and C. C. Blackmore, eds. New York: Springer Science+Business Media, 2006, 581 pages, 183 illustrations, \$149.00.

This is a time of paradox for the specialty of radiology. Although our ability to diagnose and treat pathology expands exponentially, our research is sometimes criticized as lacking. Although few would disagree that we have made great strides in the last 20–30 years, it is hard to argue with those who point to current “standards” in medical imaging practice as based principally on relatively small often nonrandomized studies without defined or measured patient outcomes as the gold standard. Simultaneously, we are confronted by those who question the rapidly growing number of medical imaging procedures performed and the associated spiraling cost.

Of course, radiology is not alone in receiving such criticism. Much of medical practice, from palpation of the abdomen to auscultation of the heart, is without solid grounding in controlled outcomes-oriented research. This deficiency has led to the development of “evidence-based” medicine initiatives in many specialties and a movement toward “evidence-based” practice as the definition of standard of care. So far, this trend has had limited impact on radiology, but there have been notable leaders of this research within our specialty, 2 of whom are editors of *Evidence-Based Imaging*. Drs. Medina and Blackmore have compiled a book that is truly *sui generis* within the radiology literature. This work is unique not only in the approach to the subject matter but also in the potential range of readers.

Evidence-Based Imaging seeks to accomplish both general and specific goals: to educate the reader on the broad concepts and principles of evidence-based medicine and to examine a limited series of 28 medical conditions ranging from lung cancer to spinal trauma and to determine the quality of the evidence for current “best” imaging practice in each. As such, the potential readers of the work span the gamut from those interested in the field of evidence-based or effectiveness research in radiology to the radiologist seeking a quick reference on how to approach a specific clinical problem. Many of us in the neuroradiology community fall into 1 or both of these groups.

The first chapter is devoted to a review of the principles of

evidence-based imaging (definition, process steps, types of economic analyses in medicine, and application of the evidence). The authors have provided a useful summary of the important concepts not only in the field of evidence-based imaging but in medical research as a whole. They have included good explanations of the possible studies performed, basic statistical terms (sensitivity, specificity, accuracy, and so forth), and

the multiple different forms of economic and cost-effectiveness analyses. They then focus on the key difference between accuracy studies (how good is carotid MRA in detecting stenosis?) and effectiveness studies (how good is carotid MRA in improving the outcome of patients with a TIA?). The latter is often missing from much of the radiology literature.

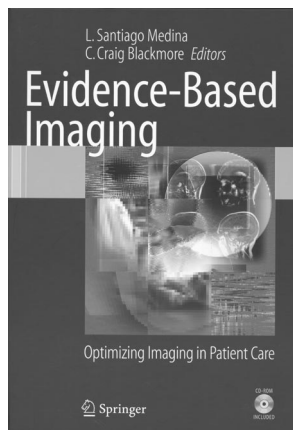
The second chapter is an excellent review of how to assess critically the literature; how to look for error and bias in an article; and what inherent biases frequently enter into research, especially that involving screening larger populations. These 2 review chapters set the stage for the rest of the text. Moreover, they provide a ready reference and refresher of these basic principles for those in practice for some time and a good synopsis for residents just entering the field.

The remaining 28 chapters are each dedicated to the understanding of the appropriate role of imaging in the evaluation and management of a specific disorder or medical condition. Eleven of these topics are of interest to neuroradiologists and cover such conditions as acute stroke, brain tumors, Alzheimer disease, and lower back pain. Each chapter, though written by a different author, is structured with the same format. Up front is a list of issues/questions to be addressed, followed by a summary of the “Key Points” articulated. This provides a quick synopsis for those who only want to glance at a topic.

Following these lists, each chapter has sections devoted to the definition and pathophysiology of the disease discussed, its epidemiology, the overall cost to society, the goals of imaging in that disease, and the methodology of the literature review undertaken to describe best imaging practice. Although the reviews are not true meta-analyses, they provide good summaries of the most current data available on the imaging questions addressed. However, each author is making judgments about the appropriateness of the methodology of each article reviewed and only using those articles believed to be sound.

The heart of each chapter is a series of questions/issues related to imaging of the specific disease: “What is the Imaging Technique of Choice for the Detection of Intracranial Hemorrhage?” “What is the Role of Neuroimaging in Patients with First Unprovoked Seizures?” “Chronic Sinusitis: What is the Role of Imaging? Does Imaging Change Treatment Decision Making?” Each of these questions is first answered with a “Summary of Evidence,” several conclusions about the role of imaging with an assessment of the strength of the evidence supporting each. This “evidence classification” provides the basis for clinical decision-making and is the core principle of this book. Understanding whether the assessment of the literature supports a specific imaging-based conclusion allows the reader to not determine the potential role for an imaging evaluation in the work-up or management of a patient. This assessment can also direct those who engage in research in the specific imaging area to consider how to develop further supporting studies. The evidence is classified as “strong,” “moderate,” “limited,” or “insufficient” on the basis of a review of the relevant literature examining the generalizability of the results, the study designs (random, blinded, and so forth), and the flaws or limitations, stated or unstated, in the articles.

For example, when answering the question “What is the Role of Imaging in Patients Suspected of Having a Herniated Disk?” the authors of that chapter find strong evidence for the correlation between loss of disk-space height over a 12–13 year period



and the development of lower back pain. Moreover, they find moderate evidence for the sensitivity (88%–94%) and specificity (57%–64%) of CT in detecting herniated disks. However, they found only limited evidence of the value of CT in detecting intrathecal nerve root pathology and could find no data on the accuracy of CT or MR imaging for nerve root impingement.

This analysis is the strength of the book and its *raison d'être*. If one is interested in understanding the current status of the literature on the application of neuroradiology to a particular clinical topic, then each chapter provides a good summary of the state of the art. The evidence-based analysis also imparts a valuable perspective on the degree to which we should rely on some of the common wisdoms. It counters the natural tendency in most publications (journals, books, and so forth) to tout each new discovery as being vitally important to the better care of patients.

Like any review article or book, this analysis has limitations. The assessment will by definition be shortly out of date. The strong focus on the current state of the literature and assessment of its value makes the problem more significant with this work than with a work examining the imaging findings themselves. Moreover, each clinical topic is presented at a relatively cursory level with a short summary of the data. The organization of the chapters by clinical condition paradoxically narrows the focus of the work to more of a technique (MR, CT, and so forth) analysis than the more typical format based on an imaging finding and its differential diagnosis. Moreover, the strength of data analysis (strong, moderate, and so forth) is presented without much, if any, detail as to how each statement was determined. We have to accept the verdict of the authors on the strength of each evidence statement without much supporting information.

Even with those limitations, this book is a significant addition to the radiology literature. It is the first work that emphasizes the importance of an evidence-based perspective toward the appropriate use of imaging technology on the management of patients. The next several years will surely see an increasing focus on these issues in the health care community at large, and radiology needs to be able to respond to the implicit and sometimes explicit challenges that will surely develop. How will we answer the critics of increasing use of diagnostic imaging? How does our research document the value of imaging examinations in the outcome of patients with specific disease states? Many of us may be referring to this book and perhaps others like it increasingly in the future as we respond to these and other such questions.

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BOOK REVIEW

Atlas of Ultrasound Measurements, 2nd ed.

Barry B. Goldberg and John P. McGahan, eds. Philadelphia: Mosby-Elsevier, 2006, 512 pages, 400 illustrations, \$110.00.

The *Atlas of Ultrasound Measurements, 2nd Edition* offers insight into established diagnostic criteria detailed by leaders in the field of diagnostic sonography. It serves as a reference

for those establishing a practice, a comprehensive text for study protocol preparation, an essential reference book for those seeking and/or renewing accreditation of their laboratories, as well as a standard text for physicians in training and sonographers.

The editors organized this book into anatomic/specialty segments comprising 13 areas, which allow a quick reference of an area of interest.

There are a total of 93 chapters blending gray-scale, Doppler, and newer 3D/4D applications in obstetric and genitourinary sonography. The contributors include experts in their fields of medical sonography, as well as newcomers initiating their professional careers in this exciting imaging field.

The book offers a detailed obstetric slate of measurements, divided into 3 parts: first trimester, second and third trimesters, and obstetric Doppler, including placental circulation. These parts are then divided into 43 individual chapters with measurements, charts, illustrations, and state-of-the-art 3D/4D images for easy identification of fetal anatomic landmarks. A very complete gray-scale fetal cardiac evaluation is included, supplemented by a description of Doppler fundamental principles for accurate fetal cardiac evaluation. The authors caution the reader regarding higher energy exposure of the fetus during spectral Doppler evaluation, guiding the reader to localize the area of interest first with color Doppler (remaining within the as low as reasonably achievable recommendations). A comprehensive up-to-date reference list with classic publications and recent literature is provided.

Pediatric sonography measurements are detailed in Part 5, subdivided into 18 chapters. These range from neurosonology to abdominal/pelvic and musculoskeletal evaluations. It is rich in detail regarding scanning techniques to avoid exerting too much pressure (on the fontanelle) and selecting the best transducer. Evaluation of pyloric stenosis is comprehensive. The evaluation of the neonatal hip, endorsed by the American College of Radiology and the American Institute of Ultrasound in Medicine as the best method for the exclusion of developmental hip dysplasia, is complete with angle measurements, femoral head size, and a full description of correct positioning of the patient and anatomic landmarks for accuracy.

An entire part is dedicated to the 3 methods of cardiac evaluation with sonography, encompassing pediatric and adult patients. The author details M-mode, pulsed-Doppler, and 2D echocardiography. All calculations of cardiac and valvular performance are included with current reference articles. Transesophageal echocardiography, due to its specific applications, is not included in this book.

Head and neck imaging comprises gray-scale and Doppler evaluation, described in 2 separate parts. Chapters on internal carotid/vertebral artery surveillance (with endorsement of the consensus conference sponsored by the Society of Radiologists in Sonography) are complete. Transcranial Doppler is approached with detailed descriptions of vessel identification, flow characteristics and direction, interpretation guidelines, as

