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# Medical Decision Making

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A Physician's Guide

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To M.G. and Ari, my wisest decisions. –AS

To Rebecca, for whom I have certainty. –GB

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## Foreword

This lucid, well-written book fills a distinct gap in the literature on decision making in the health professions, especially medicine and nursing. What is this gap? And how does this book address it?

Introductory presentations of medical decision making typically begin with how to assess the accuracy of clinical evidence, especially diagnostic tests, and move on to drawing inferences. Making diagnostic judgments is conceptualized as a problem of updating opinion with imperfect information, and Bayes's theorem is the method to solve the problem. Probability and uncertainty are highlighted and Bayes's theorem is presented in one form or another. Other books are intended as graduate texts for health professionals who wish to practice decision analysis or do research using statistical decision theory. This book is positioned somewhere between those two poles.

Instead of starting with diagnostic testing, it begins with the problem of determining goals and objectives of medical care and with methods for assessing values and the quality of life. It does not neglect probability, uncertainty and how they can be effectively discussed with patients, but it puts values, utility assessment and choice on center stage. Interestingly, it does not get to Bayes' theorem and diagnostic testing until better than halfway through the text. By that time, the reader should have a very good idea of how concepts and principles of medical decision making extend well beyond the setting of diagnosis with which the field arguably began. Importantly, it shows that a scientific approach to medical decision making is not limited to technical rationality, but can pay close attention to the values and goals of thoughtful clinical practice.

Within these pages, all of the major topics in medical decision making are covered at a level of detail appropriate for a text intended for physicians and other health professionals who do not intend to specialize in the area but who want to know, in broad terms, what it is about. The topics include: 1) the role of values in many decisions and how they can be quantified for systematic decision making; 2) decision making with multiple, sometimes competing objectives, and thinking about trade-offs; 3) decision analysis, including sensitivity analysis, and ways of visualizing decisions, including decision trees and influence diagrams; 4) cost-effectiveness analysis, including measuring the quality of health outcomes (quality-adjusted life years); and 5) psychology of judgment and

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decision making. Findings of three decades of research in decision psychology are especially well integrated into the exposition. It concludes with chapters on family involvements in clinical decisions and other ethical issues.

Recently, medical decision making has been treated largely as an adjunct to evidence-based medicine. This book emphasizes a very different perspective that is, in my opinion, much needed: evidence-based medicine is discussed in a few pages, while value and quality-of-life issues are much more prominent.

The book makes a sustained effort to address the needs and concerns of learners and novices in the field. It is not a graduate text in any of the topics discussed. Mathematical formalisms and notation are kept to a minimum to increase its appeal to health-care professionals. The reasons why we should care about a particular question introduce the exposition of the methods used to approach it. The connections between clinically realistic situations and fundamental concepts and theories are repeatedly emphasized. So if one is looking for a book effectively written at a level appropriate for physicians and other health professionals who want an overview of the territory, it is in your hands. It deserves a wide audience.

*Arthur S. Elstein, Ph.D.*  
*October, 2007*

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## Preface

Decision making is a key activity – perhaps the key activity – in the practice of health care. Although physicians acquire a great deal of knowledge and many specialized skills during their training and through their subsequent practice, it is in the exercise of clinical judgment and its application to specific decisions facing individual patients that the outstanding physician is distinguished. This has become even more true as patients have been increasingly welcomed as partners in increasingly complex medical decisions, in what has been termed “shared decision making.”

Medical decision science is a field that encompasses several related pursuits. As a normative endeavor, it proposes standards for ideal decision making. As a descriptive endeavor, it seeks to explain how physicians and patients routinely make decisions, and has identified both barriers to, and facilitators of, effective decision making. As a prescriptive endeavor, it seeks to develop tools that can guide physicians, their patients, and health care policymakers to make good decisions in practice.

Although there have been decades of research and theory on the judgment and decision making of physicians and patients, this “basic science” of the decision process has too often been unknown outside the province of the academic medical center. Just as a substantial crevasse separates the theoretical geneticist from the general practitioner who could benefit from new developments in genetics and genomics, a similar canyon gapes between the decision scientist and the community physician.

The goal of this book is to bridge that gap – to provide a practical, conceptual, clinical translation of the work of decision theorists, analysts, and psychologists – and to do so in a way that will be interesting and useful to a busy physician.

We come to this book with several fundamental beliefs. Our first fundamental belief is that a large majority of clinical decisions are variations of basic patterns of decision problems that are similar across specialties, and amenable to the same basic classes of conceptual tools. All carpenters apply a common set of tools to a common raw material. A master carpenter, however, produces valuable and unique pieces by critically evaluating the distinctive grain of a piece of wood,

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carefully choosing which tools are appropriate, and skillfully applying those tools to best effect. A master clinician similarly achieves great results for patients by considering each patient as a unique individual and selectively applying conceptual tools in a skillful manner.

Our second fundamental belief is that making good decisions is more important in practice than making perfect decisions. As a result, the treatment of decision science in this book is both at a high conceptual level and necessarily abridges some of the finer grained mathematical distinctions that are of great interest to decision scientists. For readers who wish to explore the ideas we present in greater detail or mathematical rigor, we provide references to key works in modern decision theory.

Our third fundamental belief is that many clinical decisions require input from both physicians and patients, but physicians and patients are not interchangeable. Each brings a unique perspective and unique information that is largely inaccessible to the other – a point that is often made when physicians write about their own experiences as patients. A theme of this book is to consider how much and what kind of information must be provided by the patient in different types of decisions to make the decision process successful.

Our fourth fundamental belief is that the practice of medicine and health care policy are inseparably linked. Acts of clinical care are influenced by public policy and social context; in many important cases, acts of clinical care may even be expressions of policy. When health care demand exceeds resources, when access to care is difficult or inequitable, or when other factors conspire to constrain physicians' abilities to provide excellent care, they often become advocates not only for their individual patients, but for the health of their society. As these circumstances are common in both the developed and developing world, this book also introduces ideas in decision science that go beyond choices that affect an individual patient to those that impact the patient's family, community, and society.

This is a book for physicians and other smart, busy, independent-minded people with a deep concern for the health and well-being of others. We are medical educators, and as such, we know that the lecture is the least effective way of conveying information. Accordingly, this book is organized around typical clinical cases in a variety of specialties and is designed to encourage the reader to reflect on the application of the concepts presented to their own clinical practice. Where possible, chapters are self-contained, allowing the reader to approach the book in the order most useful for them and to use it as a convenient reference; where chapters must refer to earlier chapters, this is clearly noted. A brief synopsis of each chapter follows.

**Part I**

**Goals of medical care**

**Chapter 1 – Goals and objectives**

Your patient has just been diagnosed with lung cancer, and you know that she will face many decisions about her treatment and will look to you for information and guidance. Good decisions are characterized first and foremost by good decision processes – approaches designed to increase the likelihood and degree to which important goals are achieved. Before any choices can be considered, decision makers should clarify their goals and objectives. This chapter presents a typology of goals and how they operate in medical decisions, together with suggestions for how you can facilitate your patient’s clarification and refinement of their goals.

**Part II**

**Valuing health**

**Chapter 2 – Components of health**

Your patient has diabetes and is facing decisions about how intensively to manage his disease. He needs to better understand the health states that may face him in the future, each of which is multifaceted. Most health outcomes involve several different dimensions of health. Moreover, not all dimensions are equally important. Here we encounter a basic paradox of medical judgment: while only patients can truly know how much importance to give to each dimension of health, their experience is nearly always more limited than that of their physician, who may have treated scores or hundreds of patients with similar conditions and seen the results of their decisions. This chapter discusses health dimensions and subdimensions that are commonly used to measure quality of life and introduces processes for patients and physicians to identify the importance of health dimensions and evaluate the likely range of outcomes on each dimension.

**Chapter 3 – The overall health state**

Your diabetic patient has considered how his future health states might impact him across several dimensions but is reluctant to limit himself to those dimensions. Concerned about the possibility of failing to consider important facets of health or how different facets of health might interact, he wants to know how he might evaluate his overall health state. This chapter demonstrates and compares

two methods for the identification and evaluation of health states as whole, the compositional and holistic approaches.

**Chapter 4 – Quality and quantity**

Your patient has degenerative osteoarthritis in her knee and is considering total knee replacement surgery. Her decision is typical of a large group of decisions that feature trade-offs between future quality and quantity of life, particularly over the natural history of a degenerative disease. How should she think about her future quality of life and consider the course of her health over her lifetime?

**Part III**

**Understanding uncertainty**

**Chapter 5 – Embracing uncertainty**

A public health screening leads a patient to consult you about his cholesterol levels and ask whether he’s likely to have a heart attack and whether a dietary supplement might reduce his risk. Uncertainty makes both patients and physicians nervous, but is a fundamental feature of medicine. This chapter shows how understanding different types of uncertainty can help put patients at ease and guide physicians to identify the most important questions to consider in planning a workup or treatment program.

**Chapter 6 – Chance and choice**

Your patient has been diagnosed with prostate cancer and is considering which of the several courses of treatment he should follow, if any. Each offers some hope of keeping the cancer in remission, but each also presents risks of serious side effects. Most medical decisions present the possibility of several possible outcomes, with no certainty about which will actually occur. This chapter introduces tools for evaluating and comparing such options by combining information about the probabilities of outcomes with insights about the values of outcomes.

**Chapter 7 – Confidence**

A physician describes his hypertensive patient’s 10-year risk of heart attack, and the patient asks how confident the physician is in his estimate of the risk and in the likely benefit of treatment. Determining the best choice to achieve a goal is not always enough to complete a decision. Often, a physician, policy maker, or patient is also concerned with how confident they should be that the

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recommended choice is superior to other options, and the conditions under which another option would be recommended instead. This chapter discusses both subjective and statistical confidence.

## Part IV

### Developing information

#### Chapter 8 – Visualizing decisions

A couple are unsure about what kind of prenatal Down's syndrome screening strategy they should choose, and ask for your assistance in understanding the decision. One of the most powerful classes of decision aids are tools for making options, outcomes, and attributes visually comprehensible. This chapter introduces several different kinds of decision visualization and communication tools and develops a vocabulary and taxonomy for creating and evaluating new tools. Particular attention will be paid to tools for constructing choice sets, weighing and evaluating attributes, and representing the structure of decisions.

#### Chapter 9 – The power of information

Another couple facing the prenatal Down's syndrome screening decision has chosen to undergo amniocentesis, but has additional questions about the risks of the procedure and their own preferences for outcomes. One of the available options in many decisions is to gather more information. We can conceptualize the usefulness of additional information by considering how much a decision recommendation could be improved if that additional information were available. However, additional information often comes at a cost. This chapter provides both a conceptual and simplified mathematical introduction to the use of information in decisions and offers the clinician strategies for determining which information should be obtained in a decision and when. The chapter also discusses evidence-based medicine and the development of clinical trials.

#### Chapter 10 – Screening and testing

In many clinical decisions, the most ready source of additional information is diagnostic testing. Diagnostic tests include not only laboratory tests, but also other sources of information about diagnosis, such as history and physical examination. Many physicians, however, do not understand how diagnostic tests are developed or how to determine the value of the information they provide. The chapter case illustrates these concepts by considering the diagnosis of *Helicobacter pylori* infection in an adolescent girl with iron-deficiency anemia. Diagnostic testing strategies involving multiple tests in series or parallel are

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explained. This chapter also discusses psychological heuristics associated with diagnosis and conditions under which such judgments are helpful or misleading.

## **Part V**

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### **Beyond the individual**

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#### **Chapter 11 – Family matters**

Physicians are accustomed to making recommendations for others; patients, however, face additional and often unfamiliar complexities when they find themselves in a position of “agency” – responsible for decisions that affect the health of a child, an aged parent, or an incapacitated spouse. How can physicians guide patients in these situations? This chapter reviews research on how medical decision making for another differs from decision making for the self and develops recommendations for physicians whose patients seek guidance on agency. Two chapter cases illustrate applications of these recommendations: in one, a married couple consults you about prostate cancer treatment for the husband; in the other, a woman asks about assuming decision-making responsibility for her mother, who has mid-stage Alzheimer’s disease.

#### **Chapter 12 – Public health**

In the United States, physicians have traditionally focused their attention on the clinical treatment of their patients with little concern for matters of public health or the cost of medical care, but this focus has changed dramatically in the last 20 years. In other countries, physicians have always been responsible for the broader health of their societies. This chapter introduces elements of decisions involving public health. First, it considers the problem of the aggregation of value: how should society place a value on health states that may be evaluated differently by different patients? Research in the area of utility aggregation and contingent valuation is reviewed. Second, the chapter discusses direct and indirect costs and savings associated with medical care and briefly explains guidelines for the measurement of medical costs to society. Finally, the chapter combines the two by introducing cost-effectiveness analysis as a model for allocating a budget to public health programs and reviews the cost-effectiveness of several kinds of public health and medical interventions in current use. The chapter case illustrates the concepts by presenting research on the cost-effectiveness of routine hepatitis A vaccination of young children.

#### **Chapter 13 – Social values**

The final chapter once again takes up decision goals and objectives, but from the perspective of shared social values and ethical norms. This chapter makes explicit



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a variety of often implicitly accepted priority rules for decisions that involve rationing care (triage, the “rule of rescue”, cost-effectiveness) and uses organ donation and transplant as a case illustration. It also considers the application of values and goals beyond simply improving a patient’s health, such as the value of research that is not expected to be beneficial (e.g., Phase I drug trials).

## Appendix

The appendix summarizes the questions for clinical practice that arise from each of the chapters. It may be used as a tool for reflection or a quick guide to questions that might be considered in helping patients make decisions about their health.

We welcome feedback from our readers and the opportunity to continue the conversation of this book on our web forum at [www.makingmedicaldecisions.com](http://www.makingmedicaldecisions.com).

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