PERIOPERATIVE MEDICINE
Hospital Medicine: Current Concepts
Scott A. Flanders and Sanjay Saint, Series Editors

1. Anticoagulation for the Hospitalist
   Margaret C. Fang, Editor

2. Hospital Images: A Clinical Atlas
   Paul B. Aronowitz, Editor

3. Becoming a Consummate Clinician
   Ary L. Goldberger and Zachary D. Goldberger, Editors

4. Inpatient Perioperative Medicine Medical Consultation: Co-Management and
   Practice Management
   Amir K. Jaffer and Paul J. Grant, Editors

Forthcoming:

5. Inpatient Cardiovascular Medicine
   Brahmajee K. Nallamothu and Timir S. Baman, Editors
To my parents for their love, prayers, and support that helped me achieve my goal of becoming a doctor. This book and other aspects of my academic career would not be possible without the patience, unwavering love, and support of my wife Hajra and my wonderful children Saniya and Salman.

Amir K. Jaffer

To my parents, Douglas and Margaret Grant, who have inspired and motivated me throughout my entire medical career with unwavering love and encouragement.

Paul J. Grant
# CONTENTS

**PREFACE**

**CONTRIBUTORS**

**PART I  SYSTEMS OF CARE, QUALITY, AND PRACTICE MANAGEMENT**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HOSPITALIST AS A MEDICAL CONSULTANT</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Siva S. Ketha and Amir K. Jaffer</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CO-MANAGEMENT OF THE SURGICAL PATIENT</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Eric Siegal</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>IMPROVING THE QUALITY AND OUTCOMES OF PERIOPERATIVE CARE</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Mihaela Stefan and Peter K. Lindenauer</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>THE PREOPERATIVE EVALUATION: HISTORY, PHYSICAL EXAM, AND THE ROLE OF TESTING</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Paul J. Grant</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>PERIOPERATIVE MEDICATION MANAGEMENT</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Christopher Whinney</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>DEVELOPING, IMPLEMENTING, AND OPERATING A PERIOPERATIVE CLINIC</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Seema Chandra, Daniel Fleisher, and Amir K. Jaffer</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>DEVELOPING, IMPLEMENTING, AND OPERATING A MEDICAL CONSULTATION SERVICE</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Joshua D. Lenchus and Kurt Pfeifer</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>PERIOPERATIVE MEDICINE: CODING, BILLING, AND REIMBURSEMENT ISSUES</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Jessica Zuleta and Seema Chandra</td>
<td></td>
</tr>
</tbody>
</table>
### PART II  ASSESSING AND MANAGING RISK BY ORGAN SYSTEM OR SPECIAL POPULATION

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>ASSESSING AND MANAGING CARDIOVASCULAR RISK</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>Vineet Chopra and James B. Froehlich</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>ASSESSING AND MANAGING PULMONARY RISK</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>Gerald W. Smetana</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>ASSESSING AND MANAGING ENDOCRINE DISORDERS</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>David Wesorick</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ASSESSING AND MANAGING HEPATOBIILIARY DISEASE</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>Aijaz Ahmed and Paul Martin</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>ASSESSING AND MANAGING HEMATOLOGIC DISORDERS</td>
<td>163</td>
</tr>
<tr>
<td></td>
<td>M. Chadi Alraies and Ajay Kumar</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>RENAL DISEASE AND ELECTROLYTE MANAGEMENT</td>
<td>185</td>
</tr>
<tr>
<td></td>
<td>Maninder S. Kohli</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>ASSESSING AND MANAGING NEUROVASCULAR, NEURODEGENERATIVE, AND NEUROMUSCULAR DISORDERS</td>
<td>201</td>
</tr>
<tr>
<td></td>
<td>Peter G. Kallas</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>ASSESSING AND MANAGING RHEUMATOLOGIC DISORDERS</td>
<td>215</td>
</tr>
<tr>
<td></td>
<td>Gregory C. Gardner and Brian F. Mandell</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>ASSESSING AND MANAGING PSYCHIATRIC DISEASE</td>
<td>231</td>
</tr>
<tr>
<td></td>
<td>Elias A. Khawam, Anjala V. Tess, and Leo Pozuelo</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>THE PREGNANT SURGICAL PATIENT</td>
<td>251</td>
</tr>
<tr>
<td></td>
<td>Michael P. Carson</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>THE PATIENT WITH CANCER</td>
<td>267</td>
</tr>
<tr>
<td></td>
<td>Sunil K. Sahai and Marc A. Rozner</td>
<td></td>
</tr>
<tr>
<td>PART III</td>
<td>POSTOPERATIVE CARE AND CO-MANAGEMENT BY SURGERY TYPE</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>20 CARDIAC SURGERY</td>
<td>285</td>
<td></td>
</tr>
<tr>
<td>Uzma Abbas and Andres F. Soto</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 21 INTRA-ABDOMINAL AND PELVIC SURGERY  | 301 |
| M. Chadi Alraies and Franklin Michota |

| 22 MAJOR ORTHOPEDIC SURGERY  | 309 |
| Barbara Slawski |

| 23 TRAUMA SURGERY  | 325 |
| Fahim A. Habib, Nikolay Buagev, and Mark G. McKenney |

| 24 NEUROSURGERY  | 339 |
| Christina Gilmore Ryan, Kamal S. Ajam, and Rachel E. Thompson |

| 25 BARIATRIC SURGERY  | 357 |
| Donna L. Mercado, Mihaela Stefan, and Xiao Liu |

| 26 OPHTHALMIC SURGERY  | 373 |
| Jessica Zuleta and Aldo Pavon Canseco |

<table>
<thead>
<tr>
<th>PART IV</th>
<th>COMMON POSTOPERATIVE CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 SEPSIS</td>
<td>385</td>
</tr>
<tr>
<td>Lena M. Napolitano</td>
<td></td>
</tr>
</tbody>
</table>

| 28 POSTOPERATIVE CARDIAC COMPLICATIONS  | 407 |
| Efren C. Manjarrez, Karen F. Mauck, and Steven L. Cohn |

| 29 POSTOPERATIVE NAUSEA AND VOMITING  | 425 |
| Tina P. Le and Tong J. Gan |

| 30 DELIRIUM  | 439 |
| Dimitriy Levin and Jeffrey J. Glasheen |

<p>| 31 POSTOPERATIVE FEVER  | 451 |
| James C. Pile |</p>
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Author(s)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>VENOUS THROMBOEMBOLISM</td>
<td>Darrell W. Harrington and Katayoun Mostafaie</td>
<td>463</td>
</tr>
<tr>
<td>33</td>
<td>SURGICAL SITE INFECTIONS</td>
<td>Emily K. Shuman and Carol E. Chenoweth</td>
<td>485</td>
</tr>
<tr>
<td>34</td>
<td>POSTOPERATIVE KIDNEY INJURY</td>
<td>Charuhas V. Thakar</td>
<td>499</td>
</tr>
<tr>
<td>35</td>
<td>PERIOPERATIVE PAIN</td>
<td>Daniel Berland and Naeem Haider</td>
<td>517</td>
</tr>
</tbody>
</table>

INDEX    537
Perioperative medicine is an increasingly essential component of clinical practice for both hospitalists and hospital-based internists in the United States today. In a 2012 survey of attendees at the Society of Hospital Medicine Annual Meeting Pre-course on this topic, over 90% were involved in co-management of surgical patients. With our aging population, patients are living longer and undergoing more surgeries than ever before. It is estimated that over 100,000 procedures are performed daily in the United States today. The associated costs of surgery and its complications also continue to increase significantly. It is projected that surgery-related adverse events cost the health system over $50 billion. These events need to be minimized through evidence-based strategies and interventions.

The first edition of our book *Perioperative Medicine: Medical Consultation and Co-Management* is envisioned to be a comprehensive textbook to help the internist, hospitalist, anesthesiologist, allied health professional, fellow, resident, and medical student manage the various aspects of medical care of the surgical patient. The focus is on both the preoperative and postoperative medical management of the surgical patient. This book is not intended to help guide intraoperative management. Rather, it focuses on systems, operations, and quality of perioperative care, assessment of patient and system-specific preoperative risk, evidence-based strategies that minimize risk, and management of common postoperative conditions. We also address important operational and system issues surrounding the development and implementation of both preoperative clinics and medical consultation services. In today’s era of decreasing reimbursement, we have additionally focused on documentation, coding, billing, and payment issues, which are increasingly vital components of clinical practice. To facilitate access to the content, our book is divided into four main sections: Part I: Systems of Care, Quality, and Practice Management; Part II: Assessing and Managing Risk by Organ System or Special Population; Part III: Postoperative Care and Co-Management by Surgery Type; and Part IV: Common Postoperative Conditions.

As the Accountable Care Act is implemented, we must focus more and more on practicing high-quality, safe evidence-based perioperative care at the lowest cost. Therefore, patient care must be of the highest value across the whole perioperative spectrum. In addition, the principles of modern perioperative medicine may help us modify some long-standing traditions with limited benefit that can be eliminated.
from our current practice. We believe this book will arm you with a wealth of cutting-edge, evidence- and value-based knowledge that you can start using in your practice right away, and serve as a reference for years to come.

It is also our hope that this book will continue to enhance the overall quality of perioperative care you deliver. It was developed for you and we welcome comments and feedback regarding this first edition, as well as suggestions to improve future editions.

ACKNOWLEDGMENTS

We want to thank the series editors, Sanjay Saint and Scott Flanders, for their vision for this special series and for their trust in us. We especially want to thank all the contributing authors, as well as Thomas Moore and the Wiley staff for their assistance throughout the process of putting this book together. Finally, a special thanks to Ila Gold and Sarah Quadri for assisting during various stages of this book. The book would not be possible without all of you!

Amir K. Jaffer, MD, SFHM
(ajaffer@med.miami.edu)

Paul J. Grant, MD, SFHM
(paulgran@med.umich.edu)
CONTRIBUTORS

**Uzma Abbas, MD**
Assistant Professor of Clinical Medicine
Division of Hospital Medicine
Department of Medicine
University of Miami Miller School of Medicine
Medical Director, UM Hospitalist Service
University of Miami Hospital

**Aijaz Ahmed, MD**
Associate Professor of Medicine
Division of Gastroenterology and Hepatology
Stanford University School of Medicine

**Kamal S. Ajam, MD**
Clinical Assistant Professor
Wake Forest University Baptist Medical Center
Department of Anesthesiology
Carolina Pain Institute

**M. Chadi Alraies, MD, FACP**
Clinical Assistant Professor of Medicine
Cleveland Clinic Lerner College of Medicine of Case Western Reserve University
Department of Hospital Medicine
Institute of Medicine, The Cleveland Clinic

**Daniel Berland, MD, FACP, ABAM**
Clinical Assistant Professor
Departments of Medicine and Anesthesiology
University of Michigan Health System

**Nikolay Buagev, MD**
Fellow, Trauma & Surgical Critical Care
Jackson Memorial Hospital

**Aldo Pavon Canseco, MD**
Assistant Professor of Clinical Medicine
Division of Hospital Medicine
University of Miami Miller School of Medicine
Michael P. Carson, MD
Associate Clinical Professor of Medicine
Assistant Clinical Professor of Obstetrics, Gynecology & Reproductive Sciences
UMDNJ—Robert Wood Johnson Medical School
Director of Research/Outcomes
Jersey Shore University Medical Center

Seema Chandra, MD
Assistant Professor of Clinical Medicine and Pediatrics
Division of Hospital Medicine
Department of Medicine
University of Miami Miller School of Medicine

Carol E. Chenoweth, MD
Professor of Medicine
Division of Infectious Diseases
Hospital Epidemiologist
University of Michigan Health System

Vineet Chopra, MD, FACP, FHM
Assistant Professor of Medicine
Department of Internal Medicine
University of Michigan Health System

Steven L. Cohn, MD, FACP
Director, Medical Consultation Service
University of Miami Hospital
Professor of Clinical Medicine
Division of Hospital Medicine
Department of Medicine
University of Miami Miller School of Medicine

Daniel Fleisher, MBA
Healthcare Management Engineering
University of Miami Health System

James B. Froehlich, MD, MPH, FACC
Associate Professor of Medicine
Director of Vascular Medicine
Director of Anticoagulation Clinic
University of Michigan Health System

Tong J. Gan, MD, FRCA
Professor of Anesthesiology and Vice-Chairman for Clinical Research
Department of Anesthesiology
Duke University Medical Center
Gregory C. Gardner, MD, FACP
Gilliland-Henderson Professor of Medicine
Division of Rheumatology
Adjunct Professor of Orthopaedics and Rehabilitation Medicine
University of Washington

Jeffrey J. Glasheen, MD, SFHM
Associate Professor of Medicine
Department of Medicine
Hospital Medicine Section
University of Colorado Anschutz Medical Campus

Paul J. Grant, MD
Assistant Professor of Medicine
Director, Perioperative and Consultative Medicine
Division of General Medicine
University of Michigan Health System

Fahim A. Habib, MD, FACS
Attending Trauma Surgeon
Ryder Trauma Center
Director of Critical Care
University of Miami Hospital
Assistant Professor of Surgery
DeWitt Daughtry Department of Surgery
University of Miami

Naeem Haider, MD
Clinical Assistant Professor
Department of Anesthesiology
University of Michigan Health System

Darrell W. Harrington, MD, FACP
Chief, Division of General Internal Medicine
Department of Medicine
Harbor-UCLA Medical Center
Associate Professor of Medicine
David Geffen School of Medicine at UCLA

Amir K. Jaffer, MD, FHM
Professor of Medicine
Chief, Division of Hospital Medicine
Department of Medicine
University of Miami Miller School of Medicine
CONTRIBUTORS

Peter G. Kallas, MD
Assistant Professor of Medicine and Anesthesia
Medical Director, Perioperative Medicine
Northwestern University Feinberg School of Medicine

Siva S. Ketha, MD
Senior Associate Consultant
Division of Hospital Medicine
Mayo Clinic

Elias A. Khawam, MD
Consultation Liaison Psychiatry
Cleveland Clinical Lerner College of Medicine

Maninder S. Kohli, MD, FACP
Vice-Chair
Department of Medicine
Hinsdale Hospital

Ajay Kumar, MD, FACP, SFHM
Chief, Division of Hospital Medicine
Hartford Hospital

Tina P. Le, BS
Department of Anesthesiology
Duke University Medical Center

Joshua D. Lenchus, DO, RPh, FACP, SFHM
Associate Professor of Medicine
Division of Hospital Medicine
Department of Medicine
University of Miami Miller School of Medicine
Associate Program Director
Jackson Memorial Hospital Internal Medicine Residency

Dimitriy Levin, MD
Assistant Professor of Medicine
Department of Medicine
Hospital Medicine Section
University of Colorado Anschutz Medical Campus
Peter K. Lindenauer, MD, MSc, FACP  
Associate Professor of Medicine  
Director, Center for Quality of Care Research  
Tufts University School of Medicine  
Department of General Medicine  
Baystate Medical Center

Xiao Liu, MD, PhD  
Assistant Professor of Medicine  
Tufts University School of Medicine  
Academic Hospital Medicine Program  
Division of General Internal Medicine/Geriatric  
Baystate Medical Center

Brian F. Mandell, MD, PhD, MACP, FACP  
Professor and Chairman of Academic Medicine  
Department of Rheumatic and Immunologic Disease  
Cleveland Clinical Lerner College of Medicine

Efren C. Manjarrez, MD, SFHM  
Assistant Professor of Clinical Medicine  
Associate Chief, Division of Hospital Medicine  
Department of Medicine  
Associate Chief Patient Safety and Quality Officer for Uhealth  
University of Miami Miller School of Medicine

Paul Martin, MD  
Professor of Medicine  
Chief, Division of Hepatology  
University of Miami Miller School of Medicine

Karen F. Mauck, MD, MSc  
Consultant and Assistant Professor of Medicine  
Division of General Internal Medicine  
Department of Medicine  
Mayo Clinic and Mayo Clinic College of Medicine

Mark G. McKenney, MD  
Professor of Surgery  
DeWitt Daughtry Department of Surgery  
University of Miami Miller School of Medicine
Donnal L. Mercado, MD, FACP
Division of Endocrinology
Department of Medicine
Baystate Medical Center
Associate Clinical Professor
Tufts University School of Medicine

Franklin Michota, MD, FACP, FHM
Associate Professor of Medicine
Cleveland Clinical Lerner College of Medicine at Case Western Reserve University

Katayoun Mostafaie, MD
Division of General Internal Medicine
Harbor-UCLA Medical Center
Assistant Professor of Medicine
David Geffen School of Medicine at UCLA

Lena M. Napolitano, MD, FACS, FCCP, FCCM
Professor of Surgery
Division Chief, Acute Care Surgery
Associate Chair, Department of Surgery
Department of Surgery
Director, Trauma and Surgical Critical Care
University of Michigan Health System

Kurt Pfeifer, MD, FACP
Associate Professor of Medicine
Division of General Internal Medicine
Associate Program Director
Internal Medicine Residency
Medical College of Wisconsin

James C. Pile, MD, FACP, SFHM
Associate Professor of Medicine
Divisions of Hospital Medicine and Infectious Diseases
MetroHealth Medical Center Campus of Case Western Reserve University

Leo Pozuelo, MD, FACP, FAPM
Section Head, Consultation Liaison Psychiatry
Cleveland Clinical Lerner College of Medicine
Marc A. Rozner, PhD, MD
Professor
Anesthesiology & Perioperative Medicine
UT MD Anderson Cancer Center

Christina Gilmore Ryan, MD
Assistant Professor, General Internal Medicine
Assistant Professor, Neurological Surgery (Joint Appointment)
University of Washington

Sunil K. Sahai, MD
Associate Professor of Medicine
Department of General Internal Medicine
Medical Director, Internal Medicine Perioperative Assessment Center
University of Texas, MD Anderson Cancer Center

Emily K. Shuman, MD
Instructor of Medicine
Division of Infectious Diseases
Weill Cornell Medical College

Eric Siegal, MD, SFHM
Critical Care Medicine
Aurora St. Luke’s Medical Center
Assistant Professor of Medicine
University of Wisconsin School of Medicine and Public Health

Barbara Slawski, MD, MS, FACP
Associate Professor of Internal Medicine and Orthopaedic Surgery
Chief, Section of Perioperative and Consultative Medicine
Director, Froedtert Memorial Lutheran Hospital Pre Admission Testing Clinic
Medical College of Wisconsin

Gerald W. Smetana, MD
Division of General Medicine and Primary Care
Beth Israel Deaconess Medical Center
Associate Professor of Medicine
Harvard Medical School

Andres F. Soto, MD
Medical Director Aventura Hospitalist
Aventura Hospital and Medical Center
Mihaela Stefan, MD, FACP
Assistant Professor of Medicine
Baystate Medical Center
Department of General Medicine
Tufts University School of Medicine

Anjala V. Tess, MD
Department of Medicine
Beth Israel Deaconess Medical Center
Assistant Professor of Medicine
Harvard Medical School

Charuhas V. Thakar, MD, FASN
Chief, Section of Nephrology
Cincinnati VA Medical Center
Associate Professor of Medicine
University of Cincinnati

Rachel E. Thompson, MD, FHM
Director, Medicine Consult Service
Assistant Professor, General Internal Medicine
Harborview Medical Center
Assistant Professor, Neurological Surgery (Joint Appointment)
University of Washington

David Wesorick, MD
Clinical Assistant Professor
Department of Internal Medicine
University of Michigan Medical School

Christopher Whinney, MD, FACP
Clinical Assistant Professor of Medicine
Department of Hospital Medicine
Cleveland Clinic Lerner College of Medicine

Jessica Zuleta, MD, FHM
Assistant Professor of Clinical Medicine
Division of Hospital Medicine
Department of Medicine
University of Miami Miller School of Medicine
PART I

SYSTEMS OF CARE, QUALITY, AND PRACTICE MANAGEMENT
INTRODUCTION

Medical consultation is an integral part of an Internal Medicine or a Hospital Medicine practice. Internists and hospitalists are often asked to evaluate a patient prior to surgery. The medical consultant may be seeing the patient at the request of the surgeon, or they may be a member of the primary care team assessing the patient prior to consideration for a surgical procedure. The timing of the consultation may vary from days to weeks prior to a planned elective surgical procedure and sometimes a few hours before an urgent procedure. The former is usually performed in a preoperative clinic or in an internist’s office. The latter situation is frequently encountered in a hospitalist practice. Irrespective of the timing, the general objective of this evaluation is to determine the risk to the patient from the proposed procedure and from the patient’s own known and unknown comorbidities and to recommend interventions to minimize these risks. This objective is accomplished by identifying comorbid disease conditions and risk factors for medical complications of surgery, optimizing the medical management of these conditions, recognizing and treating the potential complications, and working together with the surgical and anesthesia colleagues to form an efficient and effective perioperative care team.

Internists and hospitalists, especially individuals who have recently completed training, may not always be well acquainted with the process of medical consultation. This is often because of inadequate exposure to the intricate nuances of medical consultation during residency training. However, medical consultation is an important component of both the outpatient internal medicine practice and the hospitalist practice. Therefore, it is worthwhile to develop an optimal consultation technique. This will also increase the likelihood that the recommendations of the consultant are implemented.

The focus of this chapter is on the general principles of medical consultation and specifically on the optimal interaction/communication between referring physicians and the medical consultant.
ADVANTAGES OF MEDICAL CONSULTATION

Medical consultation is a widely prevalent practice. However, there is no evidence to show that this practice is associated with a decrease in perioperative morbidity and mortality. In fact, in a recent, large population-based cohort study conducted by Wijeysundera et al., preoperative medical consultation was associated with significant, albeit small, increases in mortality and hospital stay after major elective non-cardiac surgery. This study did have several limitations including the fact that it was an observational study and the mortality increase was small.2

But there is evidence showing that internists identify medical conditions that are related to surgical outcome and often recommend potentially lifesaving interventions for these conditions. In addition, medical consultants occasionally cancel or delay surgery so that medical conditions can be optimized.3 In another study by Devereaux et al., it was found that medical consultants frequently recommended perioperative changes in the use of cardiac medications.4 If the medical consultant makes evidence-based recommendations, then it is reasonable to conclude that consultation will improve the care of the surgical patient if such recommendations are followed. The effect of medical consultation on the length of stay is unclear. Phy et al. demonstrated a reduction in the length of stay and fewer minor complications when a hospitalist was part of the care team for patients after hip fracture surgery.5 Macpherson et al. reported a decrease in the length of stay when an internist performed a postoperative medical management in patients who had undergone elective cardiothoracic surgery.6 However, a more recent study by Auerbach in 2007 showed similar or increased costs and length of stay for patients who had a consultation from a generalist.7 The authors of this study concluded that perioperative medical consultation produces inconsistent effects on the quality of care. Both this study and the other limited observational evidence are fraught with limitations and biases, and good randomized clinical trials are difficult to do in this area to study the true impact of medical consultation.

GENERAL PRINCIPLES OF MEDICAL CONSULTATION

Goldman et al. laid out the general principles of an effective medical consultation in 1983.8 These principles are often referred to as the “Ten Commandments” of medical consultation and they are as follows:

I: Determine the Question

All too often consultants meticulously recapitulate the case and offer detailed recommendations but fail to address the question for which the consultation was called. It is important to respond to the specific question asked.

II: Establish Urgency

The consultant must determine whether the consultation is emergent, urgent, or elective and provide a timely response.
III: Look for Yourself
   Confirm the history and physical exam, and check the test results.

IV: Be as Brief as Appropriate
   Limit the number of recommendations.

V: Be Specific
   It is recommended that the consultations should be brief and goal oriented. The impressions and differential diagnosis should be expressed concisely in order of likelihood.

VI: Provide Contingency Plans
   Consultants should try to anticipate potential problems, such as what kind of postoperative complications might be expected in a particular patient. A brief description of therapeutic options to be employed should these problems arise is appropriate.

VII: Honor Thy Turf (or Thou Shalt Not Covet Thy Neighbor’s Patient)
   In general, consultants should play a subsidiary role. They should address the problem for which they were called and avoid running arguments in and out of the medical record with other services, especially if the problem lies outside their domain.

VIII: Teach with Tact
   Requesting physicians appreciate brevity and clarity, but they also appreciate consultants who make an active effort to share their expertise and insights without condescension.

IX: Talk Is Cheap and Effective
   It is crucial to have a direct conversation with the primary physician after a consultation has been performed. This is especially true if the recommendations are urgent or controversial.

X: Follow-Up
   Consultants should recognize the appropriate time to fade gracefully into a background role, but that time is almost never the same day that the consultation note is signed.

A consultation is a request made to another physician to give his or her opinion (given their expertise in the field) on the diagnosis or management of a particular patient. The requesting clinician may seek consultation for preoperative risk assessment for surgery and anesthesia, advice on diagnostic problems or management issues in the perioperative period, confirmation of a plan or assessment and reassurance, or documentation for medical legal reasons. In general when a consultation is requested, the role of the consultant should be defined through communication with
the referring physician. In a recent study by Salerno et al., it was found that surgeons more often desire “co-management” by internists in which the internist is asked to assume the management of specific aspects of the patient’s care including order writing. However, unless there is a preexisting arrangement for co-management, the surgeon needs to explicitly communicate this to the medical consultant.

Consultations should be requested in doubtful or difficult cases, or when they enhance the quality of medical care. The referring physician should always send a formal written or verbal consult request to the consulting physician unless a verbal description of the case has already been given.

Effective communication is the key to the art of medical consultation. The way in which the question or information is phrased can influence the consultant’s response. For example, a request for “management of medical conditions” will generate a completely different response as opposed to a request for “management of postoperative hypertensive urgency.” Ideally, the requesting physician should clearly state the questions to be answered by the consultant. However, this is often not the case. For example, Lee et al. found that there was disagreement between the primary physician and the consultant about the primary reason for consultation in 14% of cases. A study by Kleinman et al. found that among preoperative cardiology consultations, over half of the consult requests were for “evaluation,” 40% for “medical clearance,” and no specific reason was noted for 5%. In such instances, the consultant should directly communicate with the requesting physician to get a better sense of his or her needs in this regard. Given the high frequency of misunderstanding between consultants and referring physicians, direct communication is important and likely will prevent misinterpretation.

The consultant should always discuss potentially controversial recommendations with the primary team. It is not good practice to leave inflammatory notes in the chart. If the consultant identifies areas of concern distinct from the original reason for the consult, it is recommended that they discuss this with the primary team and seek their permission before discussing this in the chart. Conflicts of opinion should be resolved by a second consultation or withdrawal of the consultant.

Traditionally, consultative advice should be specific to the question asked. However, Salerno et al. found that only 41% of surgeons believed that internal medicine consultants should limit themselves to a specific question. Consults should be performed in a timely fashion. It is very useful if the requesting service indicates whether the consult is emergent, urgent, or routine to allow the consultant to respond accordingly.

The attending physician has overall responsibility for the patient’s treatment and is in charge of the patient’s care. The consultant physician should not assume the primary care of the patient without the consent of the referring physician. The medical consultant should be able to anticipate potential problems and make succinct therapeutic recommendations. As a consultant, the physician should restrict advice to his or her area of expertise. For internists, this usually includes general internal medicine or cardiology and various aspects of perioperative medicine. It is not advisable to make recommendations regarding the type or route of anesthesia.

The consultant should make clear and concise recommendations regarding the management of the problem at hand. These immediate concerns must be evaluated
in terms of their severity, the planned surgical procedure, the patient’s perioperative risk, and the need for further testing or intervention. It is crucial to avoid making a long list of recommendations about all of the patient’s issues as this might decrease the compliance with the recommendations.

Quite often, patients are interested in knowing the consultant’s opinion at the end of the consultation visit. Unless the consultant is the patient’s primary care physician, he or she should not express an opinion as to whether surgery should proceed. The final decision is best made by the surgeon in conjunction with the patient. The consultant does have the right to share his or her recommendations with the patient in the presence of the surgeon.

When the consultant’s expertise is no longer necessary for the care of the patient, he or she should relay this to the primary team and write a note indicating that they are signing off the case. The sign-off note should ideally indicate appropriate recommendations and arrangements for follow up of the medical problems once the patient leaves the hospital.

PREOPERATIVE MEDICAL EVALUATION

A commonly stated purpose of a preoperative consultation request is to “clear” a patient for surgery. As we have indicated before, the role of the internist or hospitalist is to outline the risks and interventions to help decrease this risk. We do not “clear” patients but in such referrals, the consultant can presume that the request is to provide a comprehensive preoperative evaluation. The consultant should avoid the use of the phrase “cleared for surgery.” Instead, they should quantify the risk of potential complications from the procedure and propose a plan for risk reduction. This is accomplished by identifying all the risk factors (cardiac and pulmonary morbidity) and their severity, and making recommendations for optimizing the medical management of these risk factors. Risks are specific to the individual patient, the type of procedure proposed, and the type of anesthesia selected. If no such risks are identified, then the consultant’s final statement could categorize this risk as low, intermediate, or high for the proposed surgery.

Another important aspect of preoperative medical consultation is management of perioperative medications. The medical consultant should make recommendations about the perioperative management of the patient’s usual outpatient medications. The consultant should also identify potential complications of the procedure (venous thromboembolism [VTE], wound infection, etc.) and make appropriate recommendations to prevent their occurrence. Many surgeons view postoperative VTE prophylaxis and surgical wound infection prophylaxis as their domain. But consultants who notice that optimal VTE and surgical wound prophylaxis is not being given should consider providing recommendations.

In summary, the medical consultant should be able to identify the pertinent medical problems, integrate this information with the physiologic stressors of anesthesia and surgery, anticipate potential perioperative problems, assess a patient’s risk and need for further interventions, and communicate effectively with the surgeon and anesthesiologist.
CO-MANAGEMENT

The field of medical consultation has changed significantly since Goldman et al. published the Ten Commandments of Effective Consultation. It is common practice these days, for the consultant to step beyond the usual role of consultant and actively manage medical conditions by ordering tests and initiating therapies, which involves writing orders in the medical record—a practice known as co-management. With the increasing prevalence of the hospitalist model of care, co-management has also become commonplace. Co-management is seen most often in orthopedic surgery patients, but other surgical subspecialties are starting to request this type of service.\textsuperscript{16–18} One advantage of the co-management model is that the medical consultant writes

<table>
<thead>
<tr>
<th>Commandment</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determine your customer.</td>
<td>Ask the requesting physician how you can best help them if a specific question is not obvious; they may want co-management.</td>
</tr>
<tr>
<td>2. Establish urgency.</td>
<td>The consultant must determine whether the consultation is emergent, urgent, or elective.</td>
</tr>
<tr>
<td>3. Look for yourself.</td>
<td>Consultants are most effective when they are willing to gather data on their own.</td>
</tr>
<tr>
<td>4. Be as brief as appropriate.</td>
<td>The consultant need not repeat in full detail the data that were already recorded.</td>
</tr>
<tr>
<td>5. Be specific, thorough, and descend from thy ivory tower to help when requested.</td>
<td>Leave as many specific recommendations as needed to answer the consult but ask the requesting physician if they need help with order writing.</td>
</tr>
<tr>
<td>6. Provide contingency plans and discuss their execution.</td>
<td>Consultants should anticipate potential problems, document contingency plans, and provide a 24-h point of contact to help execute the plans if requested.</td>
</tr>
<tr>
<td>7. Thou may negotiate joint title to thy neighbor’s.</td>
<td>Consultants can and should co-manage any facet of patient care that the requesting physician desires; a frank discussion defining which specialty is responsible for what aspects of patient care is needed.</td>
</tr>
<tr>
<td>8. Teach with tact and pragmatism.</td>
<td>Judgments on leaving references should be tailored to the requesting physician’s specialty, level of training, and urgency of the consult.</td>
</tr>
<tr>
<td>9. Talk is essential.</td>
<td>There is no substitute for direct personal contact with the primary physician.</td>
</tr>
<tr>
<td>10. Follow-up daily.</td>
<td>Daily written follow-up is desirable; when the patient’s problems are not active, the consultant should discuss signing off with the requesting physician beforehand.</td>
</tr>
</tbody>
</table>