

Essential Evidence-Based Medicine

Evidence-based medicine (EBM) – using the best evidence in the literature for the best care for an individual patient – sounds very simple. Yet most medical students and physicians do not have the mathematical background or training to critically evaluate published research. This “consumer’s guide” to EBM helps you become a more discriminating reader of the medical literature. An introduction to scientific methods and study design leads on to a better understanding of measurements and sources of bias. There is a brief introduction to statistics and hypothesis testing (Type I and II errors) and measures of risk and efficacy. The second half of the book teaches medical decision making including discussions of the clinical examination and sources of bias in that examination, likelihood ratios, sensitivity, specificity, and predictive values, and advanced topics in medical decision making. This is an ideal introductory text for medical students and all health-care professionals.

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Contents

Preface	<i>page</i> vii
Acknowledgements	ix
1 A brief history of medicine and statistics	1
2 What is evidence-based medicine?	9
3 Causation	17
4 The medical literature: an overview	22
5 Searching the medical literature Sandi Pirozzo, <i>University of Queensland</i>	30
6 Study design and strength of evidence	52
7 Instruments and measurements: precision and validity	62
8 Sources of bias	74
9 Review of basic statistics	87
10 Hypothesis testing	102
11 Type I errors and number needed to treat	113
12 Negative studies and Type II errors	122
13 Risk assessment	132
14 Multivariate analysis	145
15 Randomized clinical trials (RCTs)	150
16 Scientific integrity and the responsible conduct of research John E. Kaplan, <i>Albany Medical College</i>	162
17 Applicability and strength of evidence	170

vi	Contents	
	18 An overview of decision making in medicine	179
	19 Sources of error in the clinical encounter	196
	20 The use of diagnostic tests	206
	21 Utility and characteristics of diagnostic tests: likelihood ratios, sensitivity and specificity	211
	22 Bayes' theorem, predictive values, post-test probabilities, and interval likelihood ratios	222
	23 Comparing tests and using ROC curves	237
	24 Incremental gain and the threshold approach to diagnostic testing	242
	25 Sources of bias and critical appraisal of studies of diagnostic tests	254
	26 Screening tests	267
	27 Practice guidelines and clinical prediction rules	276
	28 Decision analysis and quantifying patient values	288
	29 Cost-effectiveness analysis	304
	30 Outcome analysis	312
	31 Meta-analysis and systematic reviews	319
	Appendix 1 Levels of evidence and grades of recommendations	329
	Appendix 2 Overview of critical appraisal	334
	Appendix 3 Formulas	337
	Appendix 4 Commonly used statistical tests	340
	Appendix 5 Proof of Bayes' theorem	343
	Appendix 6 Using balance sheets to calculate thresholds	345
	Glossary	347
	Bibliography	361
	Index	373

Preface

In 1992 during a period of innovative restructuring of the medical school curriculum at Albany Medical College, Dr. Henry Pohl, then Associate Dean for Academic Affairs, asked me to develop a course to teach students how to become lifelong learners and how the health-care system works. This charge became the focus of a new longitudinal required four-year course initially called CCCS or Comprehensive Care Case Study. In 2000, the name was changed to Evidence Based Health Care (EBHC).

During the next ten years a formidable course was developed. It concentrates on teaching evidence-based medicine (EBM) and health-care systems operations to all medical students at Albany Medical College. The first syllabus was based on a course in critical appraisal of the medical literature intended for internal medicine residents at Michigan State University. This core has expanded by incorporating medical decision making and informatics. The basis for the organization of the book lies in the concept of the educational prescription proposed by Scott Richardson, M.D.

The goal of the text is to allow the reader, whether medical student, resident, allied health care provider, or practicing physician, to become a critical consumer of the medical literature. This textbook will teach you to read between the lines in a research study and apply that information to your patients.

For reasons I do not clearly understand many physicians are “allergic” to mathematics. It seems that even the simplest mathematical calculations drive them to distraction. Medicine is mathematics. Although the math content in this book is on a pretty basic level, most daily interaction with patients involves some understanding of mathematical processes. We may want to determine how much better the patient sitting in our office will do with a particular drug, or how to interpret a patient’s concern about a new finding on their yearly physical. Far more commonly, we may need to interpret the information from the Internet that our patient brought in. Either way, we are dealing in probability. However, I have endeavored to keep the math as simple as possible.

This book does not require a working knowledge of statistical testing. The math is limited to simple arithmetic and a handheld calculator is the only computing

instrument that is needed. Online calculators are available to do many of the calculations needed in the book and accompanying CD-ROM. They will be referenced and their operations explained.

The need for learning EBM is elucidated in the opening chapters of the book. The layout of the book is an attempt to follow the process outlined in the educational prescription. You will be able to practice your skills with the practice problems on the accompanying CD-ROM. The CD-ROM also contains materials for “journal clubs” (critical appraisal of specific articles from the literature) and PowerPoint slides.

A brief word about the CD-ROM

The attached CD-ROM is designed to help you consolidate your knowledge and apply the material in the book to everyday situations in EBM. There are four types of problems on the CD:

- (1) **Multiple choice questions** are also called Self-assessment learning exercises. You will be given information about the answer after pressing “submit” if you get the question wrong. You can then go back and select the correct answer. If you are right, you can proceed to the next question. A record will be kept of your answers.
- (2) **Short essay questions** are designed for one- to three-sentence answers. When you press “submit” you will be shown the correct or suggested answer for that question and can proceed to the next question. Your answer will be saved to a specified location in your computer.
- (3) **Calculation and graphing questions** require you to perform calculations or draw a graph. These must be done off the program. You will be shown the correct answers after hitting the “submit” button. Your answer will not be saved.
- (4) **Journal clubs** require you to analyze a real medical study. You will be asked to fill in a worksheet with your answers in short essay form. After finishing, a sample of correct and acceptable answers will be shown for you to compare with your answers.

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Next, I would like to acknowledge the help of all the students and faculty involved in the EBHC Theme Planning Group for the course since the start. This group of committed students and faculty has met monthly since 1993 to make constructive changes in the course. Their suggestions have been incorporated into the book and this invaluable input has helped me develop it from a rudimentary and disconnected series of lectures and workshops to what I hope is a fully integrated educational text.

I am indebted to the staff of the Office of Medical Education of the Department of Internal Medicine at the Michigan State University for the syllabus material that I purchased from them in 1993. This became the skeleton structure of the course on which this book is based. I think they had a great idea on how to introduce the uninitiated to critical appraisal. The structure of their original course can be seen in this work.

I would like to thank Sandi Pirozzo, M.D. and John Kaplan, Ph.D. for their chapters on searching and the ethical conduct of research respectively. I would especially like to thank the following faculty and students at Albany Medical College for their review of the manuscript: John Kaplan, Ph.D., Paul Sorum, M.D., Maude Dull, M.D. (AMC 2000), Kathleen Trapp, B.S., Peter Bernstein, B.S. (AMC 2002), Sue Lahey, M.L.S., Cindy Koman, M.L.S., and Anne Marie L’Hommedieu, M.L.S. Their editorial work over the past several years has helped me refine the ideas in this book. I would also like to thank Chase Echausier, Rachael Levet, and Brian Leneghan for their persistence in putting up with my foibles in the production

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Finally, this book is dedicated to my children, Memphis, Gilah, and Noah. Thanks for all of your patience.