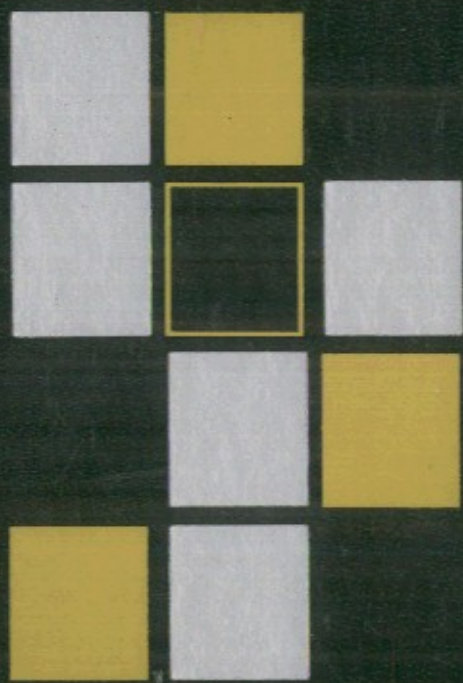




Third Edition

Hospital Epidemiology and Infection Control

C. GLEN MAYHALL



LIPPINCOTT WILLIAMS & WILKINS

Table of Contents

Contributors	xv
Preface for the 3rd Edition	xxvii

I. Applied Epidemiology and Biostatistics in Hospital Epidemiology and Infection Control

1. Principles of Infectious Diseases Epidemiology	3
<i>Lennox K. Archibald, Walter J. Hierholzer, Jr.</i>	
2. Modern Quantitative Epidemiology in the Hospital	19
<i>Jonathan Freeman, Jerome Tokars</i>	
3. Biostatistics for Hospital Epidemiology and Infection Control	49
<i>Elizabeth A. Tolley</i>	
4. Principles of Hospital Epidemiology	83
<i>Mary D. Nettleman, Richard P. Wenzel</i>	
5. Data Collection in Hospital Epidemiology	91
<i>Stephen B. Kritchevsky, Ronald I. Shorr</i>	
6. Dramatic Improvements in Healthcare Quality: You Can Do It Too	99
<i>Peter A. Gross</i>	
7. Investigation of Outbreaks	107
<i>William R. Jarvis</i>	
8. Pseudoinfections and Pseudo-outbreaks	123
<i>Burke A. Cunha</i>	

II. Healthcare Quality Improvement

9. How to Select Improvement Projects	137
<i>David Birnbaum</i>	
10. Selection of Quality Improvement Tools and Methods	147
<i>Robert Burney, Ronald Berglund</i>	
11. Collecting Data for Actions	155
<i>Stephen B. Kritchevsky, Ronald I. Shorr</i>	
12. Selecting Change Implementation Strategies	161
<i>Jan Bower, Marisel Segarra-Newnham, and Alan Tice</i>	
13. Selecting Successful Health System Managing Approaches	175
<i>Ulises Ruiz, José Simón</i>	

III. Informatics in Healthcare Epidemiology

14. Computer Fundamentals for Healthcare Epidemiology 187
John A. Sellick, Jr.

15. Using the Personal Computer for Healthcare Epidemiology 197
Keith F. Woeltje, Rebecca Wurtz

16. The Electronic Health Record: An Essential Technology for Hospital
Epidemiology 207
William H. Tettelbach, David C. Classen

IV. Epidemiology and Prevention of Nosocomial Infections of Organ Systems

17. Nosocomial Infections Related to Use of Intravascular Devices Inserted for Short-
Term Vascular Access 231
Barry M. Farr

18. Nosocomial Infections Related to Use of Intravascular Devices Inserted for Long-
Term Vascular Access 241
Hend Hanna, Issam Raad

19. Nosocomial Bloodstream Infections 253
Mark E. Rupp

20. Nosocomial Urinary Tract Infections 267
John P. Burke, Tsin Wen Yeo

21. Surgical Site Infections 287
Edward S. Wong

22. Nosocomial Pneumonia 311
Dennis C.J.J. Bergmans, Marc J.M. Bonten

23. Nosocomial Sinusitis 341
Marc J.M. Bonten

24. Nosocomial Gastrointestinal Tract Infections 351
Barry M. Farr

25. Nosocomial Burn Wound Infections 385
C. Glen Mayhall

26. Nosocomial Ocular Infections 401
Marlene Durand, David J. Weber, and William A. Rutala

27. Nosocomial Central Nervous System Infections 415
Nelson M. Gantz

V. Epidemiology and Prevention of Nosocomial Infections Caused by Specific Pathogens

Part A. Bacterial Infections

28. *Staphylococcus aureus* 443
Joseph F. John, Jr., Neil L. Barg

29. Methicillin-Resistant *Staphylococcus aureus* 471
Alan I. Hartstein, Thomas J. Sebastian, and Larry J. Strausbaugh

30.	Coagulase-Negative Staphylococci	495
	<i>John M. Boyce</i>	
31.	Streptococci	517
	<i>Kent B. Crossley</i>	
32.	<i>Enterococcus</i> Species	529
	<i>Carol E. Chenoweth</i>	
33.	Enterobacteriaceae	545
	<i>Stephanie R. Black, Marc J.M. Bonten, and Robert A. Weinstein</i>	
34.	Nonfermentative Gram-Negative Bacilli	575
	<i>John P. Flaherty, Valentina Stosor</i>	
35.	Nosocomial <i>Legionella</i> Infection	603
	<i>Janet E. Stout, Victor L. Yu</i>	
36.	<i>Clostridium difficile</i>	623
	<i>Stuart Johnson, Dale N. Gerding</i>	
<i>B. Mycobacterial Infections</i>		
37.	<i>Mycobacterium tuberculosis</i>	635
	<i>Kelly L. Moore, Samuel W. Dooley, and William R. Jarvis</i>	
38.	Nontuberculous Mycobacteria	667
	<i>Richard J. Wallace, Jr., Venkatarama R. Koppaka</i>	
<i>C. Fungal Infections</i>		
39.	<i>Candida</i>	685
	<i>Michael M. McNeil</i>	
40.	Filamentous Fungi	705
	<i>Luis Ostrosky-Zeichner, John H. Rex</i>	
<i>D. Viral Infections</i>		
41.	Influenza Viruses	709
	<i>William M. Valenti</i>	
42.	Varicella-Zoster Virus	719
	<i>John A. Zaia</i>	
43.	Herpes Simplex Virus	733
	<i>Stuart P. Adler</i>	
44.	Cytomegalovirus	737
	<i>Stuart P. Adler</i>	
45.	Hepatitis Viruses	743
	<i>Adelisa L. Panlilio, Ian T. Williams, and Denise M. Cardo</i>	
<i>E. Other Pathogens</i>		
46.	Ectoparasites	755
	<i>Susie J. Sargent</i>	
47.	Uncommon Causes of Nosocomial Infections	765
	<i>Bryan P. Simmons, Michael S. Gelfand</i>	

VI. Epidemiology and Prevention of Nosocomial Infections in Pediatric Patients

48. Nosocomial Viral Respiratory Infections in Pediatric Patients 783
Ronald B. Turner
49. Nosocomial Bacterial Infections of the Central Nervous System, Upper and Lower
Respiratory Tracts, and Skin in Pediatric Patients 793
Terry Yamauchi, Gordon E. Schutze
50. Nosocomial Gastrointestinal Tract Infections in Pediatric Patients 807
Douglas K. Mitchell
51. Nosocomial Measles, Mumps, Rubella, and Other Viral Infections 829
*Mark Papania, Susan Reef, Aisha Jumaan, Jairam R. Lingappa,
and Walter W. Williams*
52. Nosocomial Infections in Newborn Nurseries and Neonatal Intensive Care Units . . 851
Dorothy L. Moore
53. Infections Acquired in Child Care Facilities 885
Ralph L. Cordell, Steven L. Solomon

VII. Epidemiology and Prevention of Nosocomial Infections in Special Patient Populations

54. Nosocomial Infections in Dental, Oral, and Maxillofacial Surgery 913
Cynthia J. Whitener, Bruce H. Hamory
55. Nosocomial Infections in Obstetrical Patients 927
Amy Beth Kressel, Calvin C. Linnemann, Jr.
56. Nosocomial Infections in Patients with Spinal Cord Injury 937
Rabih O. Darouiche
57. Healthcare-Associated Infections in Adults Infected with Human
Immunodeficiency Virus 945
Donald E. Craven, Kathleen A. Steger Craven, and Francesco G. De Rosa
58. Nosocomial Infections in Patients with Neoplastic Diseases 969
Aditya H. Gaur, Patricia M. Flynn
59. Nosocomial Infections in Solid Organ Transplant Recipients 985
Nina Singh
60. Infection Control and Prevention in Hematopoietic Stem Cell Transplant Patients 1011
Sara E. Cosgrove, Trish M. Perl

VIII. Epidemiology and Prevention of Nosocomial Infections Associated with Diagnostic and Therapeutic Procedures

61. Nosocomial Infections Associated with Anesthesia 1073
Loreen A. Herwaldt, Jean M. Pottinger, Stacy A. Coffin, Sebastian Schulz-Stübner
62. Nosocomial Infections Associated with Cardiac Catheterization and Other Invasive
Procedures in Cardiology 1117
Markus Dettenkofer, Franz D. Daschner

63.	Infection Risks of Endoscopy	1125
	<i>John Holton</i>	
64.	Control of Infections Associated with Hemodialysis	1139
	<i>Miriam J. Alter, Jerome I. Tokars, Matthew J. Arduino, Martin S. Favero</i>	
65.	Infections Associated with Peritoneal Dialysis	1161
	<i>Jeffrey D. Band</i>	
66.	Nosocomial Infections Associated with Physical Therapy, Including Hydrotherapy	1173
	<i>Stephen M. Kralovic, Calvin C. Linnemann, Jr.</i>	
67.	Infections that Complicate the Insertion of Prosthetic Devices	1181
	<i>Daniel P. Lew, Didier Pittet, Francis A. Waldvogel</i>	
68.	Nosocomial Infections Associated with Respiratory Therapy	1207
	<i>Keith S. Kaye, David J. Weber, and William A. Rutala</i>	
69.	Nosocomial Infections Associated with Transfusion of Blood and Blood Products	1223
	<i>Charles J. Schleupner</i>	
70.	Nosocomial Infections Associated with Procedures Performed in Radiology	1261
	<i>Bruce S. Ribner</i>	
71.	Infections Associated with Hyperbaric Oxygen Therapy and Hyperbaric Chambers, and Research in Altitude Chambers and Saturation Diving	1271
	<i>Jon T. Mader, Jue Wang</i>	
72.	Infection Control in Gene Therapy	1279
	<i>David J. Weber, Martin E. Evans, and William A. Rutala</i>	
73.	Infections in Xenotransplantation—A Model for Detection of Unknown Pathogens	1289
	<i>Jay A. Fishman</i>	

IX. Epidemiology and Prevention of Nosocomial Infections Related to Hospital Support Services

74.	Central Sterile Supply	1301
	<i>Lynne Sehulster, Janet K. Schultz</i>	
75.	Pharmacy Service	1315
	<i>Cyrus C. Hopkins</i>	
76.	Volunteer Services	1323
	<i>Kathy B. Miller</i>	
77.	Environmental Services	1327
	<i>Donald Vesley, Andrew J. Streifel</i>	

X. Epidemiology and Prevention of Nosocomial Infections in Healthcare Workers

78.	Nosocomial Viral Hepatitis in Healthcare Workers	1337
	<i>Susan E. Beekmann, David K. Henderson</i>	
79.	Nosocomial Human Immunodeficiency Virus Infection in Healthcare Workers . .	1361
	<i>Susan E. Beekmann, David K. Henderson</i>	

80.	Vaccination of Healthcare Workers	1381
	<i>Michael D. Decker, David J. Weber, William Schaffner</i>	
81.	Nosocomial Diseases of Healthcare Workers Spread by the Airborne or Contact Routes (Other than Tuberculosis)	1401
	<i>Michael D. Decker, William Schaffner</i>	
82.	Nosocomial Infections in Diagnostic Laboratories	1431
	<i>David L. Sewell</i>	
83.	Prevention of Occupationally Acquired Infections in Prehospital Healthcare Workers	1443
	<i>James M. Melius</i>	
84.	Prevention of Occupationally Acquired Infections in Posthospital Healthcare Workers	1449
	<i>Charles W. Stratton IV</i>	

XI. Disinfection and Sterilization

85.	Selection and Use of Disinfectants in Healthcare	1473
	<i>William A. Rutala, David J. Weber</i>	
86.	Sterilization and Pasteurization	1523
	<i>John H. Keene</i>	
87.	Reuse of Medical Devices Labeled for Single-Use	1535
	<i>Velvl W. Greene</i>	

XII. Prevention of Infections Acquired by Patients in Healthcare Facilities Related to Construction, Renovation, Demolition and Ventilation Systems

88.	Prevention of Infections Related to Construction, Renovation, and Demolition . . .	1549
	<i>Judene Bartley</i>	
89.	Design and Maintenance of Hospital Ventilation Systems and the Prevention of Airborne Nosocomial Infections	1577
	<i>Andrew J. Streifel</i>	

XIII. Antimicrobial Agents in Hospital Epidemiology and Infection Control

90.	Mechanisms of Bacterial Resistance to Antimicrobial Agents	1593
	<i>Louis B. Rice</i>	
91.	Antimicrobial Resistance in Hospital Flora and Nosocomial Infections	1613
	<i>G.L. French</i>	

XIV. The Literature in Hospital Epidemiology and Infection Control

92.	Searching the Literature in Hospital Epidemiology and Infection Control	1639
	<i>Cynthia J. Walker, K. Ann McKibbin, Fiona Smaill, R. Brian Haynes</i>	
93.	A Methodologically Focused Review of the Literature in Hospital Epidemiology and Infection Control	1645
	<i>Matthew Samore, Stephan Harbarth</i>	

XV. Organization and Implementation of Infection Control Programs

- 94.** Surveillance of Nosocomial Infections 1659
Teresa C. Horan, Robert P. Gaynes
- 95.** Isolation of Patients with Communicable Diseases 1703
Jan Evans Patterson
- 96.** Hand Washing and Hand Disinfection 1727
Manfred L. Rotter
- 97.** Evaluating and Selecting Products that Have Infection Control Implications 1747
*Robyn R.M. Gershon, Kristine A. Qureshi, Martha J. Grimes,
and Judith McKenzie*
- 98.** Education of Healthcare Workers in the Prevention of Healthcare-Associated
Infections 1755
Karen K. Hoffmann, Eva P. Clontz
- 99.** Infection Control and the Employee Health Service 1765
Pamela S. Falk
- 100.** Medical Waste Management 1773
Judith G. Gordon, Peter A. Reinhardt, Gerald A. Denys
- 101.** Epidemiology and Prevention of Nosocomial Infections Associated with Animals
in the Hospital 1787
David J. Weber, William A. Rutala
- 102.** Role of the Microbiology Laboratory in Hospital Epidemiology and Infection
Control 1809
Charles W. Stratton IV, John N. Greene
- 103.** Determining the Cost-Effectiveness of Healthcare Epidemiology and Infection
Control Programs 1827
Linda M. Mundy, Victoria J. Fraser
- 104.** Legal Issues in Hospital Epidemiology and Infection Control 1835
Mary Anne Bobinski

XVI. Hospital Epidemiology and Infection Control in Special Settings for Healthcare Delivery

- 105.** Hospital Epidemiology and Infection Control in Small Hospitals 1849
William E. Scheckler
- 106.** Epidemiology and Prevention of Infections in Residents of Long-Term Care
Facilities 1855
Larry J. Strausbaugh, Carol L. Joseph
- 107.** Epidemiology and Prevention of Infections in Home Healthcare 1881
Philip W. Smith, Jane S. Roccaforte
- 108.** Infection Control in Countries with Limited Resources 1889
W. Charles Huskins, Edward J. O'Rourke, Emily Rhinehart, Donald A. Goldmann

XVII. Bioterrorism

- 109.** Biologic Terrorism: An Overview 1921
Margaret A. Hamburg, C.J. Peters

xiv / TABLE OF CONTENTS

- 110.** The State and Local Response to Bioterrorism. 1929
*Marcelle Layton, Elsie Lee, Don Weiss, Debra Berg, Sara Beatrice,
and Joel Ackelsberg*
- 111.** The Agents of Bioterrorism 1945
Michael Osterholm, Elizabeth Linner McClure, and C.J. Peters
- 112.** Preparedness for a Bioterrorist Attack with Smallpox 1965
Michael Albert, Daniel R. Lucey, and Joel G. Breman

XVIII. Emerging Infectious Diseases and Healthcare Epidemiology

- 113.** Severe Acute Respiratory Syndrome 1979
Jay C. Butler, John A. Jernigan
- Subject Index 1991