Dean F. Sittig
Joan S. Ash

Clinical Information Systems

Overcoming Adverse Consequences

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We dedicate this book to Cody Curtis, our project manager throughout the course of this work. Her steadfastness, organizational skills, encouragement, and ability to find humor in the most routine events provided us with the strength to see the project through to completion.

About the Authors

Dean F. Sittig, MS, PhD

Dean F. Sittig is an associate professor at the School of Health Information Sciences at the University of Texas Health Science Center at Houston and a member of the University of Texas–Memorial Hermann Center for Healthcare Quality and Safety. Dr. Sittig earned a masters degree in biomedical engineering from Pennsylvania State University in 1984 and a PhD in medical informatics from the University of Utah in 1988. In 1992, he was elected as a fellow in the American College of Medical Informatics.

Dr. Sittig's research interests center on the design, development, implementation, and evaluation of all aspects of clinical information systems. In addition to Dr. Sittig's work on measuring the impact of clinical information systems on a large scale, he is working to improve our understanding of the factors that lead to success, as well as the unintended consequences associated with computer-based clinical decision support and provider order entry systems.

He has just finished co-authoring an award-winning book on clinical decision support, titled *Improving Outcomes with Clinical Decision Support: An Implementer's Guide*.

Finally, he is the founding editor of both The Informatics Review (www.informatics-review.com), an online serial devoted to helping clinicians and information system professionals keep up to date with the field of clinical informatics, and The ClinfoWiki (www.clinfowiki.org), an interactive, collaborative, online clinical informatics reference resource.

Joan S. Ash, PhD, MLS, MS, MBA

Joan S. Ash is professor and vice-chair of the Department of Medical Informatics and Clinical Epidemiology in the School of Medicine at Oregon Health and Science University (OHSU), Portland, Oregon. She holds masters degrees in library science, health science, and business administration, and a PhD in systems science. Dr. Ash has served on the boards of directors of the American Medical Informatics Association and the Medical Library Association, and on NLM's Biomedical Library and Informatics Review Committee. She is presently chair of the Board of Scientific Counselors for the Lister Hill National Center for Biomedical Communications of NLM. She is also an elected fellow of the American College of Medical Informatics.

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Dr. Ash's research focuses on behavioral and social issues related to implementing clinical information systems, specifically computerized provider order entry (CPOE) and clinical decision support (CDS), and the use of qualitative methods for conducting such studies. She leads a team of researchers, the Provider Order Entry Team (POET), which has conducted national surveys of CPOE use and its unintended consequences and fieldwork in fifteen organizations to investigate success factors and unintended consequences of CPOE and CDS. Results are available on the POET web site at www.cpoe.org.

Preface

The publication of the Institute of Medicine's treatises on the state of healthcare quality and safety in the United States in the late 1990s and early 2000s has put incredible pressure on healthcare organizations of all sizes and types, but especially hospitals, to begin implementing state-of-the-art clinical information systems. After former President George W. Bush's pronouncement in January, 2004, that all Americans should have electronic health records within the next ten years, the pressure only increased. More recently, several scientific publications described unintended adverse events that occurred following implementation of these complex, state-of-the-art clinical information systems.

The goal of this book is to help those charged with the challenging task of implementing one of these clinical information systems within their own organization to better understand and begin to deal with the inevitable, unintended, adverse events that may occur. It is based on a multi-year academic research project carried out by the Provider Order Entry Team (POET) from the Oregon Health and Science University in Portland, Oregon, funded by the National Institutes of Health National Library of Medicine, and led by Joan S. Ash. In brief, this research project involved a dedicated, multidisciplinary team of investigators, including the authors of this volume, who traveled around the United States visiting a number of carefully selected pioneering healthcare systems with advanced clinical information systems. At each site, the group conducted extensive interviews with key clinical, technical, and administrative informants as well as carrying out hours upon hours of observations of clinicians as they used, and often struggled with, these clinical information systems.

The history of this unintended consequences project has its roots in a prior study of success factors for the implementation of computerized provider order entry (CPOE). During that project, the authors naturally encountered barriers to success while probing for positive strategies. Even the organizations that have the best systems have stumbled along the way; fortunately representatives from within those organizations have shared stories about the problems so that lessons can be learned from them. Although excellent organizations do their best, they cannot always avoid or overcome certain unintended consequences that come their way during any implementation. This preliminary knowledge about unintended consequences led to the study that is the focus here.

The methods used for the unintended consequences study are ethnographic, including primarily qualitative methods, and also small surveys. Sites were purposively selected with the help of experts to provide a variety of sizes and types. Informants were carefully selected based on their roles. The team, composed not

only of the authors, but also of clinicians and informatics specialists, spent several days at each site, after gathering information about the history of the system and the system itself. The team conducted semi-structured interviews with information technology, clinical, and administrative staff that were knowledgeable about CPOE. Team members shadowed and conducted informal interviews with clinicians as they worked, writing detailed field notes that were later expanded to be analyzed by the team. A categorization of types of unintended adverse consequences was the result, and the data provided quotes and examples so that for each type the team could delve deeply into its nature. Although "clinical decision support systems" (CDS) did not emerge as a type, since it is often a cause of rather than a kind of unintended consequence, a chapter about CDS is included here because it offers guidance about overcoming CDS-related unintended consequences.

Each chapter in this monograph is based on a published or as-yet unpublished paper written by this team, though each has been heavily edited so that repetition about, for example, methodology, is truncated or omitted. Several of the papers stem from the earlier study; these chapters about communication, special people, and the emotional aspects of CPOE present results that were subsequently validated during the unintended consequences study.

The book begins with an overview of the various types of unintended adverse consequences that often occur following implementation of these systems, and the next eight chapters describe them in detail. Chapter 10, at the end of Part I, summarizes the issues that need to be addressed for an implementation to be successful, with as few unintended consequences as possible. At the end of each chapter, there is a list of questions that you can use to help assess how your organization is doing with respect to each of these problematic areas.

Part II of the book begins with a list of considerations that organizations should keep in mind during the implementation and optimization process. Chapter 12 describes the role of special people within your organization who can help ensure that clinical information systems work as planned. The next chapter describes a relatively simple assessment tool that can be used to gauge an organization's readiness to deal with these unintended consequences. The book ends with a description of an innovative qualitative research methodology that can be used to study one's own organization.

In sum, this book is designed to both warn and inform about what often happens following implementation of a state-of-the-art clinical information system. In addition, it provides the knowledge and tools to help an organization identify, measure, and then overcome these obstacles and utilize clinical information systems to achieve the high-quality, cost-effective, efficient, safe, timely, and patient-centered healthcare system that the Institute of Medicine has envisioned.

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Brief Contents

About the Authors xv
Preface xvii
Acknowledgments xviii

Part I Understanding the Unintended Adverse Consequences Associated with Clinical Information Systems 1

Chapter 1 Computer-Based Provider Order Entry: Placing the Application into Perspective 3
Chapter 2 An Introduction to Unintended Consequences of Clinical Information Technology 29
Chapter 3 A Sociotechnical Assessment of Unintended Adverse Consequences Associated with Clinical Workflow 53
Chapter 4 Emotional Aspects of Clinical Information System Use 67
Chapter 5 Shifts in Power, Control, and Autonomy 77
Chapter 6 The Nature of Clinical Information System–Related Errors 85
Chapter 7 Clinical Decision-Support Systems 105
Chapter 8 Clinical Information Systems and Communication: Reciprocal Impacts 115
Chapter 9 Overdependence on Technology 125
Chapter 10 Persistent Paper: The Myth of "Going Paperless" 135

Part II Overcoming the Unintended Adverse Consequences Associated with Clinical Information Systems 145

Chapter 11 Considerations for Successful CPOE Implementations 147
Chapter 12 The Importance of Special People 165
Chapter 13 Assessment of the Anticipated Consequences of CPOE Prior to Implementation 181
Chapter 14 Rapid Assessment of Clinical Information System Interventions 191
Chapter 15 Basic Microbiologic and Infection Control Information to Reduce the Potential Transmission of Pathogens to Patients via Computer Hardware 199
Chapter 16 Lessons from "Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order-Entry System" 215

Index 223

Contents

About the Authors xv
Preface xvii
Acknowledgments xviii

Part I Understanding the Unintended Adverse Consequences Associated with Clinical Information Systems 1

Chapter 1 Computer-Based Provider Order Entry: Placing the Application into Perspective 3
1.1 Examples of CPOE Implementation Efforts 4
1.2 Rationale for Direct CPOE 7
1.3 Sociologic Barriers to Direct CPOE 11
1.4 Logistic Challenges Involved in CPOE Implementation 14
1.5 System Design Issues 17
1.6 Use of Expert Systems to Facilitate CPOE 21
1.7 Implications for Future CPOE Systems 23
1.8 References 24

Chapter 2 An Introduction to Unintended Consequences of Clinical Information Technology 29
2.1 Key Points 29
2.2 Introduction 29
2.3 Background 30
2.4 Major Categories of Unintended Consequences Identified 30
2.5 Discussion 45
2.6 Conclusion 48
2.7 References 48

Chapter 3 A Sociotechnical Assessment of Unintended Adverse Consequences Associated with Clinical Workflow 53
3.1 Key Points 53
3.2 Introduction 53
3.3 Key Findings 55
3.4 Conclusion 62
3.5 References 65

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Chapter 4 Emotional Aspects of Clinical Information System Use 67
4.1 Key Points 67
4.2 Introduction 67
4.3 Ways in Which Emotions Lead to Unintended Consequences 68
4.4 Discussion 72
4.5 Conclusion 74
4.6 References 75

Chapter 5 Shifts in Power, Control, and Autonomy 77
5.1 Key Points 77
5.2 Introduction 77
5.3 How Does CPOE Change the Power Structure in Organizations? 78
5.4 Discussion 82
5.5 Conclusion 83
5.6 References 84

Chapter 6 The Nature of Clinical Information System–Related Errors 85
6.1 Key Points 85
6.2 Introduction 85
6.3 Background and Methods 87
6.4 Kinds of Silent Errors 88
6.5 Discussion and Conclusion 96
6.6 References 99

Chapter 7 Clinical Decision-Support Systems 105
7.1 Key Points 105
7.2 Introduction 105
7.3 Results 105
7.4 Discussion 110
7.5 Conclusion 111
7.6 References 113

Chapter 8 Clinical Information Systems and Communication: Reciprocal Impacts 115
8.1 Key Points 115
8.2 Introduction 115
8.3 Key Findings: Reciprocal Impacts of CPOE on Communication 115
8.4 Disturbance of Doctor–Nurse Communication: "There's Not That Physical Presence" 116
8.5 Discussion 121
8.6 Conclusion 122
8.7 References 123

Chapter 9 Overdependence on Technology 125
9.1 Key Points 125
9.2 Introduction 125
9.3 Results 126
9.4 Discussion and Suggestions for the Future 129
9.5 Conclusion 131
9.6 References 133

Chapter 10 Persistent Paper: The Myth of "Going Paperless" 135
10.1 Key Points 135
10.2 Introduction 135
10.3 Rationale for Persistent Paper 136
10.4 Discussion 139
10.5 Conclusion 141
10.6 References 142

Part II Overcoming the Unintended Adverse Consequences Associated with Clinical Information Systems 145

Chapter 11 Considerations for Successful CPOE Implementations 147
11.1 Introduction 147
11.2 Consideration 1: Motivation for Implementing CPOE 147
11.3 Consideration 2: Foundations Needed Prior to Implementing CPOE 148
11.4 Consideration 3: Costs 150
11.5 Consideration 4: Integration/Workflow/Healthcare Processes 151
11.6 Consideration 5: Value to Users/Decision-Support Systems 152
11.7 Consideration 6: Vision/Leadership/People 154
11.8 Consideration 7: Technical Considerations 156
11.9 Consideration 8: Management of Project or Program/Strategies/Processes from Concept to Implementation 158
11.10 Consideration 9: Training/Support/Help at the Elbow 160
11.11 Consideration 10: Learning/Evaluation/Improvement 161
11.12 Final Thoughts 162

Chapter 12 The Importance of Special People 165
12.1 Key Points 165
12.2 Introduction 165
12.3 Special People 166
12.4 Administrative Leadership Level 167
12.5 Clinical Leadership Level 170

12.6 Support Staff Level: Bridgers 173
12.7 Discussion 176
12.8 Conclusion and Recommendations: New Bottles, New Wine 178
12.9 References 179

Chapter 13 Assessment of the Anticipated Consequences of CPOE Prior to Implementation 181
13.1 Key Points 181
13.2 Introduction 181
13.3 Background 182
13.4 Methods 183
13.5 Results 183
13.6 Discussion 185
13.7 Conclusion 189
13.8 References 189

Chapter 14 Rapid Assessment of Clinical Information System Interventions 191
14.1 Key Points 191
14.2 Introduction 191
14.3 Selection of Methodological Approaches 192
14.4 Development of the Field Manual 193
14.5 Preparation for Site Visits 194
14.6 Subject Selection 194
14.7 Data Collection 195
14.8 Data Management 195
14.9 Data Analysis 195
14.10 Results 196
14.11 Lessons Learned about Methods 196
14.12 References 196

Chapter 15 Basic Microbiologic and Infection Control Information to Reduce the Potential Transmission of Pathogens to Patients via Computer Hardware 199
15.1 Introduction 199
15.2 Review of Pertinent Microbiologic Concepts and Findings 199
15.3 Potential Solutions with Emphasis on Basic Infection Control Principles 205
15.4 Practical Applications of Infection Control Principles in Medical Settings 207
15.5 Summary 209
15.6 References 210

Chapter 16 Lessons from "Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order-Entry System" 215

16.1 Introduction 215

16.2 What We Can Learn from This Study 216

16.3 Conclusion 219

16.4 References 220

Index 223

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