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Eta S. Berner
Editor

Clinical Decision Support Systems

Theory and Practice

Third Edition



Springer

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Preface

When the first edition of Clinical Decision Support Systems was published in 1999, I began the preface with the statement, “We are at the beginning of a new era in the application of computer-based decision support for medicine.” Usually such statements in hindsight seem unduly optimistic, but if we look at the landscape of health-care information technology today, that assessment appears to be surprisingly accurate. Shortly after the book was published, the first of several landmark reports from the Institute of Medicine on the quality of health care led to greater awareness of the role these systems can play in improving patient safety and healthcare quality. The second edition was published in 2007, a time when there was increased governmental, research and commercial interest in clinical decision support systems (CDSS), but predicated the HITECH Act, which accelerated the use of electronic health records and incentivized the incorporation of CDSS into clinical practice in the US. This third edition of Clinical Decision Support Systems: Theory and Practice is being published at a time when electronic health records are being routinely used in clinical practice, and clinical decision support systems are seeing more use as well.

The purpose of this book is to provide an overview of the background and state-of-the-art of CDSS. Throughout this book we use CDSS to refer to both the singular and plural (system and systems). A persistent theme is that CDSS have enormous potential to transform health care, but developers, evaluators, and users of these tools need to be aware of the design and implementation issues that must be addressed for that potential to be realized as these systems continue to evolve. This book is designed to be (1) a resource on clinical decision support systems for informatics specialists; (2) a textbook for teachers or students in health or medical informatics training programs; and (3) a comprehensive introduction for clinicians, with or without expertise in the applications of computers in medicine, who are interested in learning about current developments in computer-based clinical decision support systems.

The book includes chapters by nationally recognized experts on the design, evaluation and application of these systems. This edition includes updates of chapters in the previous editions, as well as seven entirely new chapters. The first chapter intro-

duces the topics that are explored in depth in later chapters. Chapters 2 and 3 describe the design foundations behind the decision support tools used today. While there is some overlap in the concepts addressed in these chapters, they each have unique foci. Chapter 2 focuses primarily on the mathematical foundations of the knowledge-based systems. Chapter 3 focuses on systems based on pattern recognition and advanced data mining approaches. Chapter 4 includes a detailed discussion of usability principles for CDSS. Chapter 5 discusses newer models for CDSS architecture and Chap. 6 addresses issues in the development and implementation of CDSS. Chapter 7 examines the impact of government regulations on the use of CDSS. Chapters 8 and 9 discuss the legal, ethical, and evaluation issues that must be addressed when these systems are actively used in health care. Chapters 10, 11, and 12 provide examples of specific types of CDSS. CDSS for patients are described in Chap. 10. Chapter 11 addresses diagnostic decision support systems and sets this development in the context of the process of physician, not just computer, diagnosis. Chapter 12 illustrates the application of CDSS to the growing field of genomic medicine. The last three chapters focus on the applications of these systems in clinical practice. The authors of these chapters are from institutions that not only have a strong history of deployment of these systems, but also have performed the research and evaluation studies that provide perspective for others who are considering the use of these tools within the commercial systems that are increasingly incorporating CDSS.

This book represents an effort, not just by the editor or the individual chapter authors, but by many others who have provided assistance to them. We are grateful for the support and encouragement of Grant Weston and Joni Fraser from Springer. The Agency for Healthcare Research and Quality, the National Library of Medicine, and other NIH institutes have provided much appreciated support for my own and many of the chapter authors' research on CDSS. Finally, I want to express my gratitude to the many colleagues who have been collaborators on my research activities in clinical decision support systems over the past 30 years.

Birmingham, AL, USA

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