

The Pharmacy Informatics Primer

DOINA DUMITRU, PharmD, MBA
Pharmacy Operations Manager
Harris County Hospital District
Houston, Texas

With a Foreword by Karl Gumper

American Society of Health-System Pharmacists®
BETHESDA, MARYLAND

Any correspondence regarding this publication should be sent to the publisher, American Society of Health-System Pharmacists, 7272 Wisconsin Avenue, Bethesda, MD 20814, attention: Special Publishing.

The information presented herein reflects the opinions of the contributors and advisors. It should not be interpreted as an official policy of ASHP or as an endorsement of any product. The information contained in this program, and the companion workbook, are to be used as guidance.

Because of ongoing research and improvements in technology, the information and its applications contained in this text are constantly evolving and are subject to the professional judgment and interpretation of the practitioner due to the uniqueness of each pharmacy's role in compounding sterile preparations and the handling of hazardous drugs. The editors, contributors, and ASHP have made reasonable efforts to ensure the accuracy and appropriateness of the information presented in this document. However, any user of this information is advised that the editors, contributors, advisors, and ASHP are not responsible for the continued currency of the information, for any errors or omissions, and/or for any consequences arising from the use of the information in the document in any and all practice settings. Any reader of this document is cautioned that ASHP makes no representation, guarantee, or warranty, express or implied, as to the accuracy and appropriateness of the information contained in this document and will bear no responsibility or liability for the results or consequences of its use.

Acquisitions Editor: Hal Pollard
Director, Special Publishing: Jack Bruggeman
Senior Editorial Project Manager: Dana Battaglia
Editorial Resources Manager: Bill Fogle
Cover and Page Design: DeVall Advertising
Compositor: Carol A. Barrer

Library of Congress Cataloging-in-Publication Data

The pharmacy informatics primer / [edited by] Doina Dumitru.

p. ; cm.

ISBN 978-1-58528-166-4

1. Medical informatics. 2. Pharmacy. 3. Information organization--Computer programs.

I. Dumitru, Doina.

[DNLM: 1. Clinical Pharmacy Information Systems. 2. Information Storage and Retrieval.

3. Medical Records Systems, Computerized. 4. Safety Management. QV 26.5 P536 2008]

RS122.2.P44 2008

362.17'820285--dc22

2008036537

©2009, American Society of Health-System Pharmacists, Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, microfilming, and recording, or by any information storage and retrieval system, without written permission from the American Society of Health-System Pharmacists.

ASHP is a service mark of the American Society of Health-System Pharmacists, Inc.; registered in the U.S. Patent and Trademark Office.

ISBN: 978-1-58528-166-4

Dedication

To Razvan, Matei, and Calin—their patience and support during this process has been my inspiration. And to my dad, Iosef Ciuca—he would have been so proud.

Acknowledgments

The writing and editing of *The Pharmacy Informatics Primer* could not have been accomplished without the tireless energy, enthusiasm, patience, and cooperation of my contributors. Each of them took time of away from their lives to write on topics that are key to the future of pharmacy practice. Their dedication to the profession is truly inspiring, and it has been an honor to work with each of them.

Hal Pollard at ASHP, who encouraged me to follow my dream and make a lasting contribution to our profession.

Dana Battaglia and the ASHP editorial team were instrumental in keeping the project on task. Their experience and patience dealing with unforeseen circumstances made the entire process smooth.

Lynn Boecler, who inspired me to enter the pharmacy informatics field in the first

place. At the time I was a new pharmacy graduate, and she took a chance and gave me the opportunity of a lifetime. She also taught me to never forget that I was a pharmacist first, regardless of where my career path would take me.

Stan Kent, who suggested I go back to school for a management degree. I am very thankful for his timely advice and mentorship. He led me down the management path, and I have never regretted it.

My friends and former (unofficial) colleagues at Epic Systems: Jeff Krueger, Tony Brummel, Brian Eith, and Marc Mroz. They taught me more than I ever wanted to know about information systems, interfaces, and hardware. They also taught me how to approach project management from an engineering point of view. That skill has been invaluable to me over the years.

Table of Contents

Preface	vi
Foreword	viii
<i>Karl Gumpper</i>	
Contributors	x
1 Computerized Provider Order Entry	1
<i>Patricia J. Hoey, W. Paul Nichol, and Robert Silverman</i>	
2 ePrescribing	19
<i>Kevin C. Marvin</i>	
3 Clinical Decision Support	35
<i>Eric Rose and Michael A. Jones</i>	
4 Pharmacy Information Systems	65
<i>Chad Hardy</i>	
5 Pharmacy Automation Systems	77
<i>Steven Rough, Joel Melroy</i>	
6 Bar Code Medication Scanning at the Point of Care	103
<i>Kevin C. Borchert</i>	
7 Smart Pump Technology	119
<i>Helen T. Giannopoulos</i>	
8 System Maintenance	129
<i>Doina Dumitru</i>	
9 A New Frontier: Impact of the Electronic Medical Record and Computerized Provider Order Entry on Pharmacy Services	139
<i>Michael Sura</i>	
10 Medication Safety	167
<i>Stanley S. Kent and Lynn Boecler</i>	
11 Reporting and Data Mining	179
<i>Michael E. McGregory and Scott R. McCreadie</i>	
12 Planning for Downtime	195
<i>Alicia S. Miller</i>	
13 Management Issues	221
<i>Marc Young</i>	
Glossary	235
Index	243

Preface

In doing informatics presentations at various pharmacy and information system vendor conferences, I have been frequently struck by the commonality of questions that are asked by audiences after each presentation. Regardless of the topic on which I was presenting, the same questions would often be asked after each presentation. Further, in reviewing published pharmacy informatics literature, I had often been frustrated by the lack of practical application pearls. Too often, the literature presents abstract ideas that are difficult to visualize and operationalize in a health-system setting. By the fall of 2005, I had concluded that someone should write a book that captures the answers to those questions and provides real informatics application tips to pharmacy managers. When I was approached by ASHP in late 2005 to submit my ideas for a book to them, I was thrilled. I submitted a proposed table of contents that addressed the general categories of pharmacy informatics issues, corresponding to the questions I had received over the years. I just did not anticipate that the unknown author/editor of such a publication would be me. After much encouragement from ASHP, I agreed to work on the project, and I am very grateful to their team for the opportunity. I believe that *The Pharmacy Informatics Primer* will fill a much-needed void in pharmacy management literature.

The intended audience is primarily pharmacy managers and pharmacy information technology (IT) project managers. However, the book is also an excellent resource for pharmacy students exposed to pharmacy informatics for the first time, especially since pharmacy schools add informatics to their curricula. The intent of the publication is to provide readers with practical knowledge that can be applied immediately within their organizations.

The concepts presented in *The Pharmacy Informatics Primer* are meant to be used every day, in real-world situations. Although each chapter provides an introduction to the technology or management issue being presented, the core information focuses on practical implementation and technology usage issues. This information is what is often obtained in informal discussions with project and operations managers at conferences or dinners. To facilitate the use of the practical concepts presented, main points of each chapter are also summarized in a Pearls section in each chapter. This can serve as a quick reference for a busy pharmacy manager who needs a bottom-line answer to “how do I deal with bar coding?”

I recommend that pharmacy managers, IT project managers, and students utilize the following steps in applying the principles presented in the chapters:

1. Read the chapter that focuses on the technology you will be implementing or with which you are having issues.
2. Review the Pearls table and make a copy that can be placed on your bulletin board for daily review.
3. Compare the concepts/ideas presented in the chapter with your own organization. What are the similarities? What are the differences? What will work at your institution? What needs to be changed?
4. Plot your own course of action, based on the answers to the questions above. If you reach an impasse or have trouble answering those questions, team up with other managers in your organization to help facilitate discussion and brainstorming sessions. You may also contact the author of the chapter or myself for further guidance.

My goal is that pharmacy managers and pharmacy IT project managers will no lon-

ger feel that they must “reinvent the wheel” with each new IT project implementation. In most cases, other organizations have gone before you, and your organization can learn much from someone else’s experience. I also hope that this publication will inspire a new generation of pharmacists to enter the informatics field. As more technology is developed to support clinical workflows (as opposed to reworking clinical workflows to support limited technology), there is a great need for experienced clinicians and

managers to bring their knowledge to the informatics field. I hope that students will consider this as a future career path.

Doina Dumitru, PharmD, MBA

Pharmacy Operations Manager

Harris County Hospital District

LBJ Hospital–Pharmacy Administration

5656 Kelley Street

Houston, TX 77026

August, 2008

Foreword

As a clinical pharmacist, I have found many uses for technology in my practice. As a pediatric practitioner, I have used technology to compound parenteral nutrition solutions and to verify the safe prescribing of medications for our smallest patients. The use of technology in patient care is quickly evolving. Whether a clinical practitioner or a manager, today's pharmacist must rely on technology to perform his or her job duties effectively and efficiently.

Pharmacists have been routinely utilizing computers and automation since the 1980s to complete many tasks in providing care to patients. As the medication use process becomes more complicated, technology and automation may help make this system safer and more efficient. In 2006 the ASHP Board of Directors approved the formation of the Section of Pharmacy Informatics and Technology, which provides a membership community to ASHP members who work with information systems and technology in hospitals and health systems. The section has quickly grown to meet the needs of its members in all areas of pharmacy informatics. Members represent a broad spectrum of backgrounds and experience from pharmaceutical industry, academia, manufacturing, consulting, and hospitals and health systems. Members are pharmacy clinicians, managers, directors, technicians, analysts, students, and residents.

Many are interested in pharmacy informatics as a growing subspecialty in pharmacy, as evidenced by expanded requirements for our schools of pharmacy and growth of PGY-2 pharmacy informatics residencies. There is a need to better educate all healthcare workers about healthcare information technology and informatics. The medical and nursing professions are involved in defining the role of physicians and nurses

in the development and implementation of health information systems. *The Pharmacy Informatics Primer* will help define some of the primary issues that all disciplines need to consider and work together.

The Pharmacy Informatics Primer is designed to be a starting point for pharmacists, residents, and students to explore the changing environment that many practitioners are experiencing. The authors have provided practical examples to illustrate the use of specific technologies in caring for patients in both an inpatient and outpatient environment.

As pharmacy moves forward, each pharmacist will need to evaluate where technology and automation will fit into his or her institution's practice model. The way pharmacists and technicians work at present may be entirely different in the future. Careful planning should be considered during the acquisition, implementation, and maintenance of these systems to ensure the system provides an optimal level of safety. This primer provides sound advice to the reader to evaluate not just the technology being considered for deployment but also the medication use process in its current and future states. When considering the deployment of a CPOE system, the institution must evaluate the impact of that system on the physician, nurse, pharmacist, and even practitioners that do not typically handle medications.

All healthcare institutions must begin evaluating the need for technology and automation in their environments. Those hospitals and health systems that have made the investment in technology should be expected to pave the way for other institutions by sharing their experiences with the profession and others. The reader of the primer will gain an appreciation for the complexities of these information systems. The use

of CPOE, BCMA, CDSS, eRx, and robotics are available in many institutions. There is no right or wrong implementation strategy, but all institutions should be encouraged to start planning.

With the complexities of patient care that are evolving in gene therapy and genomics, the use of technology should aid the pharmacist to ensure appropriate therapies are ordered and provided to the patient to optimize his or her care. The integration of these technologies at the point of care will also allow for a greater access of information that will ensure safe and effective care. Since there are many companies providing these solutions, these systems must be interoperable and function without fail.

The Pharmacy Informatics Primer is an excellent resource for the novice and seasoned practitioner alike and is a reference in planning for the acquisition of technology or the enhancement of existing technologies. As expected, the use of technology will continue to grow and change at a rapid pace. When you think about the initial size of computers taking up whole rooms compared to today's tools being held in your hand, the rapid change in technology is mind boggling. One must keep in mind that research needs to be continuously conducted to demonstrate the value of technology

on patient care. Remember, the introduction of technology is not without its positive and negative consequences and should always be implemented with patient safety foremost in the minds of pharmacists.

**Karl F. Gumpper, RPh, BCNSP, BCPS,
FASHP**

Director, Section of Pharmacy
Informatics and Technology
American Society of Health-System
Pharmacists
August, 2008

Additional Resources

- Koppel R, Wetterneck T, Telles JL, Karsh B-T. Workarounds to barcode medication administration systems: their occurrences, causes, and threats to patient safety. *J Am Med Inform Assoc.* 2008;15:408–423. PrePrint published April 24 2008; doi:10.1197/jamia.M2616.
- Ash JS, Sittig DE, Poon EG, Guappone K, Campbell E, Dykstra RH. The extent and importance of unintended consequences related to computerized provider order entry. *J Am Med Inform Assoc.* 2007;14(4):415–423. PrePrint published July 1, 2007; doi:10.1197/jamia.M2373.

Contributors

Lynn Boecler, PharmD, MS

Senior Director, Pharmacy Services
Evanston Northwestern Healthcare
Evanston, Illinois

Kevin C. Borchert, PharmD

Pharmacy Informatics Coordinator
Nebraska Methodist Hospital
Omaha, Nebraska

Doina Dumitru, PharmD, MBA

Pharmacy Operations Manager
Harris County Hospital District
Houston, Texas

Helen T. Giannopoulos, PharmD

Pharmacy Clinical Manager
Children's Healthcare of Atlanta
Atlanta, Georgia

**Karl F. Gumper, RPh, BCNSP, BCPS,
FASHP**

Director, Section of Pharmacy Informatics and
Technology
American Society of Health-System
Pharmacists
Bethesda, Maryland

Chad Hardy, PharmD, MS

Pharmacy Informatics Manager
Harris County Hospital District
Houston, Texas

Patricia J. Hoey, RPh

Clinical Applications Coordinator
VA Puget Sound Health Care System
Seattle, Washington

Michael A. Jones, BS, PharmD

Pharmacy Informatics Specialist
University of Colorado Hospital
Aurora, Colorado

Stanley S. Kent, MS, FASHP

Assistant Vice President
Evanston Northwestern Healthcare
Evanston, Illinois

Kevin C. Marvin, RPh, MS, FASHP

Pharmacy Informatics Consultant
Burlington, Vermont

Scott R. McCreadie, PharmD, MBA

Strategic Project Coordinator
Clinical Assistant Professor
Department of Pharmacy Services
University of Michigan Health Center
Ann Arbor, Michigan

Michael E. McGregory, PharmD, BCPS

Strategic Projects Coordinator
University of Michigan Health System
Department of Pharmacy Services
Ann Arbor, Michigan

Joel Melroy, PharmD, MS

Manager
Ashley River Tower Pharmacy Services
Medical University of South Carolina Hospital
Authority
Charleston, South Carolina

Alicia S. Miller, RPh, MS

Practice Manager
Eclipsys Corporation
Westerville, Ohio

W. Paul Nichol, MD

National Director Medical Informatics, Patient
Care Services
Veterans Health Administration, Department
of Veterans Affairs
Washington, DC

Associate Chief of Staff for Clinical
Information Management
VA Puget Sound Health Care System
Seattle and Tacoma, Washington

Clinical Associate Professor of Medicine
Division of General Internal Medicine
School of Medicine
Clinical Associate Professor of Health Services
School of Public Health and Community
Medicine
University of Washington
Seattle, Washington

Eric Rose, PharmD

Corporate Pharmacy Informatics Liaison
Orlando Health
Orlando, Florida

Steve Rough, MS, RPh

Director of Pharmacy
University of Wisconsin Hospital and Clinics
Madison, Wisconsin

Robert Silverman, PharmD

Pharmacy Informatics Specialist
Hines VA Hospital
and VA Pharmacy Benefits Management—
Strategic Healthcare Group
Hines, Illinois

Michael Sura, PharmD

Director of Clinical Informatics
Froedtert Memorial Lutheran Hospital
Milwaukee, Wisconsin

Marc Young, PharmD, MS, BCPS

Lieutenant Commander, U.S. Navy
Pharmacy Informatics Advisor

