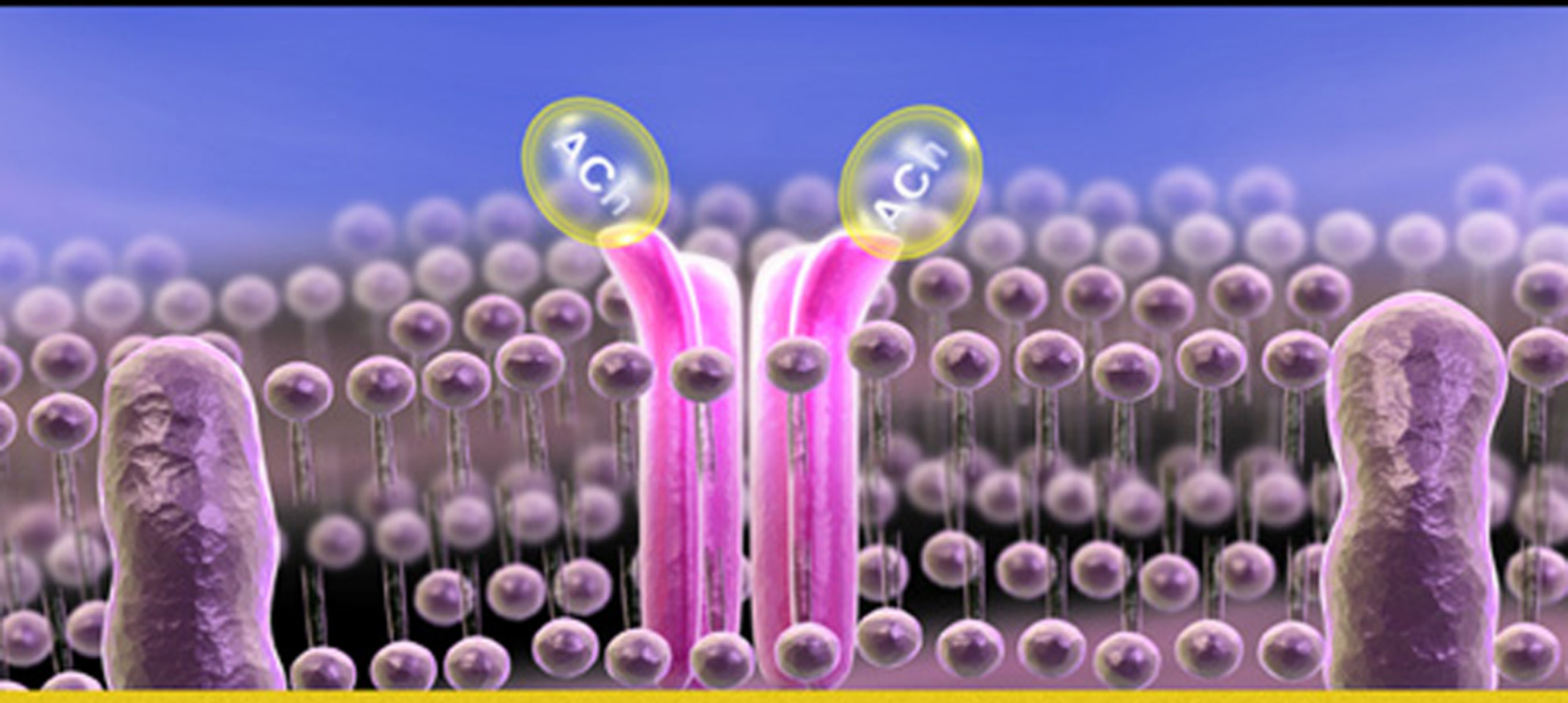
100 Case Studies in Pathophysiology



Harold J. Bruyere, Jr.

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100 CASE STUDIES IN PATHOPHYSIOLOGY

Harold J. Bruyere, Jr., Ph.D.

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Dedication

This case studies workbook is dedicated to my beloved wife, Kathy, my son, Travis, and my daughter, Kimberly, who have been an inspiration to me and whom I love very much.

Case Study 32 is dedicated to my friend, Merrill Buckley, who passed away on July 6, 2007 after a long and courageous battle with chronic renal failure.

Case Study 45 is dedicated to my late friend, Eddie Alwin, who struggled with Parkinson disease for many years.

Case Study 49 is dedicated to my father, who passed away in July 1993 after a long and courageous battle with depression.

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ABOUT THE AUTHOR

Professor Bruyere has 30 years of experience teaching students in human medicine, pharmacy, nursing, and the allied health professions. He has been a member of the faculty at the University of Wisconsin, the University of Wyoming, and the University of Washington.

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PREFACE

The primary purpose of *100 Case Studies in Pathophysiology* is to provide students beginning their formal education in the health sciences with a resource they can use to begin to develop their clinical problem-solving and critical thinking skills. This workbook, which provides a strong link between theory and practice, was designed for use by medical, pharmacy, nursing, and allied health educators and their students. The basic concept that underlies this workbook is that clinical manifestations of an illness are directly associated with the pathophysiology of human disease.

This workbook provides a straightforward approach to integrating basic pathophysiology, risk factors, physical examination findings, and clinical laboratory data for 100 significant health problems in the United States today. Some of the case studies were written from comprehensive interviews with patients, some are composites of case studies reported in the medical literature, and others are drawn from my personal experiences. Review summaries of selected major health problems allow students to develop effective methods of clinical assessment and disease management. In addition, the principles and concepts of underlying disease processes presented here will further prepare students for the study of basic pharmacology.

Goals of This Workbook

The three major goals of this workbook are:

- To provide a basic, straightforward, and current resource tool for medical, pharmacy, nursing, and allied health students who have minimal experience interpreting a medical case study or a patient's medical record;
- To provide students in the health sciences with an opportunity to develop their clinical problem-solving skills by identifying clinical manifestations, abnormal clinical laboratory data, and risk factors for a variety of significant health disorders;
- To provide an opportunity for students in the health sciences to develop their clinical critical thinking skills by selecting appropriate disease management options through a case study approach.

The Audience

This workbook is unique in that it was designed for students in human medicine, pharmacy, nursing, and the allied health sciences to support early courses in basic pathophysiology or general pathology. I made the assumption that students who would use this workbook had not completed courses in pharmacology and were novices regarding drug treatment. I also assumed that students would be learning for the first time how to problem solve and think critically with a medical case study before them.

The use of case studies in this workbook does not require extensive knowledge and experience in human medicine, pharmacy, or nursing. Case studies are basic, concise, and introduce the student to new medical terms and medical abbreviations that are commonly used by health professionals. Each patient case also incorporates important clinical signs, symptoms, and laboratory data that are consistent with a specific health problem. The student will use tables of clinical laboratory reference values (e.g., normal white blood cell count, normal serum sodium or potassium concentrations) to recognize data collected from case study patients that are abnormal and suggestive of specific disease states.

The workbook can be used to complement a variety of basic pathophysiology or pathology textbooks. *100 Case Studies in Pathophysiology* also can be used by itself as a concise and effective review of concepts previously learned.

Organizational Philosophy

This book uses the organ systems approach to categorize human diseases and other health conditions. This approach allows the instructor to cover conditions in a logical and efficient manner (e.g., cardiovascular disorders, gastrointestinal disorders, or respiratory disorders). However, instructors must ensure that an anatomic and physiologic review of the appropriate organ system has been completed before students begin each of the case studies. Success in working through each case presentation presupposes fundamental knowledge of the normal anatomy and physiology of the appropriate organ system. For example, a complete review of the anatomy and physiology of the heart is essential before completing the case studies in Part 1, Cardiovascular Disorders, such as "Acute Myocardial Infarction" and "Congestive Heart Failure."

This workbook contains a wide range of pertinent clinical information so that students may better interpret and assess each case study patient. Seven appendices are included for patient assessment purposes:

- Appendix A: Table of Clinical Reference Values
- Appendix B: Table of Normal Height and Weight in Children
- Appendix C: Table of Blood Pressure in Children
- Appendix D: Table of Karnovsky Performance Status
- Appendix E: Table of Common Medical Abbreviations
- Appendix F: Table of APGAR Scoring for Newborns
- Appendix G: Questionnaire of Quality of Life in Epilepsy (QOLIE-31)

Case Study Structure

The organization of *100 Case Studies in Pathophysiology* provides health science instructors and students with a logical and efficient method for integrating the pathophysiology of health conditions with appropriate clinical information. Each case study is divided into a Patient Case of a specific health condition and the supporting Disease Summary (found on the accompanying CD-ROM).

Patient Cases

Patient Cases are found in the printed workbook. Although the structure of each case is similar, it is not identical. This variability is intentional so that students will understand that patient medical records vary significantly by individual healthcare providers. The cases present detailed information that simulates real-life patients. I have included questions that assess understanding in each Patient Case. The basic structure of the Patient Case in this workbook includes the following components:

- **Patient's Chief Complaints**
- **History of Present Illness**
- **Past Medical History**
- **Family History**
- **Social History**
- **Medications**
- **Allergies**
- **Review of Systems**
- **Physical Examination Findings** (including vital signs)
- **Laboratory Blood Test Results**
- **Specialized Test Results** (e.g., urinalysis, chest x-ray, or electrocardiogram)

Disease Summaries

There is one Disease Summary on the CD-ROM to accompany each Patient Case in the workbook. Questions within many of the Disease Summaries assess the student's understanding or require the student to conduct more extensive research of the medical literature. Boldface

is used to draw students' attention to especially important key concepts, and many key terms are italicized and defined. Each Disease Summary is presented in the following order:

- **Definition** of the medical condition
- **Prevalence** of the medical condition in the United States with a focus on age, gender, and racial/ethnic group predispositions
- **Significance** of the medical condition with emphasis on bothersome symptoms, mortality rates, and national economic implications
- **Causes and Risk Factors** of the medical condition
- **Pathophysiology** of the medical condition based on established research findings
- **Diagnosis:** (based on) **Clinical Manifestations and Laboratory Tests**
- **Appropriate Therapy** with a focus on the primary goals of treatment and common nonpharmacologic, pharmacologic, and surgical approaches
- **Serious Complications and Prognosis** (i.e., the consequences of failure to treat the condition appropriately)

Learning Objectives

The major objective of this case studies book is to provide a current and close correlation between basic principles of human disease and clinical practice. It is important for students to thoroughly understand the underlying pathophysiologic processes that are present in the patients they will serve. Additionally, understanding basic pathophysiologic mechanisms of human disease ultimately promotes better decision-making efforts by healthcare providers and a better quality of life for their patients.

By working through the case studies in this workbook, students will:

- Strengthen their vocabulary in human medicine, pharmacy, and nursing;
- Develop an ability to recognize clinical signs and symptoms that are consistent with a large group of common human health conditions;
- Develop an ability to identify abnormal clinical laboratory test results that are consistent with a variety of human health disorders;
- Develop clinical problem-solving and critical thinking skills;
- Gain insights for specific treatments and methods of clinical assessment.

Student and Instructor Resources

Student Resources

The CD-ROM included with this book and the Student Resource Center at http://thePoint.lww.com/bruyere includes the following materials:

- The Disease Summary for each case study, including definition, prevalence, significance, causes and risk factors, pathophysiology, diagnosis, appropriate treatment, and serious complications and prognosis.
- An Image Bank that contains more than 150 color photographs and illustrations from the text to enhance the student's understanding of a wide range of medical conditions presented in the workbook. These figures will help students master the concepts and principles of pathophysiology. The tables from the book are also included.

Instructor Resources

We understand the demand on an instructor's time, so to help make your job easier, you will have access to Instructor Resources upon adoption of *100 Case Studies in Pathophysiology*. In addition to the student resources just listed, an Instructor's Resource Center at http://thePoint.lww.com/bruyere includes the following:

- Answers to the questions found in the Disease Summary and Patient Case sections of this product

Suggestions for Future Editions

I made every effort to ensure that all information presented in *100 Case Studies in Pathophysiology* is current and accurate. However, I encourage readers to contact me by email at hbruyere@uwyo.edu with corrections and suggestions that will make the next edition of this workbook better than the first.

Acknowledgments

This workbook is a direct result of my 30-year career of teaching pathology and pathophysiology to students in human medicine, pharmacy, nursing, and the allied health sciences. The workbook also is the product of an extensive medical literature search that spanned four years, numerous drafts of the manuscript, and a rigorous review process. However, a workbook such as *100 Case Studies in Pathophysiology* cannot be developed without the personal contributions of numerous individuals. I am indebted to them all and pleased to have the opportunity to provide some recognition to them.

Initially, I would like to extend my deepest appreciation to my beloved wife, Kathy, and my amazing children, Travis and Kimberly, for their strong support, encouragement, and understanding during this lengthy project.

Two professional colleagues to whom I owe so very much are Enid Gilbert-Barness, MD, PhD (my major professor at the University of Wisconsin—Madison) and H. John Baldwin, PhD (former Dean at the University of Wyoming School of Pharmacy). There is no one on this earth who has taught me as much pathology and as much about effectively teaching pathology as Dr. Gilbert-Barness. She has been a role model and friend whom I have respected and admired for more than 35 years. Furthermore, this workbook would never have been contemplated had it not been for the profound influence that Dr. Gilbert-Barness has had in my life.

Dr. H. John Baldwin recognized qualities and abilities in me that I apparently overlooked in myself. He hired me for my first tenure-track faculty appointment at the University of Wyoming in 1987. More importantly, he also provided me with strong leadership and support that allowed me to develop as a teacher and researcher and be promoted to full professor in 1999. I will always be grateful for his contributions to the success of my career.

Four of my former colleagues and friends at the University of Wisconsin—Madison were very instrumental in my decision to pursue a teaching and research career in pathology—Chirane Viseskul, MD; Sunita Arya, MD; Ken Gilchrist, MD; and Tom Warner, MD. I will not forget the encouragement and guidance that they afforded me during those early years of my career.

I would also like to thank all of those individuals who, with openness and honesty, have shared their medical histories with me during the last four years, but especially Mary Lee, Kathy Bruyere, and the late Merrill Buckley.

100 Case Studies in Pathophysiology is also a reflection of the talents of all those who participated in the development and review processes. These include eight expert reviewers and the staff at Lippincott Williams & Wilkins, coordinated by Meredith Brittain—my patient, understanding, and competent managing editor.

Finally, I would like to acknowledge the numerous medical, pharmacy, nursing, and allied health students at the University of Wisconsin—Madison and the University of Wyoming with whom I have worked closely in the classroom during the past 30 years. They have made significant contributions with their insights, stories, and questions and have helped to ensure that this case studies workbook was developed with both clarity and quality.

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PART

1

CARDIOVASCULAR DISORDERS

CASE STUDY

1 ACUTE MYOCARDIAL INFARCTION

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

"I'm having pain in my chest and it goes up into my left shoulder and down the inside of my left arm. I'm also having a hard time catching my breath and I feel somewhat sick to my stomach."

History of Present Illness

Mr. W.G. is a 53-year-old white man who began to experience chest discomfort while playing tennis with a friend. At first he attributed his discomfort to the heat and having had a large breakfast. Gradually, however, discomfort intensified to a crushing sensation in the sternal area and the pain seemed to spread upward into his neck and lower jaw. The nature of the pain did not seem to change with deep breathing. When Mr. G. complained of feeling nauseated and began rubbing his chest, his tennis partner was concerned that his friend was having a heart attack and called 911 on his cell phone. The patient was transported to the ED of the nearest hospital and arrived within 30 minutes of the onset of chest pain. En route to the hospital, the patient was placed on nasal cannulae and an IV D_5W was started. Mr. G. received aspirin (325 mg po) and 2 mg/IV morphine. He is allergic to meperidine (rash). His pain has eased slightly in the last 15 minutes but is still significant; was 9/10 in severity; now 7/10. In the ED, chest pain was not relieved by 3 SL NTG tablets. He denies chills.

Past Medical History

- Ulcerative colitis × 22 years
- HTN × 12 years (poorly controlled due to poor patient compliance)
- Type 2 DM × 5 years
- S/P AMI 5 years ago that was treated with cardiac catheterization and PTCA; chronic stable angina for the past 4 years
- BPH × 2 years
- Hypertriglyceridemia
- Adenomatous colonic polyps

Family History

- Father died from myocardial infarction at age 55, had DM
- Mother died from breast cancer at age 79
- Patient has one sister, age 52, who is alive and well and one brother, age 44, with HTN
- Grandparents "may have had heart disease"

Social History

- 40 pack-year history of cigarette smoking
- Married and lives with wife of 29 years
- Has two grown children with no known medical problems
- Full-time postal worker for 20 years, before that a baker for 8 years
- Occasional alcohol use, average of 2 beers/week
- Has never used street drugs

Review of Systems

Positive for some chest pain with physical activity "on and off for a month or so," but the pain always subsided with rest

Allergies

- Meperidine (rash)
- Trimethoprim-sulfamethoxazole (bright red rash and fever)

Medications

- Amlodipine 5 mg po Q AM
- Glyburide 10 mg po Q AM, 5 mg po Q PM
- EC ASA 325 mg po QD
- Gemfibrozil 600 mg po BID
- Sulfasalazine 1.5 g po BID
- Terazosin 1 mg po HS

Physical Examination and Laboratory Tests

General Appearance

The patient is an alert and oriented white male who appears to be his stated age. He is anxious and appears to be in severe acute distress.

Vital Signs

See Patient Case Table 1.1

Patient Case Table 1.1 Vital Signs

BP	160/98 right arm sitting	RR	18	HT	5′10½″
P	105 with occasional premature beat	T	98.2°F	WT	184 lbs

Skin

Cool, diaphoretic, and pale without cyanosis

Neck

Supple without thyromegaly, adenopathy, bruits, or jugular venous distension

Head, Eyes, Ears, Nose, and Throat

- Pupils equal at 3 mm, round, responsive to light and accommodation
- Extra-ocular muscles intact
- Fundi benign
- Tympanic membranes intact
- Pharynx clear

Chest and Lungs

- No tenderness with palpation of chest wall
- No dullness with percussion
- Slight bibasilar inspiratory crackles with auscultation
- No wheezes or friction rubs

Cardiac

- Tachycardia with occasional premature beat
- Normal S_1 and S_2
- No S_3, soft S_4
- No murmurs or rubs

Abdomen

- Soft and non-tender
- Negative for bruits and organomegaly
- Bowel sounds heard throughout

Musculoskeletal/Extremities

- Normal range of motion throughout
- Muscle strength on right 5/5 UE/LE; on left 4/5 UE, 5/5 LE
- Pulses 2+
- Distinct bruit over left femoral artery
- No pedal edema

Neurological

- Cranial nerves II–XII intact
- Cognition, sensation, gait, and deep tendon reflexes within normal limits
- Negative for Babinski sign

Laboratory Blood Test Results (3½ hours post-AMI)

See Patient Case Table 1.2

Patient Case Table 1.2 Laboratory Blood Test Results					
Na	133 meq/L	Mg	1.9 mg/dL	CK-MB	6.3 IU/L
K	4.3 meq/L	PO_4	2.3 mg/dL	Troponin I	0.3 ng/mL
Cl	101 meq/L	Chol	213 mg/dL	Hb	13.9 g/dL
HCO_3	22 meq/L	Trig	174 mg/dL	Hct	43%
BUN	14 mg/dL	LDL	143 mg/dL	WBC	4,900/mm^3
Cr	0.9 mg/dL	HDL	34 mg/dL	Plt	267,000/mm^3
Glu, fasting	264 mg/dL	CPK	99 IU/L	HbA_{1c}	8.7%

Arterial Blood Gases

- pH 7.42
- PaO_2 90 mm
- $PaCO_2$ 34 mm
- SaO_2 96.5%

Electrocardiogram

4 mm ST segment elevation in leads V_2–V_6

Chest X-Ray

Bilateral mild pulmonary edema (<10% of lung fields) without pleural disease or widening of the mediastinum

Clinical Course

Patient history showed no contraindications to thrombolysis. The patient received IV reteplase, IV heparin, metoprolol, and lisinopril. Approximately 90 minutes after initiation of reteplase therapy, the patient's chest pain and ST segment elevations had resolved and both heart rate and blood pressure had normalized. The patient was stable until two days after admission when he began to experience chest pain again. Emergency angiography revealed a 95% obstruction in the left anterior descending coronary artery. No additional myocardium was at risk—consistent with single-vessel coronary artery disease and completed AMI. Percutaneous transluminal coronary angioplasty of the vessel was successfully performed, followed by placement of a coronary artery stent. After the stent was placed, the patient received abciximab infusion. Ejection fraction by echocardiogram three days post-AMI was 50% and the patient's temperature was 99.5°F. The remainder of the patient's hospital stay was unremarkable. He was gradually ambulated, physical activity was slowly increased, and he was discharged eight days post-AMI.

Patient Case Question 1. Cite *six* risk factors that predisposed this patient to acute myocardial infarction.

Patient Case Question 2. In which Killip class is this patient's acute myocardial infarction?

Patient Case Question 3. For which condition is this patient taking amlodipine?

Patient Case Question 4. For which condition is this patient taking glyburide?

Patient Case Question 5. For which condition is this patient taking gemfibrozil?

Patient Case Question 6. For which condition is this patient taking sulfasalazine?

Patient Case Question 7. For which condition is this patient taking terazosin?

Patient Case Question 8. Are there any indications that this patient needed oxygen supplementation during his hospital stay?

Patient Case Question 9. Cite *four* clinical signs that suggest that acute myocardial infarction has occurred in the left ventricle and not in the right ventricle.

Patient Case Question 10. Which single laboratory test provides the clearest evidence that the patient has suffered acute myocardial infarction?

Patient Case Question 11. Based on the patient's laboratory tests, what type of treatment approach may be necessary to prevent another acute myocardial infarction?

Patient Case Question 12. What is suggested by the "distinct bruit over the left femoral artery"?

Patient Case Question 13. What is the pathophysiologic mechanism for elevated temperature that occurred several days after the onset of acute myocardial infarction?

Patient Case Question 14. Does this patient satisfy the clinical criteria for *metabolic syndrome*?

CASE STUDY

2

ANEURYSM OF THE ABDOMINAL AORTA

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

J.A. is an 83-year-old male who presents to his PCP complaining of a "strange rhythmic, throbbing sensation in the middle of his abdomen." He has sensed this feeling for the past three days. For the past several weeks he has also experienced deep pain in his lower back that "feels like it is boring into my spine." He describes the pain as persistent but may be relieved by changing position. "I think that I hurt my back lifting some firewood," he explains. The patient has never smoked.

Patient Case Question 1. Given the diagnosis, what is probably causing this patient's lower back pain?

Past Medical History

- Triple coronary artery bypass surgery at age 73
- History of cluster headache
- History of PUD
- History of OA
- History of psoriasis
- Recent history of hypercholesterolemia

Medications

- Celecoxib 200 mg po QD
- Aspirin 81 mg po QD
- Clopidogrel 75 mg po QD
- Simvastatin 20 mg po HS
- Multivitamin tablet QD

Patient Case Question 2. For which health condition is the patient taking celecoxib, and what is the basic pharmacologic mechanism of action for this medication?

Patient Case Question 3. For which health condition is the patient taking simvastatin, and what is the basic pharmacologic mechanism of action for this medication?

Patient Case Question 4. For which health condition is the patient taking clopidogrel, and what is the basic pharmacologic mechanism of action for this medication?

Physical Examination and Laboratory Tests

Auscultation of the abdomen revealed a significant bruit over the aorta. Palpation of the abdomen revealed an abnormally wide pulsation of the abdominal aorta with some tenderness. When questioned, the patient denied nausea, vomiting, urinary problems, loss of appetite, heart failure, drug allergies, and a history of family members who had been diagnosed with an aortic aneurysm.

Patient Case Question 5. What is a bruit?

The patient's vital signs were as follows: BP 150/95; HR 83; RR 14; T 98.8°F; WT 158 lbs; HT 5′9″

Patient Case Question 6. Based on the patient's vital signs, which type of medication is indicated?

A CBC was ordered and the results of the CBC are shown in Patient Case Table 2.1

Patient Case Table 2.1 Complete Blood Count

Hb	13.9 g/dL	**WBC Differential**	
Hct	43%	Neutrophils	59%
WBC	5,100/mm^3	Lymphocytes	32%
RBC	6.0 million/mm^3	Monocytes/Macrophages	5%
Plt	315,000/mm^3	Eosinophils	3%
ESR	6 mm/hr	Basophils	1%

Patient Case Question 7. What important information can be gleaned from the patient's CBC?

Laboratory blood tests were ordered and the results are shown in Patient Case Table 2.2

Patient Case Table 2.2 Laboratory Blood Test Results

Na^+	145 meq/L	Glu, fasting	112 mg/dL	AST	15 IU/L
K^+	4.9 meq/L	Uric acid	2.9 mg/dL	ALT	37 IU/L
Cl^-	104 meq/L	BUN	9 mg/dL	Total bilirubin	1.0 mg/dL
Ca^{+2}	8.7 mg/dL	Cr	0.7 mg/dL	Cholesterol	202 mg/dL
Mg^{+2}	2.3 mg/dL	Alk Phos	79 IU/L	HDL	50 mg/dL
PO_4^{-3}	3.0 mg/dL	PSA	11.6 ng/mL	LDL	103 mg/dL
HCO_3^-	27 meq/L	Alb	3.5 g/dL	Trig	119 mg/dL

Patient Case Question 8. Which single abnormal laboratory value has to be of most concern?

An abdominal x-ray was performed, a localized dilation of the abdominal aorta was visualized, and calcium deposits were seen within the aortic aneurysm.

Patient Case Question 9. What has caused the calcium deposits in the aorta?

Patient Case Question 10. What type of imaging test is now most appropriate in this patient?

An abdominal aortic aneurysm of 6.5 cm in diameter was located at the level of the renal arteries and extended downward into the iliac arteries.

Patient Case Question 11. Would a "wait-and-see" approach be appropriate or should surgery be advised for this patient?

Patient Case Question 12. Would surgical excision and graft placement or endovascular stent placement be more appropriate treatment for this patient?

CASE STUDY

3 CONGESTIVE HEART FAILURE

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

H.J. presented to the ER late one evening complaining of a "racing heartbeat." She is an overweight, 69-year-old white female, who has been experiencing increasing shortness of breath during the past two months and marked swelling of the ankles and feet during the past three weeks. She feels very weak and tired most of the time and has recently been waking up in the middle of the night with severe breathing problems. She has been sleeping with several pillows to keep herself propped up. Five years ago, she suffered a transmural (i.e., through the entire thickness of the ventricular wall), anterior wall (i.e., left ventricle) myocardial infarction. She received two-vessel coronary artery bypass surgery 4½ years ago for obstructions in the left anterior descending and left circumflex coronary arteries. Her family history is positive for atherosclerosis as her father died from a heart attack and her mother had several CVAs. She had been a three pack per day smoker for 30 years but quit smoking after her heart attack. She uses alcohol infrequently. She has a nine-year history of hypercholesterolemia. She is allergic to nuts, shellfish, strawberries, and hydralazine. Her medical history also includes diagnoses of osteoarthritis and gout. Her current medications include celecoxib, allopurinol, atorvastatin, and daily aspirin and clopidogrel. The patient is admitted to the hospital for a thorough examination.

Patient Case Question 1. Based on the limited amount of information given above, do you suspect that this patient has developed *left-sided CHF*, *right-sided CHF*, or *total CHF?*

Patient Case Question 2. How did you arrive at your answer to Question 1?

Patient Case Question 3. What is a likely cause for this patient's heart failure?

Patient Case Question 4. From the information given above, identify *three* risk factors that probably contributed to the patient's heart attack five years ago.

Patient Case Question 5. Why is this patient taking allopurinol?

Patient Case Question 6. Why is this patient taking atorvastatin?

Patient Case Question 7. Why is this patient taking celecoxib?

Patient Case Question 8. Why is this patient taking aspirin and clopidogrel?

Physical Examination and Laboratory Tests

Vital Signs

BP = 125/80 (left arm, sitting); P = 125 and regular; RR = 28 and labored; T = 98.5°F oral; Weight = 215 lb; Height = 5′8″; patient is appropriately anxious

Head, Eyes, Ears, Nose, and Throat

- Funduscopic examination normal
- Pharynx and nares clear
- Tympanic membranes intact

Skin

- Pale with cool extremities
- Slightly diaphoretic

Neck

- Neck supple with no bruits over carotid arteries
- No thyromegaly or adenopathy
- Positive JVD
- Positive HJR

Patient Case Question 9. What can you say about this patient's blood pressure?

Patient Case Question 10. Why might this patient be tachycardic?

Patient Case Question 11. Why might this patient be tachypneic?

Patient Case Question 12. Is this patient technically *underweight*, *overweight*, *obese*, or is her weight *healthy?*

Patient Case Question 13. Explain the pathophysiology of the abnormal skin manifestations.

Patient Case Question 14. Do abnormal findings in the neck (JVD and HJR) suggest *left heart failure, right heart failure,* or *total CHF?*

Lungs

- Bibasilar rales with auscultation
- Percussion was resonant throughout

Heart

- PMI displaced laterally
- Normal S_1 and S_2 with distinct S_3 at apex
- No friction rubs or murmurs

Abdomen

- Soft to palpation with no bruits or masses
- Significant hepatomegaly and tenderness observed with deep palpation

Extremities

- 2+ pitting edema in feet and ankles extending bilaterally to mid-calf region
- Cool, sweaty skin
- Radial, dorsal pedis and posterior tibial pulses present and moderate in intensity

Neurological

- Alert and oriented × 3 (to place, person, and time)
- Cranial and sensory nerves intact
- DTRs 2+ and symmetric
- Strength is 3/5 throughout

Chest X-Ray

- Prominent cardiomegaly
- Perihilar shadows consistent with pulmonary edema

ECG

- Sinus tachycardia with waveform abnormalities consistent with LVH
- Pronounced Q waves consistent with previous myocardial infarction

ECHO

Cardiomegaly with poor left ventricular wall movement

Radionuclide Imaging

EF = 39%

Patient Case Question 15. Which abnormal cardiac exam and chest x-ray findings closely complement one another?

Patient Case Question 16. Which abnormal cardiac exam and ECG findings closely complement one another?

Laboratory Blood Test Results

See Patient Case Table 3.1

Patient Case Table 3.1 Laboratory Blood Test Results

Na^+	153 meq/L	$PaCO_2$	53 mm Hg
K^+	3.2 meq/L	PaO_2	65 mm Hg (room air)
BUN	50 mg/dL	WBC	5,100/mm^3
Cr	2.3 mg/dL	Hct	41%
Glu, fasting	131 mg/dL	Hb	13.7 g/dL
Ca^{+2}	9.3 mg/dL	Plt	220,000/mm^3
Mg^{+2}	1.9 mg/dL	Alb	3.5 g/dL
Alk phos	81 IU/L	TSH	1.9 µU/mL
AST	45 IU/L	T_4	9.1 µg/dL
pH	7.35		

Patient Case Question 17. What might the abnormal serum Na^+ and K^+ levels suggest?

Patient Case Question 18. Explain the abnormal BUN and serum Cr concentrations.

Patient Case Question 19. What might be causing the elevated serum glucose concentration?

Patient Case Question 20. Explain the abnormal serum AST level.

Patient Case Question 21. Explain the abnormal arterial blood gas findings.

Patient Case Question 22. Which of the hematologic findings, if any, are abnormal?

Patient Case Question 23. What do the TSH and T_4 data suggest?

Patient Case Question 24. Identify four drugs that might be immediately helpful to this patient.

Patient Case Question 25. Ejection fraction is an important cardiac function parameter that is used to determine the contractile status of the heart and is measured with specialized testing procedures. If a patient has an SV = 100 and an EDV = 200, is EF abnormally *high, low,* or *normal?*

Clinical Course

After administration of low doses of the diuretics hydrochlorothiazide (which blocks sodium reabsorption) and triamterene (which reduces potassium excretion), the patient voided 4,500 mL clear, yellow urine during the first 24 hours and another 3,500 mL during the second day post-admission. Bibasilar "crackles" and dependent edema also subsided. The patient lost three pounds in total body weight.

Vital signs were as follows: BP = 115/80 (right arm, sitting); P = 88 and regular; RR = 16 and unlabored; PaO_2 (room air) = 90; $PaCO_2$ = 44. H.J. was discharged on day 4 with prescription medicines and orders to pursue a follow-up with a cardiologist as soon as possible.

CASE STUDY

4 DEEP VENOUS THROMBOSIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

J.B. is an overweight, 58-year-old man who has had swelling in his left foot and ankle and pain in his left calf for six days. The pain has been getting worse for the past 24 hours. The patient ranks the pain as 8/10. He has made an appointment today with his PCP.

Past Medical History

- Previous episode of DVT at age 54; treated with warfarin for 1 year
- Diagnosed with diabetes mellitus type 2, 5 years ago

A preliminary diagnosis of DVT is made and the patient is admitted to the hospital for a thorough clinical workup.

Family History

- Father died at age 63 from myocardial infarction
- Mother alive at age 80 with diabetes mellitus type 2
- Brother, age 56, alive and healthy
- No family history of venous thromboembolic disease reported

Social History

- Patient is single and lives alone
- Works as dean of pharmacy school, 11 years
- 28 pack-year smoking history, currently smokes 1 pack per day
- Drinks 3–4 beers/day during the week and a 6-pack/day on weekends
- No history of illicit drug use

Medications

- Glyburide 5 mg po QD × 3 years
- Denies taking any over-the-counter or herbal products

Patient Case Question 1. For what condition is this patient taking glyburide?

Patient Case Question 2. What is the basic pharmacologic mechanism of action for glyburide?

Allergies

- Penicillin causes a rash
- Cat dander causes watery eyes and sneezing

Physical Examination and Laboratory Tests

General

J.B. is a pleasant, overweight, white male in moderate acute distress from leg pain.

Vital Signs

BP = 130/80; P = 110; RR = 16; T = 99.8°F; Ht = 5′10″; Wt = 245 lb; SaO_2 = 98% on room air

Patient Case Question 3. Which two of J.B.'s vital signs are abnormal and why are these abnormal vital signs consistent with a diagnosis of DVT?

Patient Case Question 4. Is J.B. considered *underweight, overweight,* or *obese* or is his weight technically considered *normal and healthy?*

Head, Eyes, Ears, Nose, and Throat

- Atraumatic
- Pupils equal, round, and reactive to light and accommodation
- Extra-ocular movements intact
- Fundi normal
- Normal sclera
- Ears and nose clear
- Tympanic membranes intact
- Oral mucous membranes pink and moist

Neck

- Supple
- No cervical adenopathy
- Thyroid non-palpable

- No carotid bruits
- No jugular venous distension

Chest

- Bilateral wheezing
- No crackles

Heart

- Regular rate and rhythm
- Distinct S_1 and S_2
- No S_3 or S_4
- No murmurs, rubs, or gallops

Abdomen

- Soft, non-tender, and non-distended
- No masses, guarding, rebound, or rigidity
- No organomegaly
- Normal bowel sounds

Genitalia

- Normal penis and testes

Rectal

- No masses
- Heme-negative brown stool

Extremities

- No clubbing or cyanosis
- Left foot and ankle swollen
- Left calf swollen to twice normal size
- No tenderness, pain, swelling, or redness, right lower extremity

Neurological

- Alert and oriented × 3
- No neurologic deficits noted

Laboratory Blood Test Results

See Patient Case Table 4.1

Patient Case Table 4.1 Laboratory Blood Test Results

Na^+	145 meq/L	Cr	0.9 mg/dL	RBC	5.2 million/mm^3	HDL	30 mg/dL
K^+	4.9 meq/L	Glu, fasting	160 mg/dL	AST	17 IU/L	LDL	152 mg/dL
Cl^-	112 meq/L	Hb	15.1 g/dL	ALT	8 IU/L	Trig	160 mg/dL
HCO_3^-	23 meq/L	Hct	42%	Alk phos	100 IU/L	ESR	23 mm/hr
Ca^{+2}	9.7 mg/dL	WBC	12,200/mm^3	PT	12.9 sec		
BUN	10 mg/dL	Plt	270,000/mm^3	Cholesterol	280 mg/dL		

Specialized Serum Laboratory Testing

Homocys, 91 µmol/L

Hypercoagulability Profile

- (−) factor V Leiden mutation
- (−) prothrombin 20210A mutation
- (+) protein C deficiency
- (−) protein S deficiency
- (−) antithrombin III deficiency

Patient Case Question 5. Identify *two* risk factors for DVT from the laboratory data directly above.

Patient Case Question 6. Identify *two* other abnormal laboratory findings consistent with a diagnosis of DVT.

Patient Case Question 7. Identify *three* other abnormalities from the laboratory data above that may be unrelated to DVT but nevertheless should be addressed by the patient's PCP.

Doppler Ultrasound

- Left lower extremity shows no flow of the left posterior tibial vein
- Normal flow demonstrated within the left common femoral and iliac veins
- Right lower extremity shows normal flow of the deep venous system from the level of the common femoral to posterior tibial vein

Diagnosis

Deep vein thrombosis of the left posterior tibial vein

Patient Case Question 8. Prior to warfarin therapy, list two drugs that may serve as *initial* treatment for this patient.

Patient Case Question 9. For how long should this patient be treated with warfarin?

CASE STUDY

5

HYPERTENSION

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

HPI

E.W. is a 40-year-old African American male, who has had difficulty controlling his HTN lately. He is visiting his primary care provider for a thorough physical examination and to renew a prescription to continue his blood pressure medication.

PMH

- Chronic sinus infections
- Hypertension for approximately 11 years
- Pneumonia 6 years ago that resolved with antibiotic therapy
- One major episode of major depressive illness caused by the suicide of his wife of 15 years, 5 years ago
- No surgeries

FH

- Father died at age 49 from AMI; had HTN
- Mother has DM and HTN
- Brother died at age 20 from complications of CF
- Two younger sisters are A&W

SH

The patient is a widower and lives alone. He has a 15-year-old son who lives with a maternal aunt. He has not spoken with his son for four years. The patient is an air traffic controller at the local airport. He smoked cigarettes for approximately 10 years but stopped smoking when he was diagnosed with HTN. He drinks "several beers every evening to relax"

and does not pay particular attention to the sodium, fat, or carbohydrate content of the foods that he eats. He admits to "salting almost everything he eats, sometimes even before tasting it." He denies ever having dieted. He takes an occasional walk but has no regular daily exercise program.

Patient Case Question 1. Identify *six* risk factors for hypertension in this patient's history.

Meds

- Hydrochlorothiazide 50 mg po QD
- Pseudoephedrine hydrochloride 60 mg po q6h PRN
- Beclomethasone dipropionate 1 spray into each nostril q6h PRN

Patient Case Question 2. Why is the patient taking hydrochlorothiazide and what is the primary pharmacologic mechanism of action of the drug?

Patient Case Question 3. Why is the patient taking pseudoephedrine hydrochloride and what is the primary pharmacologic mechanism of action of the drug?

Patient Case Question 4. Why is the patient taking beclomethasone dipropionate and what is the primary pharmacologic mechanism of action of the drug?

All

Rash with penicillin use

ROS

- States that his overall health has been fair to good during the past 12 months
- Weight has increased by approximately 20 pounds during the last year
- Denies chest pain, shortness of breath at rest, headaches, nocturia, nosebleeds, and hemoptysis
- Reports some shortness of breath with activity, especially when climbing stairs, and that breathing difficulties are getting worse
- Denies any nausea, vomiting, diarrhea, or blood in the stool
- Self-treats occasional right knee pain with OTC extra-strength acetaminophen
- Denies any genitourinary symptoms

Patient Case Question 5. What is the most clinically significant information related to HTN in this review of systems?

Physical Exam and Lab Tests

Gen

The patient is an obese black man in no apparent distress. He appears to be his stated age.

Vital Signs

See Patient Case Table 5.1

Patient Case Table 5.1 Vital Signs

Average BP	155/96 mm Hg (sitting)	Ht	5′11″
HR	73 and regular	Wt	221 lb
RR	15 and unlabored	BMI	31.0
T	98.8°F		

Patient Case Question 6. Identify the *two* most clinically significant vital signs relative to this patient's HTN.

HEENT

- TMs intact and clear throughout
- No nasal drainage
- No exudates or erythema in oropharynx
- PERRLA, pupil diameter 3.0 mm bilaterally
- Sclera without icterus
- EOMI
- Funduscopy reveals mild arteriolar narrowing with no nicking, hemorrhages, exudates, or papilledema

Patient Case Question 7. What is the significance of the HEENT examination?

Neck

- Supple without masses or bruits
- Thyroid normal
- (−) lymphadenopathy

Lungs

- Mild basilar crackles bilaterally
- No wheezes

Heart

- RRR
- Prominent S_3 sound
- No murmurs or rubs

Patient Case Question 8. Which abnormalities in the heart and lung examinations may be related and why might these clinical signs be related?

Abd

- Soft and ND
- NT with no guarding or rebound
- No masses, bruits, or organomegaly
- Normal BS

Rectal/GU

- Normal size prostate without nodules or asymmetry
- Heme (−) stool
- Normal penis and testes

Ext

- No CCE
- Limited ROM right knee

Neuro

- No sensory or motor abnormalities
- CNs II–XII intact
- Negative Babinski
- DTRs = 2+
- Muscle tone = 5/5 throughout

Patient Case Question 9. Are there any abnormal neurologic findings and, if so, might they be caused by HTN?

Laboratory Blood Test Results

See Patient Case Table 5.2

Patient Case Table 5.2 Laboratory Blood Test Results

Na	139 meq/L	RBC	5.9 million/mm^3	Mg	2.4 mg/dL
K	3.9 meq/L	WBC	7,100/mm^3	PO_4	3.9 mg/dL
Cl	102 meq/L	AST	29 IU/L	Uric acid	7.3 mg/dL
HCO_3	27 meq/L	ALT	43 IU/L	Glu, fasting	110 mg/dL
BUN	17 mg/dL	Alk phos	123 IU/L	T. cholesterol	275 mg/dL
Cr	1.0 mg/dL	GGT	119 IU/L	HDL	31 mg/dL
Hb	16.9 g/dL	T. bilirubin	0.9 mg/dL	LDL	179 mg/dL
Hct	48%	T. protein	6.0 g/dL	Trig	290 mg/dL
Plt	235,000/mm^3	Ca	9.3 mg/dL	PSA	1.3 ng/mL

Patient Case Question 10. Why might this patient's GGT be abnormal?

Patient Case Question 11. Identify *three* other clinically significant lab tests above.

Urinalysis

See Patient Case Table 5.3

Patient Case Table 5.3 Urinalysis

Appearance	Clear and amber in color	*Microalbuminuria*	(+)
SG	1.017	*RBC*	0/hpf
pH	5.3	*WBC*	0/hpf
Protein	(−)	*Bacteria*	(−)

Patient Case Question 12. What is the clinical significance of the single abnormal urinalysis finding?

ECG

Increased QRS voltage suggestive of LVH

ECHO

Moderate LVH with EF = 46%

Patient Case Question 13. What is the likely pathophysiologic mechanism for LVH in this patient?

Patient Case Question 14. What does the patient's EF suggest?

CASE STUDY

6 HYPOVOLEMIC SHOCK

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Ms. K.Z., a 22-year-old university coed, was rushed to the emergency room 35 minutes after sustaining multiple stab wounds to the chest and abdomen by an unidentified assailant. A witness had telephoned 911.

Paramedics arriving at the scene found the victim in severe acute distress. Vital signs were obtained: HR 128 (baseline 80), BP 80/55 (baseline 115/80), RR 37 and labored. Chest auscultation revealed decreased breath sounds in the right lung consistent with basilar atelectasis (i.e., collapsed lung). Pupils were equal, round, and reactive to light and accommodation. Her level of consciousness was reported as "awake, slightly confused, and complaining of severe chest and abdominal pain." Pedal pulses were absent, radial pulses were weak, and carotid pulses were palpable. The patient was immediately started on intravenous lactated Ringer's solution at a rate of 150 mL/hr.

Patient Case Question 1. With *two words*, identify the specific type of hypovolemic shock in this patient.

An electrocardiogram monitor placed at the scene of the attack revealed that the patient had developed sinus tachycardia. She was tachypneic, became short of breath with conversation, and reported that her heart was "pounding in her chest." She appeared to be very anxious and continued to complain of pain. Her skin and nail beds were pale but not cyanotic. Skin turgor was poor. Peripheral pulses were absent with the exception of a thready brachial pulse. Capillary refill time was approximately 7–8 seconds. Doppler ultrasound had been required to obtain an accurate BP reading. The patient's skin was cool and clammy. There was a significant amount of blood on her dress and on the pavement near where she was lying.

Patient Case Question 2. Based on the patient's clinical manifestations, approximately how much of her total blood volume has been lost?

During transport to the hospital, vital signs were reassessed: HR 138, BP 75/50, RR 38 with confusion. She was diagnosed with hypovolemic shock and IV fluids were doubled. Blood samples were sent for typing and cross-matching and for both chemical and hematologic analysis.

Laboratory test results are shown in Patient Case Table 6.1

Patient Case Table 6.1 Laboratory Test Results

Hb	8 g/dL	PaO_2	53 mm Hg	pH	7.31
Hct	25%	$PaCO_2$	52 mm Hg	SaO_2	84% on RA

Patient Case Question 3. How many units of whole blood are minimally required?

Patient Case Question 4. Is it necessary that sodium bicarbonate be administered to the patient at this time?

Oxygen was started at 3 L/min by nasal cannula. Repeat arterial blood gases were: PaO_2 82 mm Hg, $PaCO_2$ 38 mm Hg, pH 7.36, SaO_2 95%.

Patient Case Question 5. Are arterial blood gas results improving or deteriorating?

ER physicians chose not to start a central venous line. An indwelling Foley catheter was inserted with return of 180 mL of amber-colored urine. Urine output measured over the next hour was 14 mL. Ms. Z's condition improved after resuscitation with 1 L lactated Ringer's solution and two units packed red blood cells over the next hour.

Patient Case Question 6. Based on urine output rate, in which class of hypovolemic shock can the patient be categorized at this time?

Laboratory blood test results are shown in Patient Case Table 6.2

Patient Case Table 6.2 Laboratory Test Results

Na	136 meq/L	BUN	37 mg/dL	PTT	33 sec
K	3.5 meq/L	Cr	1.9 mg/dL	Ca	9.0 mg/dL
Cl	109 meq/L	Glu, random	157 mg/dL	Plt	178,000/mm^3
HCO_3	25 mg/dL	PT	12.1 sec	WBC	6,300/mm^3

Patient Case Question 7. Explain the pathophysiology of the abnormal BUN and Cr.

Patient Case Question 8. Does the patient have a blood clotting problem?

Patient Case Question 9. Explain the pathophysiology of the abnormal serum glucose concentration.

The patient was taken to the operating room for surgical correction of lacerations to the right lung, liver, and pancreas. There, she received an additional six units of type B+ blood. Surgery was successful and the patient was admitted to the ICU for recovery with the following vital signs: HR 104, BP 106/70, RR 21, urinary output 29 mL/hr. A repeat BUN and Cr revealed that these renal function parameters had returned to near-normal values (23 mg/dL and 1.4 mg/dL, respectively).

Patient Case Question 10. Based on clinical signs after surgery, in which class of hypovolemic shock can the patient be categorized at this time?

CASE STUDY

7

INFECTIVE ENDOCARDITIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

HPI

Mr. H.Y. is a 63-year-old male, who presents to the ER with a two-day history of high-grade fever with chills. "I don't feel well and I think that I may have the flu," he tells the ER nurse and physician. He also complains of "some painful bumps on my fingers and toes that came on last night." He denies IVDA. When asked about recent medical or dental procedures, he responded: "I had an infected tooth removed about two weeks ago." He does not recall receiving any antibiotics either prior to or after the procedure.

Patient Case Question 1. Which type of infective endocarditis is suggested by the patient's clinical manifestations—acute or subacute?

PMH

- Asthma since childhood
- Rheumatic fever as a child × 2 with mitral valve replacement 2 years ago
- HTN × 20 years
- DM type 2, × 9 years
- COPD × 4 years
- H/O tobacco abuse
- Alcoholic liver disease

Patient Case Question 2. Which *three* of the illnesses in this patient's medical history may be contributing to the onset of infective endocarditis and why are these diseases considered risk factors?

FH

- Mother died from CVA at age 59; also had ovarian cancer
- Father had H/O alcohol abuse; suffered AMI at age 54; DM type 2; died in his 60s from pancreatic cancer that "spread to his bones"

SH

- Married for 43 years, recently widowed and lives alone
- Father of 4 and grandfather of 10
- One son lives in same city, but his other children live in other states
- Insurance salesman who retired last year
- Monthly income is derived from social security, retirement account, and a small life insurance benefit following his wife's death (breast cancer)
- Manages his own medications, has no health insurance, and pays for his medications himself
- 45 pack-year smoking history, but quit when he was diagnosed with emphysema
- Has a history of alcohol abuse, but quit drinking 4 years ago; continues to attend AA meetings regularly and is active in his church as an usher and Prayer Warrior

ROS

- Patient denies any pain other than the lesions on his fingers and toes
- Denies cough, chest pain, breathing problems, palmar or plantar rashes, and vision problems
- (+) for mild malaise and some loss of appetite

Patient Case Question 3. What is the significance of the absence of breathing problems, chest pain, rashes, and visual problems?

Meds

- Theophylline 100 mg po BID
- Albuterol MDI 2 puffs QID PRN
- Atrovent MDI 2 puffs BID
- Nadolol 40 mg po QD
- Furosemide 20 mg po QD
- Metformin 850 mg po BID

Patient Case Question 4. For which *two* disease states might the patient be taking theophylline?

Patient Case Question 5. Which medication or medications is the patient taking for diabetes?

Patient Case Question 6. Which medication or medications is the patient taking for high blood pressure?

All

Penicillin (rash, shortness of breath, significant swelling "all over")

Patient Case Question 7. Why are the clinical manifestations of the penicillin allergy so significant?

PE and Lab Tests

Gen

The patient is a significantly overweight, elderly male in moderate acute distress. His skin is pale and he is slightly diaphoretic. He is shivering noticeably.

Vital Signs

See Patient Case Table 7.1

Patient Case Table 7.1 Vital Signs

BP	150/92	RR	23 and unlabored	Ht	5′10″
P	118	T	102.5°F	Wt	252 lb

Patient Case Question 8. Is this patient technically considered *overweight* or *obese*?

Skin/Nails

- Very warm and clammy
- No rashes
- No petechiae or splinter hemorrhages in nail beds
- Multiple tattoos
- No "track" marks

Patient Case Question 9. What is the significance of the absence of "track" marks?

HEENT

- Anicteric sclera
- PERRLA
- EOMI
- Conjunctiva WNL
- No retinal exudates
- TMs intact
- Nares clear
- Oropharynx benign and without obvious lesions

- Mucous membranes moist
- Poor dentition

Neck

- Supple
- (−) for lymphadenopathy, JVD, and thyromegaly

Heart

- Tachycardia with regular rhythm
- Normal S_1 and S_2
- Diastolic murmur along the left sternal border (not previously documented in his medical records), suggestive of aortic regurgitation

Patient Case Question 10. What is the most significant and relevant clinical finding in the physical examination so far and what is the pathophysiology that explains this clinical sign?

Chest

- CTA throughout
- Equal air entry bilaterally
- No wheezing or crackles
- Chest is resonant on percussion

Abd

- Soft and non-tender
- (+) bowel sounds
- No organomegaly

Genit/Rect

Deferred

Ext

- No CCE
- Reflexes bilaterally 5/5 in all extremities
- Small, tender nodules that range in color from red to purple in the pulp spaces of the terminal phalanges of the fingers and toes ("Osler nodes")

Neuro

- No focal deficits noted
- A & O × 3

Laboratory Blood Test Results

See Patient Case Table 7.2

Patient Case Table 7.2 Laboratory Blood Test Results					
Na	135 meq/L	Glu, random	145 mg/dL	Bands	7%
K	3.7 meq/L	Hb	14.1 g/dL	Lymphs	12%
Cl	100 meq/L	Hct	40%	Monos	1%
HCO_3	22 meq/L	Plt	213,000/mm^3	Alb	4.0 g/dL
BUN	17 mg/dL	WBC	19,500/mm^3	ESR	30 mm/hr
Cr	1.0 mg/dL	Neutros	80%	Ca	8.9 mg/dL

Patient Case Question 11. Identify *five* elevated laboratory test results that are consistent with a diagnosis of bacterial endocarditis.

Patient Case Question 12. Explain the pathophysiology for *any three* of the five elevated laboratory results identified in Question 11 above.

Patient Case Question 13. Identify *two* subnormal laboratory results that are consistent with a diagnosis of bacterial endocarditis.

Urinalysis

The urine was pale yellow, clear, and negative for proteinuria and hematuria. A urine toxicology screen was also negative.

Patient Case Question 14. Explain the pathophysiology of proteinuria and hematuria in a patient with infective endocarditis.

ECG

Normal

Transthoracic ECHO

A 3-cm vegetation on the aortic valve was observed. No signs of ventricular hypertrophy or dilation were seen.

Blood Cultures

3 of 3 sets (+) for *Streptococcus viridans* (collection times 1030 Tuesday, 1230 Tuesday, 1345 Tuesday)

Patient Case Question 15. What are the *six* diagnostic Modified Duke University criteria that favor a diagnosis of infective endocarditis in this patient?

Patient Case Question 16. What is the appropriate pharmacologic treatment for this patient?

CASE STUDY

8

PERIPHERAL ARTERIAL DISEASE

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

Mrs. R.B. is a 52-year-old woman with a 40-year history of type 1 diabetes mellitus. Although she has been dependent on insulin since age 12, she has enjoyed relatively good health. She has been very careful about her diet, exercises daily, sees her primary care provider regularly for checkups, and is very conscientious about monitoring her blood glucose levels and self-administration of insulin. She is slightly overweight and was diagnosed with hypertension four years ago. Her high blood pressure has been well controlled with a thiazide diuretic. She does not smoke and rarely drinks alcoholic beverages.

Mrs. B. was planning to shop at the local supermarket on Saturday, but her son telephoned her at the last minute and apologized that he had to work and could not drive her. Since she had only a few necessary items to pick up, she decided to walk the five blocks to the store. Rather than wear her usual walking shoes, she wore a pair of more fashionable shoes. Upon her return home, Mrs. B. removed her shoes and noticed a small blister on the ball of her right foot. She felt no discomfort from the blister. However, two days later, she was alarmed when she found that the blister had developed into a large, open wound that was blue-black in color. For the next two days, she carefully cleansed the wound and covered it with sterile gauze each time. The wound did not heal and, in fact, became progressively worse and painful. Her son urged her to seek medical attention, and five days after the initial injury she made an appointment with her primary care provider.

Patient Case Question 1. Identify this patient's *two* most critical risk factors for peripheral arterial disease.

Current Status

Mrs. B.'s foot wound is approximately 1 inch in diameter and contains a significant amount of necrotic tissue and exudate. Furthermore, there is a lack of pink granulation tissue—an indication that the wound is not healing. The patient has a history of bilateral intermittent

claudication, but denies pain at rest and recent numbness, tingling, burning sensations, and pain in her buttocks, thighs, calves, or feet. Examination of the peripheral pulses revealed normal bilateral femoral and popliteal pulses. However, the right dorsalis pedis artery and right posterior tibial artery pulses were not palpable. The patient has no history of coronary artery disease or cerebrovascular disease.

Patient Case Question 2. What level of peripheral arterial disease is suggested by her pulse examination: iliac disease, femoral disease, superficial femoral artery disease, or tibial disease?

Patient Case Question 3. Briefly describe the locations of the dorsalis pedis artery and posterior tibial artery pulses.

Physical Examination and Laboratory Tests

A pallor test revealed level 3 pallor in the right lower leg and foot and level 1 pallor in the left lower extremity. Ankle-brachial tests were conducted.

Left brachial systolic pressure: 130 mm
Left ankle systolic pressure: 110 mm
Right brachial systolic pressure: 125 mm
Right ankle systolic pressure: 75 mm

Patient Case Question 4. What conclusions can be drawn from the pallor and ankle-brachial test results?

A careful physical examination of the patient's feet and legs revealed that both feet were cool to the touch and the toes on her right foot were slightly cyanotic. However, there was no mottling of the skin and sensory, reflex, and motor functions of both legs were intact. Her vital signs are shown in Patient Case Table 8.1.

Patient Case Table 8.1 Vital Signs

BP	130/90 sitting	RR	18	Ht	62″
P	95 and regular	T	99.8°F	Wt	145 lb

Patient Case Question 5. Why is it likely that the patient's body temperature is elevated?

A sample of the patient's blood was drawn and submitted for analysis.

Laboratory Blood Test Results

See Patient Case Table 8.2

Patient Case Table 8.2 Laboratory Blood Test Results

Hb	15.1 g/dL	*Monocytes*	3%	ESR	20 mm/hr
Hct	41%	*Eosinophils*	1%	BUN	10 mg/dL
Plt	318,000/mm^3	Na	139 meq/L	Creatinine	0.7 mg/dL
WBC	11,900/mm^3	K	4.3 meq/L	T cholesterol	291 mg/dL
Neutrophils	80%	Cl	108 meq/L	LDL	162 mg/dL
Lymphocytes	16%	Glu, fasting	210 mg/dL	HDL	26 mg/dL

Patient Case Question 6. What major conclusions can be drawn from the patient's blood work?

Patient Case Question 7. Does Mrs. B. have any signs of renal insufficiency, a common chronic complication of diabetes mellitus?

Clinical Course

The patient was hospitalized and both wound and blood cultures were started. Mrs. B. was treated with broad-spectrum antibiotics while waiting for culture reports. The wound was packed with saline-soaked Kerlix gauze to facilitate debridement of necrotic tissue. The patient was provided continuous insulin by IV with frequent monitoring of blood glucose concentrations. Serum glucose levels were maintained at 80–100 mg/dL. An electrocardiogram was normal. Wound and blood culture reports were eventually completed. The wound was contaminated with gram-positive bacteria, but the blood culture was negative.

Magnetic resonance angiography of the right lower extremity was subsequently performed and a right tibial artery obstruction was identified. The section of diseased vessel was short (3.0 cm), but there was 70% narrowing of the artery. The angiogram also showed some degree of collateral circulation around the obstructing lesion. The patient underwent successful percutaneous angioplasty of the diseased vessel and placement of a stent to restore blood flow. The foot wound showed significant signs of healing after several days of bedrest and continued antibiotic therapy. A decision to perform an amputation of the right foot was averted.

Patient Case Question 8. Based on the information provided in the patient's clinical workup, what type of medication is ultimately necessary?

Patient Case Question 9. Why is it unlikely that a thrombus or embolus contributed to arterial obstruction in this case?

Patient Case Question 10. What is "Legs for Life"?

CASE STUDY

9 PULMONARY THROMBOEMBOLISM

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

"I have severe chest pain and I can't seem to catch my breath. I think that I may be having a heart attack."

History of Present Illness

Mrs. V.A. is a 30-year-old woman who presents to the hospital emergency room following 90 minutes of chest pain. She describes the severity of her pain as 8 on a scale of 10. An hour-and-a-half ago, she developed sharp and constant right-sided chest pain and right-sided mid-back pain. The pain became worse when she attempted to lie down or take a deep breath and improved a little when she sat down. She also has had difficulty breathing. She denies any fever, chills, or coughing up blood. She reports that she just returned home 36 hours ago following a 13-hour flight from Tokyo.

Patient Case Question 1. What clinical manifestations, if any, suggest a pulmonary embolus in this patient?

Past Medical History

- Migraines with aura since age 23
- Mild endometriosis × 5 years
- Positive for Protein S deficiency
- One episode of deep vein thrombosis 2 years ago; treated with warfarin for 1 year
- Acute sinusitis 1 year ago

Past Surgical History

- Orthopedic surgery for leg trauma at age 7
- Ovarian cyst removed 10 months ago

Family History

- Father has hypertension
- Mother died from metastatic cervical cancer at age 49
- Brother is alive and well
- No family history of venous thromboembolic disease

Social History

- Patient lives with her husband and 8-year-old daughter
- Monogamous relationship with her husband of 10 years; sexually active
- 12 pack-year smoking history; currently smokes 1 pack per day
- Business executive with active travel schedule
- Negative for alcohol use or intravenous drug abuse
- Occasional caffeine intake

Medications

- 30 μg ethinyl estradiol with 0.3 mg norgestrel × 4 years
- Amitriptyline 50 mg po Q HS
- Cafergot 2 tablets po at onset of migraine, then 1 tablet po every 30 minutes PRN
- Metoclopramide 10 mg po PRN
- Ibuprofen 200 mg po PRN for cramps
- Multiple vitamin 1 tablet po QD
- Denies taking any herbal products

Patient Case Question 2. Identify *five* major risk factors of this patient for pulmonary thromboembolism.

Patient Case Question 3. Why do you think this patient is taking amitriptyline at bedtime every evening?

Patient Case Question 4. Why is this patient taking metoclopramide as needed?

Patient Case Question 5. What condition is causing cramps in this patient for which she requires ibuprofen?

Review of Systems

- (–) cough or hemoptysis
- (–) headache or blurred vision
- (–) auditory complaints
- (–) lightheadedness
- (–) extremity or neurologic complaints
- All other systems are negative

Allergies

- Demerol (“makes me goofy”)
- Sulfa-containing products (widespread measles-like, pruritic rash)

Physical Examination and Laboratory Tests

General

The patient is a well-developed white woman who appears slightly anxious, but otherwise is in no apparent distress.

Vital Signs

See Patient Case Table 9.1

Patient Case Table 9.1 Vital Signs

BP	126/75	RR	40, labored	WT	139 lb	O_2 SAT	99% on room air
P	105, regular	T	98.6°F	HT	5′5″		

Patient Case Question 6. Are any of the patient's vital signs consistent with pulmonary thromboembolism?

Patient Case Question 7. Is this patient technically considered *underweight, overweight,* or *obese* or is this patient's weight considered *normal and healthy?*

Skin

- Fair complexion
- Normal turgor
- No obvious lesions

Head, Eyes, Ears, Nose, and Throat

- Pupils equal, round, and reactive to light and accommodation
- Extra-ocular muscles intact
- Fundi are benign
- Tympanic membranes clear throughout with no drainage
- Nose and throat clear
- Mucous membranes pink and moist

Neck

- Supple with no obvious nodes or carotid bruits
- Normal thyroid
- Negative for jugular vein distension

Patient Case Question 8. If the clinician had observed significant jugular vein distension, what is a reasonable explanation?

Cardiovascular

- Rapid but regular rate
- No murmurs, gallops, or rubs

Chest/Lungs

- No tenderness
- Subnormal diaphragmatic excursion
- No wheezing or crackles

Abdomen

- Soft with positive bowel sounds
- Non-tender and non-distended
- No hepatomegaly or splenomegaly

Breasts

Normal with no lumps

Genit/Rect

- No masses or discharge
- Normal anal sphincter tone
- Heme-negative stool

Musculoskeletal/Extremities

- Prominent saphenous vein visible in left leg with multiple varicosities bilaterally
- Peripheral pulses 1+ bilaterally
- No cyanosis, clubbing, or edema
- Strength 5/5 throughout
- Both feet cool to touch

Neurological

- Alert and oriented to self, time, and place
- Cranial nerves II–XII intact
- Deep tendon patellar reflexes 2+

Laboratory Blood Test Results

See Patient Case Table 9.2

Patient Case Table 9.2 Laboratory Blood Test Results

Na	141 meq/L	HCO_3	27 meq/L	Hb	11.9 g/dL	WBC	5,300/mm^3
K	4.3 meq/L	BUN	17 mg/dL	Hct	34.8%	PTT	25.0 sec
Cl	110 meq/L	Cr	1.1 mg/dL	Plt	306,000/mm^3	PT	14.0 sec

Patient Case Question 9. Are any of the patient's laboratory blood tests significantly abnormal? Provide a reasonable explanation for each abnormal test.

Patient Case Question 10. What might the patient's chest x-ray reveal?

Electrocardiography

Sinus tachycardia

Echocardiography

Ventricular wall movements within normal limits

Lower Extremity Venous Duplex Ultrasonography

Both right and left lower extremities show abnormalities of venous narrowing, prominent collateral vessels, and incompressibility of the deep venous system in the popliteal veins. These findings are consistent with bilateral DVT.

V/Q Scan

Perfusion defect at right base. Some mismatch between perfusion abnormality and ventilation of right lung, suggesting an intermediate probability for pulmonary embolus.

Pulmonary Angiogram

Abrupt arterial cutoff in peripheral vessel in right base

Patient Case Question 11. Which *single* clinical finding provides the strongest evidence for pulmonary embolus in this patient?

Patient Case Question 12. Which is a more appropriate duration of treatment with warfarin in this patient: 3 months, 6 months, or long-term anticoagulation?

Patient Case Question 13. Is the use of a thrombolytic agent in this patient advisable?

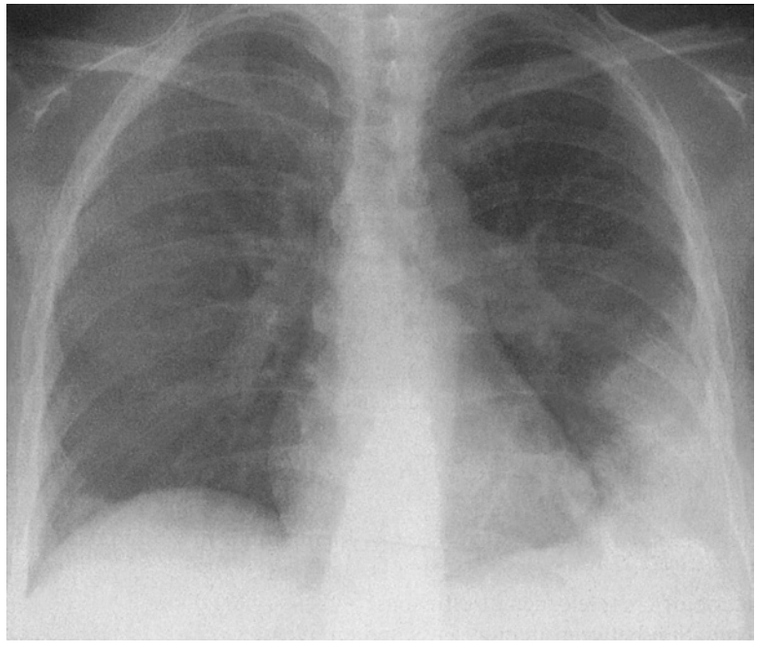
Patient Case Question 14. Would you suspect that this patient's plasma D-dimer concentration is negative or elevated? Why?

Patient Case Question 15. Is *massive pulmonary thromboembolism* an appropriate diagnosis of this patient?

Patient Case Question 16. What is a likely cause of respiratory alkalosis in this patient?

Patient Case Question 17. Areas of ischemia in the lung from a pulmonary embolus usually become hemorrhagic. The patient whose chest x-ray is shown in Patient Case Figure 9.1 presented with chest pain, hypoxia, and lower limb deep vein thrombosis. Where is the hemorrhagic area—upper right lung, lower right lung, upper left lung, or lower left lung?

Patient Case Question 18. In terms of thrombus development, what is the fundamental difference between heparin and alteplase?



PATIENT CASE FIGURE 9.1
Chest x-ray from patient who presented with chest pain, hypoxia, and lower limb deep vein thrombosis. See Patient Case Question 17. (Reprinted with permission from Kahn GP and JP Lynch. Pulmonary Disease Diagnosis and Therapy: A Practical Approach. Philadelphia: Lippincott Williams & Wilkins, 1997.)

CASE STUDY

10 RHEUMATIC FEVER AND RHEUMATIC HEART DISEASE

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

K.I. is a 14-year-old white female, who presents with her mother at the hospital emergency room complaining of a "very sore throat, a rash all over, and chills." She has had the sore throat for two days, but the rash and chills have developed within the past 12 hours.

Past Medical History

- Negative for surgeries and hospitalizations
- Negative for serious injuries and bone fractures
- Measles, age 3
- Chickenpox, age 6
- Strep pharyngitis and severe case of rheumatic fever (arthritis, carditis, chorea), age 8, treated with ibuprofen and penicillin
- Has worn eyeglasses since age 12

Family History

- Oldest of 6 siblings (3 sisters, 2 brothers)
- Father co-owns and manages tile company with his brother
- Mother is homemaker
- Youngest sister also developed strep pharyngitis and rheumatic fever 6 years ago

Social History

- "A–B" student in 9th grade
- Would like to attend University of Wisconsin–Madison and major in computer science
- Enjoys reading, music, and using the internet

- Very active in various school activities, including soccer, chorus, journal club, and speech club
- Denies use of tobacco, alcohol, and illicit substances
- Denies sexual activity

Medications

No prescribed or over-the-counter medicines

Allergies

- No known drug allergies
- Hypersensitivity to poison ivy

Physical Examination and Laboratory Tests

General

The patient is a mildly nervous but cooperative, quiet, young, white female in no acute distress. Her face and hands are dirty and she is poorly dressed with regard to both clothing size and style. She has a slim build. Has difficulty engaging in conversation. Slightly guarded in responses and rarely makes eye contact. Answers all questions completely with a low speaking voice. Some fidgeting. No other odd or inappropriate motor behavior noted.

Vital Signs

BP 103/75 lying down, right arm; P 89; RR 16; T 101.8°F; Wt 108 lb; Ht 5′3″

Skin

- Very warm and slightly diaphoretic
- Widespread "scarlet" rash on arms, legs, chest, back, and abdomen
- Mild acne on forehead
- No bruises or other lesions

HEENT

- Pupils equal, round, reactive to light and accommodation
- Extra-ocular muscles intact
- Fundi were not examined
- Tympanic membranes intact
- Teeth show no signs of erosion
- Throat shows erythema, tonsillar swelling/exudates/vesicles

Neck/Lymph Nodes

- Neck supple
- Moderate bilateral cervical adenopathy
- Thyroid normal
- No carotid bruits
- No jugular vein distension

Breasts

Normal without masses or tenderness

Heart

- Regular rate and rhythm
- No murmurs, rubs, or gallops
- Normal S_1 and S_2
- No S_3 or S_4

Lungs/Thorax

- Clear to auscultation
- No crackles or rales noted
- Patient denies any chest pain with deep breathing

Abdomen

- Ticklish during exam
- Soft, supple, not tender, not distended
- No masses, guarding, rebound, or rigidity
- No hepatosplenomegaly
- Normal bowel sounds

Genitalia/Rectal

- Normal external female genitalia
- Stool heme-negative

Musculoskeletal/Extremities

- No cyanosis, clubbing, or edema
- Negative for joint pain
- Normal range of motion throughout
- Radial and pedal pulses 2+ bilaterally
- Grip strength 5/5 throughout

Neurological

- Alert and oriented × 3
- Cranial nerves II → XII intact
- Deep tendon reflexes 2+
- No neurologic deficits noted

Electrocardiogram

Normal

Laboratory Blood Test Results

See Patient Case Table 10.1

Patient Case Table 10.1 Laboratory Blood Test Results

Na	140 meq/L	Cl	106 meq/L	Latex agglutination for group A strep	(+)
K	4.2 meq/L	WBC	16,500/mm^3	CRP	19.5 mg/dL
Ca	9.5 mg/dL	RBC	5.3 million/mm^3	Anti-streptolysin O	(+)

Patient Case Question 1. What is an appropriate diagnosis for this patient?

Patient Case Question 2. Identify *eleven* clinical manifestations that are consistent with your diagnosis above.

Patient Case Question 3. Why can rheumatic fever be ruled out as a diagnosis?

Patient Case Question 4. Does this patient have any signs of rheumatic heart disease?

Patient Case Question 5. What type of regular monitoring is necessary for this patient and why is this type of monitoring required?

Patient Case Question 6. Why is it expected that the patient's CRP is abnormal?

Patient Case Question 7. What is the pathophysiologic mechanism for cervical adenopathy in this patient?

Patient Case Question 8. What is the pathophysiologic mechanism for leukocytosis in this patient?

Patient Case Question 9. What is the drug of choice for this patient?

Patient Case Question 10. Identify *three* major risk factors for rheumatic fever in this patient.

PART

2

RESPIRATORY DISORDERS

CASE STUDY

11 ASBESTOSIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Complaints and History of Present Illness

Mr. R.I. is a 69-year-old man, who has been referred to the Pulmonary Disease Clinic by his nurse practitioner. He presents with the following chief complaints: "difficulty catching my breath and it is getting worse; a persistent, dry, and hacking cough; and a tight feeling in my chest." He is a retired construction contractor of 45 years, who primarily installed insulation materials in high-rise apartment and office buildings. He has been retired for four years and first began experiencing respiratory symptoms approximately six months ago. He has attributed those symptoms to "being a long-time smoker and it is finally catching up with me."

Past Medical and Surgical History

- Appendectomy at age 13
- Osteoarthritis in left knee (high school football injury) × 30 years
- Status post-cholecystectomy, 16 years ago
- Benign prostatic hyperplasia, transurethral resection 7 years ago
- Hypertension × 7 years
- Hyperlipidemia × 4 years
- Gastroesophageal reflux disease × 4 years

Family History

- Paternal history positive for coronary artery disease; father died at age 63 from "heart problems"
- Maternal history positive for cerebrovascular disease; mother died at age 73 "following several severe strokes"
- Brother died in a boating accident at age 17
- No other siblings

Social History

- Previously divorced twice, but currently happily married for 23 years with 3 grown children (ages 40, 45, and 49)
- Enjoys renovating old houses as a hobby and watching NASCAR racing and football on television
- Smokes 1 pack per day × 45 years
- Rarely exercises
- Drinks "an occasional beer with friends on weekends" but has a history of heavy alcohol use
- Volunteers in the community at the food pantry and for Meals on Wheels
- No history of intravenous drug use
- May be unreliable in keeping follow-up appointments, supported by the remark "I don't like doctors"

Review of Systems

- Denies rash, nausea, vomiting, diarrhea, and constipation
- Denies headache, chest pain, bleeding episodes, dizziness, and tinnitus
- Denies loss of appetite and weight loss
- Reports minor visual changes recently corrected with stronger prescription bifocal glasses
- Complains of generalized joint pain, but especially left knee pain
- Has never been diagnosed with chronic obstructive pulmonary disease or any other pulmonary disorder
- Denies paresthesias and muscle weakness
- Negative for urinary frequency, dysuria, nocturia, hematuria, and erectile dysfunction

Medications

- Acetaminophen 325 mg 2 tabs po Q 6H PRN
- Ramipril 5 mg po BID
- Atenolol 25 mg po QD
- Pravastatin 20 mg po QD
- Famotidine 20 mg po Q HS

Allergies

- Terazosin ("It makes me dizzy and I fell twice when I was taking it.")
- Penicillin (rash)

Patient Case Question 1. For which specific condition is the patient likely taking . . .

a. acetaminophen?

b. ramipril?

c. atenolol?

d. pravastatin?

e. famotidine?

Physical Examination and Laboratory Tests

General

The patient is a pleasant but nervous, elderly white gentleman. He appears pale but is in no apparent distress. He looks his stated age, has a strong Italian accent, and appears to be slightly overweight.

Vital Signs

- Blood pressure (sitting, both arms) = average 131/75 mm Hg
- Pulse = 69 beats per minute
- Respiratory rate = 29 breaths per minute and slightly labored
- Temperature = 98.6°F
- Pulse oximetry = 95% on room air
- Height = 5′9″
- Weight = 179 lb

Patient Case Question 2. Does this patient have a *healthy* weight or is he technically considered *underweight, overweight,* or *obese?*

Patient Case Question 3. Which, if any, of the vital signs above is/are consistent with a diagnosis of asbestosis?

Skin

- Pallor noted
- No lesions or rashes
- Warm and dry with satisfactory turgor
- Nail beds are pale

Head, Eyes, Ears, Nose, and Throat

- Extra-ocular muscles intact
- Pupils equal at 3 mm with normal response to light
- Funduscopy within normal limits (no hemorrhages or exudates)
- No strabismus, nystagmus, or conjunctivitis
- Sclera anicteric
- Tympanic membranes within normal limits bilaterally
- Nares patent
- No sinus tenderness
- Oral pharyngeal mucosa clear
- Mucous membranes moist but pale
- Good dentition

Patient Case Question 4. What is the significance of an absence of hemorrhages and exudates on funduscopic examination?

Neck and Lymph Nodes

- Neck supple
- Negative for jugular venous distension and carotid bruits
- No lymphadenopathy or thyromegaly

Chest/Lungs

- Breathing labored with tachypnea
- Prominent end-inspiratory crackles in the posterior and lower lateral regions bilaterally
- Subnormal chest expansion
- Mild wheezing present

Heart

- Regular rate and rhythm
- Normal S_1 and S_2
- Negative S_3 and S_4
- No murmurs or rubs noted

Abdomen

- Soft, non-tender to pressure, and non-distended
- Normal bowel sounds
- No masses or bruits
- No hepatomegaly or splenomegaly

Genitalia/Rectum

- Normal male genitalia, testes descended, circumcised
- Prostate normal in size and without nodules
- No masses or discharge
- Negative for hernia
- Normal anal sphincter tone
- Guaiac-negative stool

Musculoskeletal/Extremities

- No clubbing, cyanosis, or edema
- Muscle strength 5/5 throughout
- Peripheral pulses 2+ throughout
- Decreased range of motion, left knee
- No inguinal or axillary lymphadenopathy

Patient Case Question 5. What is the significance of the absence of jugular venous distension, hepato- and splenomegaly, extra cardiac sounds, and edema in this patient?

Neurological

- Alert and oriented × 3
- Cranial nerves II–XII intact
- Sensory and proprioception intact
- Normal gait
- Deep tendon reflexes 2+ bilaterally

Laboratory Blood Test Results

Blood was drawn for a standard chemistry panel and arterial blood gases. The results are shown in Patient Case Table 11.1.

Patient Case Table 11.1 Laboratory Blood Test Results					
Na	142 meq/L	Cr	0.9 mg/dL	WBC	9,200/mm^3
K	4.9 meq/L	Glu, fasting	97 mg/dL	Plt	430,000/mm^3
Cl	105 meq/L	Ca	9.1 mg/dL	pH	7.35
HCO_3	22 meq/L	Hb	15.9 g/dL	PaO_2	83 mm Hg
BUN	12 mg/dL	Hct	41%	$PaCO_2$	47 mm Hg

Patient Case Question 6. Is the patient *hypoxemic* or *hypercapnic?*

Patient Case Question 7. Is the patient *acidotic* or *alkalotic?*

Pulmonary Function Tests (Spirometry)

- Vital capacity, 3200 cc
- Inspiratory reserve volume, 1700 cc
- Expiratory reserve volume, 1000 cc
- Tidal volume, 500 cc
- Total lung capacity, 4500 cc

Patient Case Question 8. Are the pulmonary function tests *normal,* consistent with *restrictive* respiratory disease, or consistent with *obstructive* respiratory disease?

Patient Case Question 9. Should supplemental oxygen be immediately given to this patient?

Chest X-Ray

A posteroanterior radiograph showed coarse linear opacities at the base of each lung (more prominent on the left) that obscured the cardiac borders and diaphragm (*shaggy heart border sign*). These findings are consistent with asbestosis.

High-Resolution CT Scan

Thickened septal lines and small, rounded, subpleural, intralobular opacities in the lower lung zone bilaterally suggest *fibrosis*. Ground-glass appearance involving air spaces in the upper lung zone bilaterally suggests *alveolitis*. Small, calcified diaphragmatic pleural plaques and mild "honeycomb" changes with cystic spaces less than 1 cm were seen bilaterally and are consistent with asbestosis.

Patient Case Question 10. What is the drug of choice for treating patients at this intermediate stage of asbestosis?

CASE STUDY

12 ASTHMA

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

With breathlessness: "Cold getting to me. Peak flow is only 65%. Getting worse."

History of Present Illness

D.R. is a 27 yo man, who presents to the nurse practitioner at the Family Care Clinic complaining of increasing SOB, wheezing, fatigue, cough, stuffy nose, watery eyes, and postnasal drainage—all of which began four days ago. Three days ago, he began monitoring his peak flow rates several times a day. His peak flow rates have ranged from 200 to 240 L/minute (baseline, 340 L/minute) and often have been at the lower limit of that range in the morning. Three days ago, he also began to self-treat with frequent albuterol nebulizer therapy. He reports that usually his albuterol inhaler provides him with relief from his asthma symptoms, but this is no longer sufficient treatment for this asthmatic episode.

Past Medical History

- Born prematurely at 6 months' gestation secondary to maternal intrauterine infection; weight at birth was 2 lbs, 0 ounces; lowest weight following delivery was 1 lb, 9 ounces; spent 2½ months in neonatal ICU and was discharged from hospital 2 weeks before mother's original due date
- Diagnosed with asthma at age 18 months
- Moderate persistent asthma since age 19
- Has been hospitalized 3 times (with 2 intubations) in the past 3 years for acute bronchospastic episodes and has reported to the emergency room twice in the past 12 months
- Perennial allergic rhinitis × 15 years

Family History

- Both parents living
- Mother 51 yo with H/O cervical cancer and partial hysterectomy
- Father 50 yo with H/O perennial allergic rhinitis and allergies to pets

- No siblings
- Paternal grandmother, step-grandfather and maternal grandmother are chain smokers but do not smoke around the patient

Social History

- No alcohol or tobacco use
- Married with two biological children and one stepson
- College graduate with degree in business, currently employed as a business development consultant with private firm
- There are no pets in the home at this time

Review of Systems

- Reports feeling unwell overall, "4/10"
- Denies H/A and sinus facial pain
- Eyes have been watery
- Denies decreased hearing, ear pain, or tinnitus
- Throat has been mildly sore
- (+) SOB and productive cough with clear, yellow phlegm for 2 days
- Denies diarrhea, N/V, increased frequency of urination, nocturia, dysuria, penile sores or discharge, dizziness, syncope, confusion, myalgias, and depression

Medications

- Ipratropium bromide MDI 2 inhalations QID
- Triamcinolone MDI 2 inhalations QID
- Albuterol MDI 2 inhalations every 4–6 hours PRN

Allergies

- Grass, ragweed, and cats → sneezing and wheezing

Physical Examination and Laboratory Tests

General

- Agitated, WDWN white man with moderate degree of respiratory distress
- Loud wheezing with cough
- Eyes red and watery
- Prefers sitting to lying down
- SOB with talking
- Speaks only in short phrases as a result of breathlessness

Vital Signs

See Patient Case Table 12.1

Patient Case Table 12.1 Vital Signs

BP	150/80	RR	24	HT	6′1″
P	115	T	100.2°F	WT	212 lbs
Pulsus paradoxus	20	Pulse ox	92% (room air)		

Patient Case Question 1. Based on the available clinical evidence, is this patient's asthmatic attack considered *mild, moderate,* or *bordering on respiratory failure?*

Patient Case Question 2. What is the most likely trigger of this patient's asthma attack?

Patient Case Question 3. Identify *three major* factors that have likely contributed to the development of asthma in this patient.

Skin

- Flushed and diaphoretic
- No rashes or bruises

HEENT

- EOMI
- PERRLA
- Fundi benign, no hemorrhages or exudates
- Conjunctiva erythematous and watery
- Nasal cavity erythematous and edematous with clear, yellow nasal discharge
- Hearing intact bilaterally
- TMs visualized without bulging or perforations
- Auditory canals without inflammation or obstruction
- Pharynx red with post-nasal drainage
- Uvula mid-line
- Good dentition
- Gingiva appear healthy

Neck/Lymph Nodes

- Neck supple
- Trachea mid-line
- No palpable nodes or JVD noted
- Thyroid without masses, diffuse enlargement, or tenderness

Chest/Lungs

- Chest expansion somewhat limited
- Accessory muscle use prominent
- Diffuse wheezes bilaterally on expiration and, occasionally, on inspiration
- Bilaterally decreased breath sounds with tight air movement

Heart

- Tachycardia with regular rhythm
- No murmurs, rubs, or gallops
- S_1 and S_2 WNL

Abdomen

- Soft, NT/ND
- No bruits or masses
- Bowel sounds present and WNL

Genitalia/Rectum

Deferred

Musculoskeletal/Extremities

- ROM intact in all extremities
- Muscle strength 5/5 throughout with no atrophy
- Pulses 2+ bilaterally in all extremities
- Extremities clammy but good capillary refill at 2 seconds with no CCE or lesions

Neurological

- Alert and oriented to place, person, and time
- Thought content: *appropriate*
- Thought process: *appropriate*
- Memory: *good*
- Fund of knowledge: *good*
- Calculation: *good*
- Abstraction: *intact*
- Speech: a*ppropriate in both volume and rate*
- CNs II–XII: *intact*
- Fine touch: *intact*
- Temperature sensation: *intact*
- Vibratory sensation: *intact*
- Pain sensation: *intact*
- Reflexes 2+ in biceps, Achilles, quadriceps, and triceps bilaterally
- No focal defects observed

Laboratory Blood Test Results

See Patient Case Table 12.2

Patient Case Table 12.2 Laboratory Blood Test Results

Na	139 meq/L	Hb	13.6 g/dL	Monos	6%
K	4.4 meq/L	Hct	41%	Eos	3%
Cl	105 meq/L	Plt	$292 \times 10^3/mm^3$	Basos	1%
HCO_3	26 meq/L	WBC	$8.9 \times 10^3/mm^3$	Ca	8.8 mg/dL
BUN	15 mg/dL	Segs	51%	Mg	2.5 mg/dL
Cr	0.9 mg/dL	Bands	2%	Phos	4.1 mg/dL
Glu (non-fasting)	104 mg/dL	Lymphs	37%		

Peak Flow

175 L/min

Arterial Blood Gases

- pH 7.55
- $PaCO_2$ = 30 mm Hg
- PaO_2 = 65 mm Hg

Chest X-Ray

Hyperinflated lungs with no infiltrates that suggest inflammation/pneumonia

Patient Case Question 4. Do the patient's arterial blood gas determinations indicate that the asthmatic attack is *mild, moderate* or *bordering on respiratory failure*?

Patient Case Question 5. Identify the metabolic state reflected by the patient's arterial blood pH.

Patient Case Question 6. What is the cause of this metabolic state?

Clinical Course

The patient is admitted for treatment with oxygen, inhaled bronchodilators, and oral prednisone (60 mg/day initially, followed by a slow taper to discontinuation over 10 days). However, the patient becomes increasingly dyspneic and more agitated despite treatment. Heart rate increases to 125 bpm, pulsus paradoxus increases to 30 mm Hg, respiratory rate increases to 35/min, and breathing becomes more labored. Wheezing becomes loud throughout both inspiratory and expiratory phases of the respiratory cycle. Signs of early cyanosis become evident. The extremities become cold and clammy and the patient no longer is alert and oriented. Repeat ABG are: pH 7.35, PaO_2 = 45 mm Hg, and $PaCO_2$ = 42 mm Hg (40% oxygen by mask).

Patient Case Question 7. What do this patient's mental state, heart rate, pulsus paradoxus, respiratory rate, and wheezing suggest?

Patient Case Question 8. Why are the patient's extremities cold?

Patient Case Question 9. Why is the patient no longer alert and oriented?

Patient Case Question 10. Why is the patient becoming cyanotic?

Patient Case Question 11. Why has the skin become clammy?

Patient Case Question 12. What do the patient's arterial blood gases indicate now?

CASE STUDY

13 BACTERIAL PNEUMONIA

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Chief Complaints

Provided by patient's home caregiver: "Mrs. I. is confused and very sick. She was up most of last night coughing."

HPI

Mrs. B.I. is an 84-year-old white female, who is widowed and a retired bank manager. She owns her own home and has a 45-year-old female caregiver who lives in the home. Currently, Mrs. I. uses a walker and takes daily strolls to the park with her caregiver. She is able to perform most activities of daily living; however, the caregiver prepares all meals.

The patient presents to the clinic accompanied by her caregiver, who reports that Mrs. I. has a one-week history of upper respiratory symptoms and a two-day history of increasing weakness and malaise. Approximately three days ago, the patient developed a cough that has gradually become worse and she now has difficulty catching her breath. The caregiver also reports that the patient was confused last night and nearly fell while going to the bathroom. The patient has been coughing up a significant amount of phlegm that is thick and green in color. She has no fever. The caregiver has become concerned by the patient's reduction in daily activities and an inability to get rid of her "cold."

Patient Case Question 1. Based on the patient's history of illness, is this type of infection considered *community-acquired* or *nosocomial?*

PMH

- Tobacco dependence × 64 years
- Chronic bronchitis for approximately 13 years
- Urinary overflow incontinence × 10 years
- HTN × 6 years, BP has been averaging 140/80 mm Hg with medication

- Mild left hemiparesis caused by CVA 4 years ago
- Depression × 2 years
- Constipation × 6 months
- Influenza shot 3 months ago

FH

- (+) for HTN and cancer
- (−) for CAD, asthma, DM

SH

- Patient lives with caregiver in patient's home
- Smokes 1/2 ppd
- Some friends recently ill with "colds"
- Occasional alcohol use, none recently

ROS

- Difficult to conduct due to patient's mental state (lethargy present)
- Caregiver states that patient has had difficulty sleeping due to persistent cough
- Caregiver has not observed any episodes of emesis but reports a decrease in appetite
- Caregiver denies dysphagia, rashes, and hemoptysis

Patient Case Question 2. Provide a clinical definition for *lethargy*.

Meds

- Atenolol 100 mg po QD
- HCTZ 25 mg po QD
- Aspirin 325 mg po QD
- Nortriptyline 75 mg po QD
- Combivent MDI 2 puffs QID (caregiver reports patient rarely uses)
- Albuterol MDI 2 puffs QID PRN
- Docusate calcium 100 mg po HS

All

PCN (rash)

Patient Case Question 3. Match the pharmacotherapeutic agents in the left-hand column directly below with the patient's health conditions in the right-hand column.

a. atenolol	_____ depression
b. HCTZ	_____ constipation
c. nortriptyline	_____ HTN
d. albuterol	_____ chronic bronchitis
e. docusate calcium	

PE and Lab Tests

Gen

The patient's age appears to be consistent with that reported by the caregiver. She is well groomed and neat, uses a walker for ambulation, and walks with a noticeable limp. She is a lethargic, frail, thin woman who is oriented to self only. The patient is also coughing and using accessory muscles to breathe. She is tachypneic and appears to be uncomfortable and in moderate respiratory distress.

Vital Signs

See Patient Case Table 13.1

Patient Case Table 13.1 Vital Signs

BP	140/80, no orthostatic changes noted	HT	5′10½″
P	95 and regular	WT	124 lbs
RR	38 and labored	BMI	17.6
T	98.3°F	O_2 saturation	86% on room air

Skin

- Warm and clammy
- (–) for rashes

HEENT

- NC/AT
- EOMI
- PERRLA
- Fundi without lesions
- Eyes are watery
- Nares slightly flared; purulent discharge visible
- Ears with slight serous fluid behind TMs
- Pharynx erythematous with purulent post-nasal drainage
- Mucous membranes are inflamed and moist

Neck

- Supple
- Mild bilateral cervical adenopathy
- (–) for thyromegaly, JVD, and carotid bruits

Lungs/Thorax

- Breathing labored with tachypnea
- RUL and LUL reveal regions of crackles and diminished breath sounds
- RLL and LLL reveal absence of breath sounds and dullness to percussion
- (–) egophony

Cardiac

- Regular rate and rhythm
- Normal S_1 and S_2
- (–) for S_3 and S_4

Abd

- Soft and NT
- Normoactive BS
- (–) organomegaly, masses, and bruits

Genit/Rect

Examination deferred

MS/Ext

- (–) CCE
- Extremities warm
- Strength 4/5 right side, 1/5 left side
- Pulses are 1+ bilaterally

Neuro

- Oriented to self only
- CNs II–XII intact
- DTRs 2+
- Babinski normal

Laboratory Blood Test Results

See Patient Case Table 13.2

Patient Case Table 13.2 Laboratory Blood Test Results

Na	141 meq/L	Glu, fasting	138 mg/dL	• Lymphs	10%
K	4.5 meq/L	Hb	13.7 g/dL	• Monos	3%
Cl	105 meq/L	Hct	39.4%	• Eos	1%
HCO_3	29 meq/L	WBC	15,200/mm^3	Ca	8.7 mg/dL
BUN	16 mg/dL	• Neutros	82%	Mg	1.7 mg/dL
Cr	0.9 mg/dL	• Bands	4%	PO_4	2.9 mg/dL

Arterial Blood Gases

See Patient Case Table 13.3

Patient Case Table 13.3 Arterial Blood Gases

pH	7.50	PaO_2	59 mm Hg on room air	$PaCO_2$	25 mm Hg

Urinalysis

See Patient Case Table 13.4

Patient Case Table 13.4 Urinalysis

Appearance: Light yellow and hazy		Protein	(–)	Nitrite	(–)
SG	1.020	Ketones	(–)	Leukocyte esterase	(–)
pH	6.0	Blood	(–)	2 WBC/RBC per HPF	
Glucose	(–)	Bilirubin	(–)	Bacteria	(–)

Chest X-Rays

- Consolidation of inferior and superior segments of RLL and LLL
- Developing consolidation of RUL and LUL
- (–) pleural effusion
- Heart size WNL

Sputum Analysis

Gram stain: TNTC neutrophils, some epithelial cells, negative for microbes

Sputum and Blood Cultures

Pending

Patient Case Question 4. Determine the patient's Pneumonia Severity of Illness score.

Patient Case Question 5. Should this patient be admitted to the hospital for treatment?

Patient Case Question 6. What is this patient's 30-day mortality probability?

Patient Case Question 7. Identify *two* clinical signs that support a diagnosis of "double pneumonia."

Patient Case Question 8. Identify *five* risk factors that have predisposed this patient to bacterial pneumonia.

Patient Case Question 9. Identify a minimum of *twenty* clinical manifestations that are consistent with a diagnosis of bacterial pneumonia.

Patient Case Question 10. Propose a likely microbe that is causing bacterial pneumonia in this patient and provide a strong rationale for your answer.

Patient Case Question 11. Identify *two* antimicrobial agents that might be helpful in treating this patient.

Patient Case Question 12. The patient has no medical history of diabetes mellitus, yet her fasting serum glucose concentration is elevated. Propose a reasonable explanation.

Patient Case Question 13. Why is this patient afebrile?

Patient Case Question 14. Is there a significant probability that bacterial pneumonia may have developed from a urinary tract infection in this patient?

Patient Case Question 15. Explain the pathophysiologic basis that underlies the patient's high blood pH.

Patient Case Question 16. The chest x-ray shown in Patient Case Figure 13.1 reveals pneumonia secondary to infection with *Mucor* species in a patient with poorly controlled diabetes mellitus. Where is pneumonia most prominent: right upper lobe, right lower lobe, left upper lobe, or left lower lobe?

PATIENT CASE FIGURE 13.1
Chest x-ray from a patient with pneumonia due to infection with Mucor. See Patient Case Question 16. (Reprinted with permission from Crapo JD, Glassroth J, Karlinsky JB, King TE Jr. Baum's Textbook of Pulmonary Diseases, 7th ed. Philadelphia: Lippincott Williams & Wilkins, 2004.)

CASE STUDY

14 CHRONIC OBSTRUCTIVE PULMONARY DISEASE

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

"I'm falling apart. I've been having more trouble breathing, my cough has gotten worse in the past three days, and now my ankles are beginning to swell up."

History of Present Illness

J.T. is a 61 yo man with COPD who presents to the emergency room with a three-day history of progressive dyspnea, cough, and increased production of clear sputum. He usually coughs up only a scant amount of clear sputum daily, and coughing is generally worse after rising in the morning. The patient denies fever, chills, night sweats, weakness, muscle aches, joint aches, and blood in the sputum. He treated himself with albuterol MDI, but respiratory distress increased despite multiple inhalations.

Upon arrival at the emergency room, there were few breath sounds heard with auscultation, and the patient was so short of breath that he had difficulty climbing up onto the examiner's table and completing a sentence without a long pause. He was placed on 4 L oxygen via nasal cannulae and given nebulized ipratropium and albuterol treatments.

Past Medical History

- History of mental illness as a young adult; one suicide attempt at age 20
- HTN × 10 years
- COPD diagnosed 6 years ago
- Left lateral malleolus and first metatarsal fracture repair 17 months ago
- Occasional episodes of acute bronchitis treated as outpatient with antibiotics
- Mild CVA 4 months ago, appears to have no residual neurologic deficits
- (–) history of TB, asbestos exposure, occupational exposure, heart disease, or asthma

Family History

- Father died from lung cancer
- Mother is alive, age 80, also has COPD and is being treated with oxygen
- One sister, developed heart disease in her 50s
- One daughter and three grandchildren, alive and well

Social History

- Patient is a recently retired beef products worker
- Married once and divorced at age 35, has not remarried
- Lives with elderly mother
- 2 pack/day Camel smoker for 37 years; has cut back to 5 cigarettes/day since he was diagnosed with COPD and is now willing to consider complete smoking cessation
- History of excessive alcohol use; has become a social drinker in last 15 years

Review of Systems

- Denies recent weight loss but has lost 25 pounds during past 7 years
- Denies progressive fatigue, loss of libido, morning headaches, and sleeping problems

Medications

- HCTZ 25 mg po Q AM
- Amlodipine 5 mg po QD
- Theophylline 200 mg po BID
- Albuterol 180 µg MDI 2 inhalations QID PRN
- Ipratropium 36 µg MDI 2 inhalations QID
- The patient has been compliant with his medications. However, he admits that he does not like to use ipratropium because it causes "dry mouth" and makes him feel "edgy."

Patient Case Question 1. Why is this patient taking amlodipine?

Patient Case Question 2. Why is this patient taking HCTZ?

Physical Examination and Laboratory Tests

General Appearance

Alert, thin, weak-appearing white male, who is somewhat improved and appears more comfortable after receiving oxygen and bronchodilator therapy

Vital Signs

See Patient Case Table 14.1

Patient Case Table 14.1 Vital Signs

BP	165/95	RR	32 and labored	HT	5′10″
P	110 and regular	T	97.9°F	WT	120 lb

Patient Case Question 3. Is this patient technically *underweight, overweight, obese,* or is this patient's weight considered *healthy*?

Skin

- Cold and dry
- (–) cyanosis, nodules, masses, rashes, itching, and jaundice
- (–) ecchymoses and petechiae
- Poor turgor

Head, Eyes, Ears, Nose, and Throat

- PERRLA
- EOMs intact
- Eyes anicteric
- Normal conjunctiva
- Vision satisfactory with no eye pain
- Fundi without AV nicking, hemorrhages, exudates, and papilledema
- TMs intact
- (–) tinnitus and ear pain
- Nares clear
- (+) pursed lip breathing
- Oropharynx clear with no mouth lesions
- Yellowed teeth
- Oral mucous membranes very dry
- Tongue normal size
- No throat pain or difficulty swallowing

Neck and Lymph Nodes

- Neck supple but thin
- (+) mild JVD
- (–) cervical lymphadenopathy, thyromegaly, masses, and carotid bruits

Chest and Lungs

- Use of accessory muscles at rest
- "Barrel chest" appearance
- Poor diaphragmatic excursion bilaterally
- Percussion hyper-resonant
- Poor breath sounds throughout
- Prolonged expiration with occasional mild, expiratory wheeze
- (–) crackles and rhonchi
- (–) axillary and supraclavicular lymphadenopathy

Heart

- Tachycardic with normal rhythm
- Normal S_1 and S_2
- Prominent S_3
- No rubs or murmurs

Abdomen

- (+) hepatosplenomegaly, fluid wave, tenderness, and distension
- (–) masses, bruits, and superficial abdominal veins
- Normal BS

Genitalia and Rectum

- Penis, testes, and scrotum normal
- Prostate slightly enlarged, but without nodules
- Heme (–) stool
- No internal rectal masses palpated

Musculoskeletal and Extremities

- Cyanotic nail beds
- (−) clubbing
- 1+ bilateral ankle edema to mid-calf
- 2+ dorsalis pedis and posterior tibial pulses bilaterally
- (−) spine and CVA tenderness
- Denies muscle aches, joint pain, and bone pain
- Normal range of motion throughout

Neurological

- Alert and oriented
- Cranial nerves intact
- Motor 5/5 upper and lower extremities bilaterally
- Strength, sensation, and deep tendon reflexes intact and symmetric
- Babinski downgoing
- Gait steady
- Denies headache and dizziness

Laboratory Blood Test Results

See Patient Case Table 14.2

Patient Case Table 14.2 Laboratory Blood Test Results

Na	147 meq/L	Plt	160 × 10^3/mm^3	Bilirubin, total	0.3 mg/dL
K	4.1 meq/L	WBC	9.1 × 10^3/mm^3	PT	14.2 sec
Cl	114 meq/L	• PMNs	62%	Alb	4.0 g/dL
HCO_3	25 meq/L	• Lymphs	27%	Protein, total	6.8 g/dL
BUN	29 mg/dL	• Eos	3%	Alk phos	78 IU/L
Cr	1.1 mg/dL	• Basos	1%	Ca	8.8 mg/dL
Glu, fasting	98 mg/dL	• Monos	7%	PO_4	3.5 mg/dL
Hb	19.3 g/dL	AST	14 IU/L	Mg	2.5 mg/dL
Hct	55%	ALT	31 IU/L	AAT	137 mg/dL

Arterial Blood Gases (on 4 L O_2 by Cannulae)

- pH 7.32
- PaO_2 65 mm Hg
- $PaCO_2$ 54 mm Hg
- SaO_2 90%

Pulmonary Function Tests

- FEV_1 = 1.67 L (45% of expected)
- FVC = 4.10 L (85% of expected)
- FEV_1/FVC = 0.41 (expected = 0.77)

Chest X-Rays

- Hyperinflation with flattened diaphragm
- Large anteroposterior diameter
- Diffuse scarring and bullae in all lung fields but especially prominent in lower lobes bilaterally
- No effusions or infiltrates
- Large pulmonary vasculature

Patient Case Question 4. Identify all of this patient's risk factors for chronic obstructive pulmonary disease and note which of them is the single most significant risk factor.

Patient Case Question 5. Identify all of the clinical manifestations in this patient that are consistent with *chronic bronchitis*.

Patient Case Question 6. Identify all of the clinical manifestations in this patient that are consistent with *emphysema*.

Patient Case Question 7. Identify all of the clinical manifestations in this patient that are consistent with *pulmonary hypertension* and *cor pulmonale*.

Patient Case Question 8. To which stage of development has this patient's COPD progressed?

Patient Case Question 9. Which serious condition is indicated by the patient's arterial blood gas analysis?

Patient Case Question 10. The patient has a strong history of alcohol abuse, which can cause liver dysfunction. Are there any indications that liver function has been compromised?

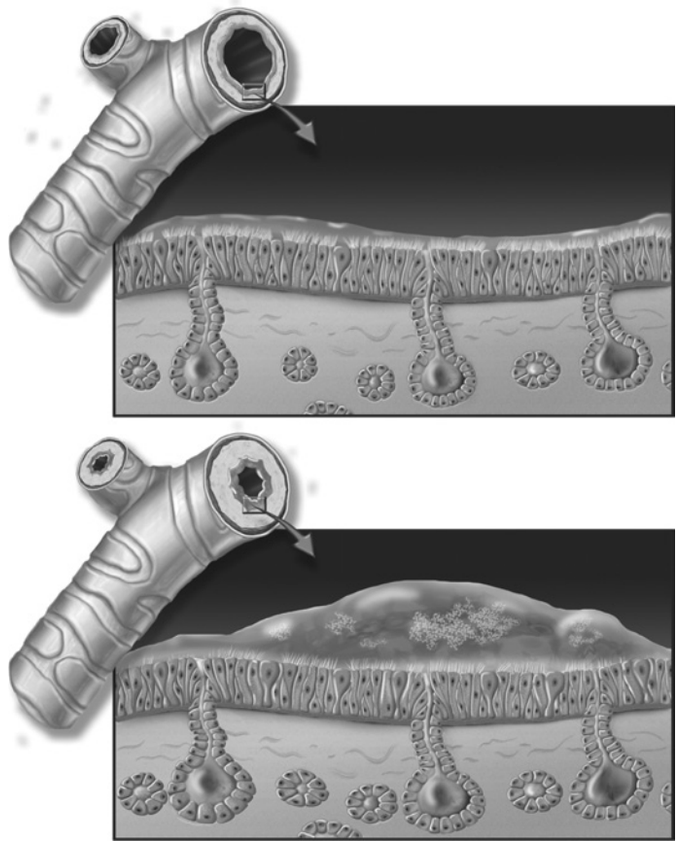
Patient Case Question 11. Explain the apparent disparity in this patient's two major renal function tests (i.e., BUN and Cr).

Patient Case Question 12. Would this patient benefit from home oxygen therapy?

Patient Case Question 13. Is there any reason to believe that an infection caused this patient's relapse of chronic obstructive pulmonary disease?

Patient Case Question 14. Is the patient in this case study alpha-1-antitrypsin deficient?

Patient Case Question 15. Create a figure legend for the illustrations shown in Patient Case Figure 14.1.



PATIENT CASE FIGURE 14.1
See Patient Case Question 15. (Image provided by the Anatomical Chart Company.)

CASE STUDY

15 CYSTIC FIBROSIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

Provided by patient's mother: "I noticed a let-down in T's exercise tolerance level a week ago, and the last couple of days his cough and sputum production have gotten much worse. When he started having breathing problems, I brought him in immediately. T is normally a bubbly and lively little boy and it is obvious when he isn't feeling well. I think that he has another infection."

HPI

T.B. is a 6 yo Caucasian male with a history of CF. He was diagnosed with CF at 8 months of age. He had been doing well until five days ago, when his mother noticed that he became tired very easily while playing. She also reported an increasing cough productive of very dark-colored sputum but that he had no fever. The patient also has not had much of an appetite during the past week and has lost 2½ pounds. His oxygen saturation is currently 87% and he was immediately placed on oxygen via nasal cannula.

PMH

T.B. was born (74 months ago) a 6 lb-7 oz white male to a 23 yo mother. A normal vaginal delivery followed an uncomplicated pregnancy. The infant had Apgar scores of 8 and 9 at 1 and 5 minutes, respectively. The initial physical examination was unremarkable, but at 30 hours following delivery, the infant developed abdominal distension and began vomiting bile. No bowel movements had occurred since birth. A second physical exam disclosed an afebrile, well-developed infant with a tense abdomen from which only occasional faint bowel sounds were heard. The anus was patent, lungs were clear to auscultation, and the cardiac exam was unremarkable. There were no neurologic abnormalities. Radiography of the abdomen revealed distended loops of bowel without air. Both the CBC and serum chemistry panel were normal. Exploratory laparotomy disclosed meconium ileus and atresia of the distal ileum. The narrowed segment of ileum was successfully resected and the infant recovered without complications. An attempt to collect a sweat sample for chloride analysis was unsuccessful. After discharge, the infant was lost to follow-up.

At 8 months of age, the child presented with failure to thrive characterized by poor weight gain. His appetite had been good, but for several months he had been having up to 6 pale and foul-smelling bowel movements daily. During that time, he had also experienced several episodes of bronchitis. Physical examination revealed a small, frail-looking, pale child who appeared malnourished with little subcutaneous fat and a protuberant abdomen. There was a scattering of crackles in both lungs consistent with pulmonary edema or pneumonia. The cardiac exam was normal. Chest x-rays showed markings in all lung fields. The patient's WBC was $8.3 \times 10^3/mm^3$, serum albumin was 1.9 g/dL, sweat chloride was 99 meq/L, and a stool smear was positive for fat. The child was hospitalized and 24 hours later became febrile with tachypnea and increasing signs of respiratory distress. Auscultation revealed poor breath sounds in the right lung. Radiographs of the chest revealed consolidation of the right lung consistent with pneumonia. The WBC had increased to $19.3 \times 10^3/mm^3$ with an increase in band forms (i.e., immature neutrophils) in the peripheral blood to 16%. Sputum cultures were positive for both *Pseudomonas aeruginosa* and *Staphylococcus aureus*. With intensive support and aggressive intravenous antibiotic therapy, the infection resolved and the patient recovered fully. A diagnosis of CF was established and the patient was referred to the regional CF center for follow-up.

During the next six years, the patient was hospitalized three times for respiratory infections and one episode of hemoptysis. The infections required hospitalization for up to two weeks at a time and IV antibiotics. He was also diagnosed with bronchiectasis and pancreatic insufficiency. His mother has been administering postural drainage to her son three times daily for approximately 30 minutes each. Some of the positions are obviously uncomfortable, but T never complains. He is being maintained on a high-calorie, high-protein, and unrestricted fat diet that is supplemented with fat-soluble vitamins and iron.

FH

- Father has HTN; mother is well
- Mother knew that she was a carrier for CF when they married, but father did not
- The patient is the only child born to a 24 yo father and 23 yo mother
- A maternal uncle died at age 16 from pneumonia secondary to CF
- The remainder of the FH is unremarkable

SH

- Patient lives at home with his father and mother and attends first grade; he is doing well in school
- Father is a full-time evening custodian at a local community college
- Mother is currently a "stay-at-home mom," but is also a registered nurse
- Family has city water and no pets
- Father smokes but only outside of the home

ROS

- Patient complains of chest pain when coughing
- Reduced ability to perform usual daily activities due to SOB
- (–) vomiting, abdominal discomfort/pain, diarrhea, constipation, change in urinary frequency, increase in thirst

Meds

- Aerosolized tobramycin 300 mg BID
- Albuterol 2.5 mg via nebulizer TID
- Dornase alfa 2.5 mg via nebulizer QD

- Fluticasone propionate 100 µg, 1 puff BID
- Prednisone 4 mg po Q 6h
- Pancrelipase: 8000 USP units lipase + 30,000 USP units amylase + 30,000 USP units protease with each meal; 4000 USP units lipase + 12,000 USP units amylase + 12,000 USP units protease with each snack
- Ferrous sulfate 15 mg po Q 8h
- ADEK Multivitamin Pediatric Chewable Tablets 1 tab po BID

All

NKDA

PE and Lab Tests

Gen

The patient is a pleasant, thin, 6 yo white male who has difficulty breathing and gasps for air when his oxygen cannula is removed. He seems small for his age. His color is pale and he appears frail and tired. The patient is sitting up on the examiner's table in the emergency room.

Vital Signs

See Patient Case Table 15.1

Patient Case Table 15.1 Vital Signs

BP	105/68 (*sitting*)	T	98.4°F	SaO_2	95% with 1.5 L O_2 88% on room air
P	122 (*regular*)	WT	29 lb (*normal for age: 36–60 lbs*)		
RR	33 (*labored*)	HT	3′4″ (*normal for age: 3′6″–4′1″*)		

Skin

- Color pale
- Cool to the touch, dry, and intact
- (–) rashes, bruises, and other unusual lesions
- Good turgor

HEENT

- Pupils equal at 3 mm, round, and reactive to light and accommodation
- Extra-ocular muscles intact
- Funduscopic exam unremarkable
- White sclera
- Conjunctiva pale and non-edematous
- TMs clear throughout, translucent, and without drainage
- Nares with dried mucus in both nostrils

- No oral lesions or erythema
- Secretions noted in posterior pharynx

Neck/LN

- Neck supple without masses
- (–) lymphadenopathy, thyromegaly, JVD, and carotid bruits

Lungs

- Crackles heard bilaterally in upper lobes
- Decreased breath sounds in lower lobes
- Wheezing noted without auscultation
- RLL and LLL dull to percussion posteriorly

Heart

- Tachycardic with regular rhythm
- (–) murmurs and rubs
- S_1 and S_2 normal
- (–) S_3 and S_4

Abd

- Abdomen soft, NT/ND
- (+) BS
- (–) HSM, masses, and bruits

Genit/Rect

- Stool heme negative
- Normal penis and testes

MS/Ext

- Mild clubbing noted
- (–) cyanosis, edema, and femoral bruits
- Capillary refill WNL at < 2 sec
- Age-appropriate strength and ROM
- Radial and pedal pulses WNL at 2+ throughout

Neuro

- Awake, alert, and oriented
- CNs intact
- DTRs 2+
- No gross motor or sensory deficits present
- Somewhat uncooperative with full neurologic exam

Laboratory Blood Test Results

See Patient Case Table 15.2

Patient Case Table 15.2 Laboratory Blood Test Results					
Na	137 meq/L	MCHC	29 g/dL	AST	16 IU/L
K	3.8 meq/L	Plt	187,000/mm^3	ALT	20 IU/L
Cl	102 meq/L	WBC	18,900/mm^3	T Bilirubin	1.0 mg/dL
HCO_3	24 meq/L	• PMNs	74%	T Protein	7.3 g/dL
BUN	19 mg/dL	• Bands	6%	Alb	3.8 g/dL
Cr	0.7 mg/dL	• Lymphs	17%	Vitamin A	40 mg/dL
Glu, fasting	109 mg/dL	• Monos	3%	Vitamin D, 25OH	43 ng/mL
Hb	11.8 g/dL	Ca	8.3 mg/dL	Vitamin E	0.2 mg/dL
Hct	35.1%	PO_4	2.9 mg/dL	PT	11.4 sec
MCV	77 fL	Mg	2.1 mg/dL	PTT	34.8 sec

Sputum Culture Results

(+) *Pseudomonas aeruginosa, Stenotrophomonas maltophilia,* and *Staphylococcus aureus*

Pulmonary Function

FEV_1 63% of predicted

Chest X-Rays

Consolidation of lower lobes of both lungs consistent with double pneumonia

Peripheral Blood Smear

Microcytic hypochromic red blood cells

Patient Case Question 1. Which of the following best explains why the patient in this case study has cystic fibrosis?

a. development of meconium ileus soon after birth

b. failure to thrive

c. both parents are carriers of a mutation for cystic fibrosis

d. frequent infections early in life

e. malabsorption of fats and proteins

Patient Case Question 2. Why would you expect the patient in this case study to be malnourished?

a. malabsorption of fats and proteins

b. deficiency of vitamins and minerals

c. significant use of calories to maintain breathing

d. both a and b

e. a, b, and c

Patient Case Question 3. Why does the patient in this case study receive postural drainage?

a. to loosen secretions from the lungs and remove them from the airways

b. to facilitate the exchange of gases

c. to strength chest muscles

d. both a and b

e. a, b, and c

Patient Case Question 4. Which of the following clinical manifestations might the patient demonstrate with the development of cor pulmonale?

a. jugular venous distension

b. edema of the ankles and feet

c. hepatomegaly

d. both a and b

e. a, b, and c

Patient Case Question 5. Based on laboratory test results, which types of nutritional supplementation should be enhanced?

Patient Case Question 6. List *three* specific laboratory test results that are consistent with development of a bacterial infection.

Patient Case Question 7. Which *two* specific laboratory test results above suggest that the patient is not vitamin K deficient?

Patient Case Question 8. Describe the pathophysiology that is causing *pallor* in this patient.

Patient Case Question 9. Which clinical evidence indicates that cirrhosis has not developed in this patient as a result of cystic fibrosis?

Patient Case Question 10. Which clinical evidence indicates that hypoproteinemia secondary to cystic fibrosis is not an issue in this patient?

Patient Case Question 11. Which clinical evidence indicates that diabetes mellitus has not developed in this patient as a result of cystic fibrosis?

Patient Case Question 12. Is this patient *hyponatremic* or *hypochloremic?*

CASE STUDY

16 LUNG CANCER

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

"My voice has been hoarse and husky for about two weeks. I've been gargling with salt water, but the problem doesn't seem to be getting any better. There's no pain or tenderness in my throat. I'm a TV news anchorman and my voice is important to my livelihood. I haven't been able to anchor the nightly news now for 10 days."

HPI

P.J. is a 54-year-old African American male, who presents to the ED with a complaint of a two-week history of hoarseness that is not getting better. When questioned further, he admits that his usual morning "smoker's cough" is getting worse and that he has "given serious thought lately to quitting smoking in the near future."

PMH

- Hypothyroidism × 27 years
- Bilateral osteoarthritis of knees × 8 years
- Depression × 2 years
- Iron deficiency anemia of unknown cause, 8 months
- Seasonal allergic rhinitis since adolescence
- Several episodes of mildly bloody sputum in past year that resolved in a few days; patient did not seek medical help
- No prior history of trauma or surgeries
- Had influenza vaccine last year
- Last tetanus booster, 6 years ago

FH

- Family history is negative for lung cancer; however, there is a positive family history for other types of cancer—paternal uncle with colorectal cancer, one niece with non-Hodgkin's lymphoma, and one niece with malignant melanoma

- Father was a mine worker and died at age 66 from complications of anthracosis
- Mother, age 77, is alive and suffers from diabetes mellitus and arthritis
- Patient is second child of four siblings
- All close family members live nearby, visit often, and are cigarette smokers; his wife has also been a long-term smoker

SH

- Married and lives with wife of 33 years
- Has 2 adult biological children and one adopted child
- Has been a 1–1½ ppd cigarette smoker since age 17
- Occasionally uses alcohol (3–4 drinks/week, usually beer)
- Vietnam War veteran with Congressional Medal of Honor
- Denies IV drug use, although he last snorted heroin 2 years ago
- Has resided for approximately 25 years near a site with a history of radioactive contamination

Meds

- Ferrous sulfate 325 mg po TID
- Levothyroxine 88 µg po QD
- Acetaminophen 500 mg po PRN
- Intra-articular cortisone injections of knees, PRN
- Nortriptyline 50 mg po QD
- OTC antihistamine, April–August every year PRN for seasonal allergic rhinitis

All

PCN → diarrhea

ROS

- Patient is positive for worsening cough and recent onset of shortness of breath with moderate exertion (e.g., climbing one flight of stairs)
- Patient denies all of the following: fever and chills; fatigue; weakness; poor appetite; unintentional weight loss; difficulty or pain with swallowing; pain in chest, abdomen, shoulders, or back; recent onset of vision problems; headache; nausea or vomiting; dizziness; significant swelling; bowel or bladder problems

PE and Lab Tests

Gen

- Patient is an A & O, middle-aged, slightly overweight African American male in NAD
- Well groomed and well dressed and appears older than stated age and somewhat restless
- He is not guarded in his responses
- No odd or inappropriate motor behavior noted
- Speech is normal in both volume and rate
- Appears to have good attention span and concentration

Vital Signs

See Patient Case Table 16.1

Patient Case Table 16.1 Vital Signs					
BP	125/70 sitting, left arm	RR	24 and slightly labored	HT	5′9½″
P	95 and regular	T	99.0°F	WT	185 lbs (187 lb 10 months ago)

Skin

- Warm and dry
- No bruising or discoloration
- Overall good-to-fair skin turgor
- Marked "crow's feet" periorbital wrinkling

HEENT

- NC/AT
- (−) facial swelling
- EOM intact
- (–) nystagmus and photophobia
- PERRLA
- Normal funduscopic exam without retinopathy
- Normal sclera
- Ear canals clear and eardrums negative; good auditory acuity
- Nose unremarkable
- Significant repair of dental caries—original teeth present
- Oral mucosa soft and moist
- Tongue midline and normal
- Tonsils intact and normal

Neck/LN

- Normal motion of neck without masses
- Normal thyroid
- (–) JVD and bruits
- (–) cervical, supraclavicular, and axillary lymphadenopathy

Lungs

- Wheeze auscultated in right upper lobe on inspiration
- Percussion reveals area of resonance to dullness over right upper lobe

Heart

- Apical pulse normally located at 5th intercostal space at mid-clavicular line
- Regular rate and rhythm
- Normal S_1 and S_2
- (–) murmurs, rubs, S_3 and S_4

Abd

- Soft, non-distended, and non-tender to palpation
- No masses or bruits
- Normal peristaltic activity

- No hepatomegaly or splenomegaly
- No CVA tenderness

Genit/Rect

- Normal penis, scrotum, and testicles
- Slightly enlarged prostate but (–) for nodules
- Rectal exam: good sphincter tone and guaiac (–) stool

MS/Ext

- Pulses 2+ throughout
- (−) CCE
- Joint enlargement and limited ROM, both knees, consistent with DJD

Neuro

- CNs II–XII grossly intact
- DTRs 2+
- Memory intact
- Normal gait
- A & O × 3
- No sensory deficits
- Coordination intact
- Muscle tone equal at 5/5 throughout
- Babinski normal and downgoing bilaterally

Laboratory Blood Test Results

See Patient Case Table 16.2

Patient Case Table 16.2 Laboratory Blood Test Results

Na	142 meq/L	Glu, fasting	94 mg/dL	ALT	30 IU/L
K	3.9 meq/L	Hb	13.8 g/dL	AST	20 IU/L
Cl	102 meq/L	Hct	39.6%	Total Bilirubin	1.2 mg/dL
HCO_3	28 meq/L	Plt	250 × 10^3/mm^3	Total Protein	6.3 g/dL
BUN	20 mg/dL	WBC	5.5 × 10^3/mm^3	Alk Phos	78 IU/L
Cr	1.2 mg/dL	Ca	11.4 mg/dL	TSH	2.4 μU/mL

Chest X-Rays

- Anteroposterior and lateral views show a 3.5-cm mass located centrally in right upper lobe displacing the right bronchus, roughly corresponding to the area of dullness and wheezing heard by auscultation
- Left lung is clear
- No signs of pleural effusion were noted

CT Scans

- Chest: Reveals the lesion seen on x-rays plus mediastinal widening and moderately enlarged right-sided hilar nodes; left-sided hilar nodes and all mediastinal nodes appear normal

- Abdomen: Normal—no unusual lesions noted
- Brain: Normal—no pathology evident

Bone Scan

WNL

Fluorescence Bronchoscopy with Lung and Lymph Node Biopsies

- Lung mass: Squamous cells with prominent nucleoli plus keratin pearls
- Hilar nodes (ipsilateral): Squamous cells with distinct nucleoli, tissue is (+) for keratin
- Mediastinal nodes (ipsilateral): Negative

Pulmonary Function Testing

FEV_1 = 1.8 L

Patient Case Question 1. Identify this patient's *five* prominent risk factors for lung cancer.

Patient Case Question 2. Why is this patient taking nortriptyline?

Patient Case Question 3. Cite all the clinical evidence that either *supports* or *excludes* metastasis of lung cancer to the brain in this patient.

Patient Case Question 4. Cite all the clinical evidence that either *supports* or *excludes* metastasis of lung cancer to bone in this patient.

Patient Case Question 5. Cite all the clinical evidence that either *supports* or *excludes* metastasis of lung cancer to the liver in this patient.

Patient Case Question 6. Which *type* of lung cancer does this patient have?

Patient Case Question 7. To which *stage* has this lung cancer progressed?

Patient Case Question 8. What is an appropriate treatment for this patient—surgery, chemotherapy, and/or radiation therapy?

Patient Case Question 9. For which type of surgery is this patient a candidate?

Patient Case Question 10. What might have caused this patient's iron deficiency anemia 8 months ago?

Patient Case Question 11. Why is *wheezing* a consistent finding with this patient's diagnosis?

Patient Case Question 12. Identify this patient's *single* abnormal laboratory blood test and briefly explain why this finding is consistent with the diagnosis.

Patient Case Question 13. What is the significance of the patient's serum TSH laboratory test?

Patient Case Question 14. Is the patient's anemia currently well controlled?

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PART

3

GASTROINTESTINAL DISORDERS

CASE STUDY

17 ACUTE PANCREATITIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaint

"It feels like I have a knife in my stomach."

HPI

F.C. is a 63 yo African American male, who presents to the emergency room at the hospital with intense left upper quadrant pain radiating to his back and under his left shoulder blade. He states that he has had intermittent, upper abdominal pain for approximately three weeks, but that the pain has been increasing in severity during the last four days.

PMH

- CAD; S/P angioplasty 1 year ago; denies any chest pain since
- HTN; does not remember exactly how long; he states "for years"
- S/P cholecystectomy
- S/P appendicitis
- (+) for hepatitis C × 5 years
- Generalized anxiety disorder, 18 months

FH

- Father was an alcoholic and died at age 49 from MI
- Mother alive at 83 with CAD
- Brother, age 60, alive and healthy
- No family history of gastrointestinal disease reported

SH

- Married with 8 children
- Retired high school math teacher and wrestling coach
- Alcohol abuse with 10–12 cans of beer per day for 15 years
- Denies use of tobacco or illicit drugs

Meds

- Nifedipine 90 mg po QD
- Lisinopril 20 mg po QD
- Paroxetine 20 mg po QD
- Tylenol #3, 2 tablets po QD PRN for back pain that started recently

Patient Case Question 1. For which condition is this patient likely taking nifedipine?

Patient Case Question 2. For which condition is this patient likely taking lisinopril?

Patient Case Question 3. For which condition is this patient likely taking paroxetine?

All

- PCN → rash
- Aspirin → hives and wheezing
- Cats → wheezing

ROS

- States that he has been feeling "very warm" and has experienced several episodes of nausea and vomiting during the past 72 hours
- Also describes an approximate 8- to 10-lb weight loss over the past 1½ months secondary to intense post-prandial pain and some loss of appetite
- He has noted a reduction in frequency of bowel movements
- No complaints of diarrhea or blood in the stool
- No knowledge of any previous history of poor blood sugar control

PE and Lab Tests

Gen

The patient is a black male who looks his stated age. He seems restless and in acute distress. He is sweating profusely and appears ill. He is bent forward on the examiner's table.

Vital Signs

See Patient Case Table 17.1

Patient Case Table 17.1 Vital Signs

BP	85/60	RR	35	WT	154 lb
HR	120	T	101.4°F	HT	5′ 7½″

HEENT

- PERRLA
- EOMI
- (−) jaundice in sclera
- TMs intact
- Oropharynx pink and clear
- Oral mucosa dry

Skin

- Dry with poor skin turgor
- Some tenting of skin noted
- No lesions noted
- (−) Grey Turner sign
- (−) Cullen sign

Patient Case Question 4. What is meant by "tenting of the skin" and what does this clinical sign suggest?

Patient Case Question 5. Are the negative Grey Turner and Cullen signs evidence of a *good* or *poor* prognosis?

Neck

- Supple
- (−) carotid bruits, lymphadenopathy, thyromegaly, and JVD

Heart

- Sinus tachycardia
- Normal S_1 and S_2 and (−) for additional cardiac sounds
- No m/r/g

Lungs

Clear to auscultation bilaterally

Abd

- Moderately distended with diminished bowel sounds
- (+) guarding
- Pain is elicited with light palpation of left upper and mid-epigastric regions
- (−) rebound tenderness, masses, HSM, and bruits

Ext

- No CCE
- Cool and pale
- Slightly diminished pulses in all extremities
- Normal ROM throughout
- Diaphoretic

Rect

- Normal sphincter tone
- No bright red blood visible
- Stool is guaiac-negative
- (−) hemorrhoids
- Prostate WNL with no nodules

Neuro

- A & O × 3 (person, place, time)
- Able to follow commands
- CNs II–XII intact
- Motor, sensory, cerebellar, and gait WNL
- Strength is 5/5 in all extremities
- DTRs 2+ throughout

Laboratory Blood Test Results

See Patient Case Table 17.2

Patient Case Table 17.2 Laboratory Blood Test Results

Na	134 meq/L	• Neutrophils	73%	T bilirubin	0.9 mg/dL
K	3.5 meq/L	• Bands	3%	Alb	3.3 g/dL
Cl	99 meq/L	• Eosinophils	1%	Amylase	1874 IU/L
HCO_3	25 meq/L	• Basophils	1%	Lipase	2119 IU/L
BUN	34 mg/dL	• Lymphocytes	20%	Ca	8.3 mg/dL
Cr	1.5 mg/dL	• Monocytes	2%	Mg	1.7 mg/dL
Glu, fasting	415 mg/dL	AST	291 IU/L	PO_4	2.4 mg/dL
Hb	18.3 g/dL	ALT	161 IU/L	Trig	971 mg/dL
Hct	53%	Alk phos	266 IU/L	Repeat Trig	969 mg/dL
WBC	16,400/mm^3	LDH	411 IU/L	SaO_2	96%

Urinalysis

See Patient Case Table 17.3

Patient Case Table 17.3 Urinalysis

Appearance:	yellow, clear	SG	1.023	pH	6.5
Glucose	+	Bilirubin	−	Bacteria	−
Ketones	−	Nitrite	−	Urobilinogen	−
Hemoglobin	−	Crystals	−	WBC	2/HPF
Protein	−	Casts	−	RBC	1/HPF

Chest X-Ray

- Anteroposterior view shows heart to be normal in size
- Lungs are clear without infiltrates, masses, effusions, or atelectasis

Abdominal Ultrasound

- Non-specific gas pattern
- No regions of dilated bowel

Abdominal CECT

Grade C

Patient Case Question 6. Identify *three* major risk factors for acute pancreatitis in this patient.

Patient Case Question 7. Identify *two* abnormal laboratory tests that suggest that acute renal failure has developed in this patient.

Patient Case Question 8. Why are hemoglobin and hematocrit abnormal?

Patient Case Question 9. How many Ranson criteria does this patient have and what is the probability that the patient will die from this attack of acute pancreatitis?

Patient Case Question 10. Does the patient have a significant electrolyte imbalance?

Patient Case Question 11. Why was no blood drawn for an ABG determination?

CASE STUDY

18 CIRRHOSIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

Provided by wife: "My husband's very confused and he has been acting strangely. This morning, he couldn't answer my questions and seemed not to recognize me. I think that his stomach has been swelling up again, too. He stopped drinking four years ago, but his cirrhosis seems to be getting worse."

HPI

S.G. is a 46 yo white male with a history of chronic alcoholism and alcoholic cirrhosis. He was admitted to the hospital from the outpatient clinic with abdominal swelling and confusion. He has unintentionally gained 15 lbs during the past four weeks. According to his wife, the patient has not been sleeping well for several weeks, has been feeling very lethargic for the past three days, can't seem to remember appointments lately, and, uncharacteristically, has lost his temper with her several times in the last month. S.G.'s boss at work had also telephoned her last week concerned about his "unusual and violent behavior on the job."

PMH

- Pneumonia 9 years ago that resolved with antimicrobial therapy
- Cirrhosis secondary to heavy alcohol use diagnosed 4 years ago with ultrasound and liver biopsy (micronodular cirrhosis)
- H/O uncontrolled ascites and peripheral edema
- H/O two upper GI hemorrhages from esophageal varices
- H/O anemia
- H/O *E. coli*-induced bacterial peritonitis 4 years ago
- H/O acute pancreatitis secondary to alcohol abuse
- No history to suggest cardiac or gallbladder disease
- No previous diagnosis of viral or autoimmune hepatitis

SURG

- S/P appendectomy requiring blood transfusions 30 years ago
- S/P open-reduction internal fixation of right femur secondary to MVA 5 years ago

FH

- Father died at age 52 from liver disease of unknown etiology
- Mother had rheumatoid arthritis and ulcerative colitis, died from massive stroke at age 66
- Maternal aunt, age 71, with Graves disease
- Patient has no siblings

SH

- Educated through eighth grade
- Department store men's clothing manager and salesman, 17-year career
- Married for 19 years with 1 daughter, age 10
- H/O ethanol abuse, quit 5 years ago following MVA, previously drank 3 cases of beer/week × 15 years
- H/O IVDA (heroin) and intranasal cocaine, quit 5 years ago
- Has smoked approximately 1/2 ppd for many years

Meds

- Propranolol 10 mg po TID
- Spironolactone 50 mg po QD
- Furosemide 20 mg po QD
- MVI 1 tablet po QD
- Occasional ibuprofen or acetaminophen for headache
- Patient has H/O non-compliance with his medications

All

NKDA

ROS

- Increasing abdominal girth
- (–) complaints of abdominal pain, fever, chills, nausea, vomiting, hematemesis, tarry stools, loss of appetite, cough, chest pain, SOB, lightheadedness, weakness, blood in the urine, diarrhea, constipation, and dry mouth

Patient Case Question 1. Hematemesis and tarry stools are clinical signs of which serious potential complication of cirrhosis?

PE and Lab Tests

Gen

The patient is restless, mildly jaundiced, and disoriented to time, place, and people. He is slow to answer questions and his answers make little sense. He is ill-appearing but in no obvious distress.

VS

- BP 120/75, P 83 and regular (supine)
- BP 118/70, P 80 and regular (standing)
- RR 14 and unlabored
- T 98.8°F orally
- WT 171 lbs
- HT 5 ft-7 in
- SaO_2 = 97%

Skin

- Warm, dry, and well perfused with normal turgor
- Mild jaundice
- (+) spider nevi on chest
- (−) palmar erythema
- Several ecchymoses on lower extremities
- Large "cobra" tattoo on right upper arm

HEENT

- (−) bruises, masses, and deformities on head
- (+) icteric sclera
- Pupils at 3 mm and reactive to light
- EOMI
- Funduscopic exam WNL
- TMs clear and intact
- O/P pink, clear, and moist without erythema or lesions

Neck/LN

- Supple
- (−) JVD
- (−) goiter, thyroid nodules, carotid bruits, and adenopathy

Chest

- Lungs CTA bilaterally without wheezes or crackles
- Diaphragmatic excursions WNL
- Good air exchange
- (+) gynecomastia

Heart

- RRR
- Normal S_1 and S_2 with no S_3 or S_4
- No m/r/g heard

Abd

- Moderately distended, firm, and slightly tender
- (+) prominent veins observed around umbilicus
- (+) HSM
- Active BS
- (−) guarding, rebound tenderness, palpable masses, and aortic, iliac, and renal bruits

Genit/Rect

- Heme-negative stool
- Penis normal, testicles moderately atrophic but without masses
- Normal sphincter tone
- (+) hemorrhoids
- Prostate may be slightly enlarged but (−) for nodules and tenderness

MS/Ext

- No clubbing or edema
- Good peripheral pulses at 2+ throughout
- Normal range of motion throughout

Neuro

- CNs grossly intact
- Brisk DTRs at 2+
- Slight asterixis noted
- Strength is equal bilaterally
- Confused and disoriented
- Negative Babinski
- Sensory grossly intact

Patient Case Question 2. Identify a *minimum of 15* clinical signs and symptoms that are consistent with a diagnosis of cirrhosis.

Laboratory Blood Test Results

See Patient Case Table 18.1

Patient Case Table 18.1 Laboratory Blood Test Results

Na	135 meq/L	WBC	4,700/mm^3	Mg	1.7 mg/dL
K	3.5 meq/L	PT	15.6 sec	AFP	90 ng/mL
Cl	101 meq/L	PTT	45.1 sec	HBsAg	(−)
HCO_3	25 meq/L	NH_3	250 µg/dL	HIV	(−)
BUN	12 mg/dL	AST	107 IU/L	Anti-HCV	(+)
Cr	0.6 mg/dL	ALT	86 IU/L	HCV RNA	2.8 million/mL
Glu, fasting	90 mg/dL	Alk Phos	224 IU/L	ANA	(−)
Hb	14.0 g/dL	Bilirubin	2.4 mg/dL	Fe	75 µg/dL
Hct	39.7%	Protein	6.6 g/dL	Ferritin	200 ng/mL
MCV	90 fL	Alb	2.7 g/dL	Transferrin saturation	38%
Plt	34,500/mm^3	Ca	8.5 mg/dL	Ceruloplasmin	37 mg/dL

Patient Case Question 3. Is the patient anemic at this time and, if so, is the anemia *normocytic, microcytic,* or *macrocytic?*

Patient Case Question 4. What is the most significant abnormality that this patient's CBC has revealed?

Patient Case Question 5. Based on the laboratory data, why has this patient's cirrhosis shown a sudden and unexpected progression?

Patient Case Question 6. Identify *four* risk factors that may have contributed to this patient's current condition.

Patient Case Question 7. Why can bacterial peritonitis be ruled out as a current potential diagnosis?

Patient Case Question 8. What justification might the patient's primary health care provider have for conducting an ANA test?

Patient Case Question 9. Why can hemochromatosis be ruled out as a contributing factor to this patient's condition?

Patient Case Question 10. Why can Wilson disease be ruled out as a contributing factor to this patient's condition?

Patient Case Question 11. Why can autoimmune hepatitis and primary biliary cirrhosis be ruled out as contributing factors to this patient's condition?

Patient Case Question 12. Is there any evidence that this patient is at high risk for osteoporosis?

Patient Case Question 13. Identify *two* abnormal laboratory tests that are consistent with ascites.

Patient Case Question 14. Which *single* laboratory test strongly suggests that the patient has developed hepatic encephalopathy?

Patient Case Question 15. How would you grade this patient's encephalopathy?

Patient Case Question 16. What is this patient's CTP score?

Patient Case Question 17. What is the probability that this patient will live for one year?

Patient Case Question 18. Does this patient have any signs of *dehydration* or *hepatorenal syndrome?*

Patient Case Question 19. The patient's primary care provider has decided to conduct extensive clinical studies for the diagnosis of liver cancer. Which *single* abnormal laboratory value has raised a concern that hepatocellular carcinoma may have developed?

CASE STUDY

19 COLORECTAL CANCER

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaint

"My colon cancer is back, I've had another surgery, and I'm ready to start another round of chemotherapy."

HPI

Dr. H.U. is a 53 yo old Asian American male, who was diagnosed with colon cancer 18 months ago. He had been completely asymptomatic until the onset of RLQ discomfort. Four days after the initial onset of symptoms, he experienced severe abdominal pain (9/10 on the standard pain scale) and presented at the emergency room. An abdominal CT scan revealed a mass in the RLQ involving the colon. A 4.5-cm tumor was surgically resected and all signs of visible disease were cleared. There was no sign of liver or lung involvement on CT scan or upon gross examination by the surgical team. Abdominal lymph nodes were biopsied to determine the extent of the disease. The pathology report revealed that the colon tumor was a poorly differentiated adenocarcinoma. The tumor had penetrated deep through the entire width of the wall of the ascending colon and perforated the visceral peritoneal membrane. Extent of the cancer was consistent with stage IIB.

Patient Case Question 1. What is the probability that the patient will still be alive in 5 years?

Serum CEA was 15.9 ng/mL. The patient underwent six cycles of fluorouracil (425 mg/m^2 IV QD $\times$ 5 days) plus leucovorin (20 mg/m^2 IV QD $\times$ 5 days) administered every 4–5 weeks as the patient was able to tolerate. After adjuvant chemotherapy was completed, chest and abdominal CT scans were negative and serum CEA was 3.4 ng/mL. The serum CEA level indicated that the patient had achieved a remission.

Last month, however, the patient noticed bright red blood on the surface of the stool and immediately contacted his oncologist. He reported that he was not experiencing any pain, fatigue, bloating, vomiting, constipation, or diarrhea. His serum CEA had increased to 23.2 ng/mL and exploratory laparotomy revealed recurrent cancer in the terminal ileum

and a large segment of the descending colon that extended into the rectosigmoid colon. There were no signs of disease in the rectum. A chest CT scan was normal, but an abdominal CT scan and ultrasound revealed evidence of multiple (12–15), small, hepatic metastases. All regions of tumor involvement in the ileum, descending colon, and rectosigmoid colon were resected and a colostomy was performed.

Patient Case Question 2. What is the probability that the patient will still be alive in five years?

PMH

- Chickenpox at age 6
- Asthma × 35 years
- Crohn disease × 8 years
- Portion of jejunum resected 6 years ago (scarring and stricture from Crohn disease → obstruction)
- Type 2 DM × 6 years
- Bilateral osteoarthritis of the knees × 3 years
- Intra-articular cortisone injection, both knees, 5 months and 2 months ago
- Negative for serious injuries or bone fractures

FH

- Father, age 75, is alive but has type 2 DM, CAD, and several episodes of severe depression with suicide attempts
- Mother, age 72, has traits of OCD but has not been diagnosed or treated
- Patient has 7 siblings—two sisters with HTN, one brother with Addison disease, one brother with type 2 DM and hypothyroidism, one sister with Down syndrome
- No family history of cancer
- He is married with one son, age 35, who is alive and well

SH

- Patient is a university professor of pathology and primate research
- Has smoked 3–4 cigars/day for 20 years
- Drinks 2–3 cans of beer and 1 glass of sake daily
- Sedentary lifestyle

Meds

- Metformin 500 mg po BID
- Budesonide 9 mg po QD
- Vitamin B12 1000 μg IM Q month
- Albuterol inhaler PRN (recently less than 1×/week)

All

Adhesive tape and latex (rash)

Patient Case Question 3. Why is the patient taking budesonide?

ROS

The patient lost weight, but he is finally getting his strength back after his second surgery. No chest pain, headaches, SOB, DOE, weakness, fatigue, or wheezing. Complains of mild irritation around the colostomy site but states that the "bag is working well" with no current malodorous problems. He has had some diarrhea with fluorouracil and leucovorin therapy in the past but took loperamide and tolerated side effects "fairly well." He still has a few aches and pains in his knees.

PE and Lab Tests

Gen

- Middle-aged Asian-American male
- Appears stated age of 53
- Cooperative but mildly anxious, oriented, attentive, and in NAD

Vital Signs

See Patient Case Table 19.1

Patient Case Table 19.1 Vital Signs

BP 120/65	(sitting, L arm)	RR	17 and unlabored	HT	5′10½″
P	70 and regular	T	98.3°F	WT	179 lbs

Skin

Warm with normal turgor and no lesions

HEENT

- PERRLA
- EOMI
- Mildly icteric sclera
- Fundi benign
- TMs intact
- OP clear with moist mucous membranes

Neck/LN

- Neck supple
- (−) cervical or axillary lymphadenopathy

Thorax

Lungs are clear to auscultation and resonant throughout all lung fields

Heart

- RRR
- Normal S_1 and S_2
- (−) murmurs, rubs, or gallops

Abd

- Colostomy in LLQ
- Tender at both costal margins
- Hepatomegaly prominent
- Mild distension with some ascites

Genit/Rect

- Normal male genitalia
- Slightly enlarged prostate with no distinct nodules
- Heme-negative stool
- No rectal wall tenderness or masses

Ext

- (−) CCE
- Pulses intact throughout

Neuro

- Speech normal
- CNs II–XII intact
- Motor: normal strength throughout
- Sensation normal
- Reflexes 2+ and symmetric throughout
- Babinski negative bilaterally
- Rapid movements, gross and fine motor coordination are normal
- Good sitting and standing balance
- Gait normal in speed and step length
- Alert and oriented × 3
- Able to do serial 7's
- Able to abstract
- Short- and long-term memories intact
- No peripheral neurologic deficits secondary to DM

Patient Case Question 4. Provide a reasonable explanation for the rather comprehensive neurologic exam performed by the oncologist.

Patient Case Question 5. Identify the *single major risk factor* associated with the patient's first occurrence of colon cancer.

Patient Case Question 6. Identify *four* more risk factors that may have contributed to the patient's first occurrence of colon cancer.

Patient Case Question 7. Identify the *single major risk factor* associated with the patient's recurrence of colon cancer.

Laboratory Blood Test Results

See Patient Case Table 19.2

Patient Case Table 19.2 Laboratory Blood Test Results

Na	140 meq/L	Hb	14.2 g/dL	ALT	169 IU/L
K	4.0 meq/L	Hct	44%	LDH	469 IU/L
Cl	101 meq/L	RBC	$5.3 \times 10^6/mm^3$	Total bilirubin	1.9 mg/dL
HCO_3	26 meq/L	Plt	$429 \times 10^3/mm^3$	Alb	2.9 g/dL
BUN	9 mg/dL	WBC	$6.5 \times 10^3/mm^3$	Total protein	4.5 g/dL
Cr	0.7 mg/dL	CEA	16.1 ng/mL	Ca	9.2 mg/dL
Glu, fasting	161 mg/dL	AST	78 IU/L	PO_4	3.5 mg/dL

Patient Case Question 8. Identify *seven* abnormal laboratory test results that are consistent with a diagnosis of colorectal cancer.

Patient Case Question 9. Why might liver function tests be abnormal?

Patient Case Question 10. Can you find any explanation among laboratory data for the development of ascites in this patient?

Patient Case Question 11. Based on the laboratory data, should chronic bleeding be a concern in this patient?

CASE STUDY

20 CONSTIPATION

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaint

"I've been having some problems moving my bowels lately. I was hoping that you might prescribe something to help me that my Medicare plan will cover."

History of Present Illness

R.H. is a 74 yo black woman, who presents to the family practice clinic for a scheduled appointment. She complains of feeling bloated and constipated for the past month, sometimes going an entire week with only one bowel movement. Until this episode, she has been very regular all of her life, having a bowel movement every day or every other day. She reports straining most of the time and it often takes her 10 minutes at a minimum to initiate a bowel movement. Stools have been extremely hard. She denies pain during straining. A recent colonoscopy was negative for tumors or other lesions. She has not yet taken any medications to provide relief for her constipation.

Furthermore, she reports frequent heartburn (3–4 times each week), most often occurring soon after retiring to bed. She uses three pillows to keep herself in a more upright position during sleep. On a friend's advice, she purchased a package of over-the-counter aluminum hydroxide tablets to help relieve the heartburn. She has had some improvement since she began taking the medicine. She reports using naproxen as needed for arthritic pain in her hands and knees. She states that her hands and knees are extremely stiff when she rises in the morning. Because her arthritis has been getting worse, she has stopped taking her daily walks and now gets very little exercise.

Past Medical History

- Menopause occurred 23 years ago
- Cystocele 12 years ago
- Osteoarthritis × 7 years
- HTN × 5 years
- S/P cholecystectomy 4 years ago

- Arthroscopy of right knee 4 years ago, complicated 1 week later by invasive staphylococcal infection for which she received 6 weeks of IV vancomycin therapy
- Depressive affective mood disorder × 3 years
- GERD with recurrent symptoms × 30 months

Family History

- She has one child who is alive and well
- Her mother died in her 80s from diabetes and stroke
- Her father died at age 60 from acute MI
- Two brothers, 68 and 70 yo, are alive and both have HTN
- No known family history of colorectal disease

Social History

- She is widowed and living alone but is presently engaged; husband of 41 years passed away 4 years ago
- (−) alcohol and tobacco use
- (+) caffeine use, 2 cups of coffee with each meal
- She does not pay attention to sodium, fat, or carbohydrate content of foods; she prepares her own meals and eats few fresh fruits, vegetables, and whole grains
- (−) history of sexual abuse, eating disorders, or psychological problems
- Denies non-compliance with her medications ("I always take my medicines on time.")

Review of Systems

- (+) for constipation, lower abdominal fullness, frequent sense of incomplete evacuation, heartburn, occasional arthritic pain in hands and knees with movement, frequent insomnia
- (−) for abdominal pain, nausea, vomiting, malaise, tendency to suppress bowel movements, alternating bouts of diarrhea and constipation, fatigue, fecal incontinence
- (−) history for endocrine and neurologic disorders

Medications

- Nifedipine 30 mg po QD
- Hydrochlorothiazide 50 mg po QD
- Imipramine 100 mg po QD
- Multiple vitamin 1 tablet po QD
- Aluminum hydroxide 300 mg po PRN
- Glucosamine hydrochloride 500 mg po TID
- Conjugated estrogens 0.625 mg po QD
- Medroxyprogesterone acetate 2.5 mg po QD
- Zolpidem tartrate 5 mg po HS PRN

Allergies

- Penicillin and cephalexin → severe hives
- Sulfa drugs → confusion
- Citrus fruits and juices → upset stomach

Patient Case Question 1. For which condition is this patient taking nifedipine?

Patient Case Question 2. For which condition is this patient taking hydrochlorothiazide?

Patient Case Question 3. Why is this patient taking glucosamine?

Patient Case Question 4. Why is this patient taking medroxyprogesterone acetate?

Patient Case Question 5. For which condition is this patient taking zolpidem tartrate?

Physical Examination and Laboratory Tests

General Appearance

- Patient is a well-developed, well-nourished, pleasant, talkative, cooperative, and slightly anxious, elderly African American female
- She is well dressed in a suit, well groomed, and appears younger than her stated age
- She is sitting up on the examination table in no apparent distress and appears both alert and oriented

Vital Signs

See Patient Case Table 20.1

Patient Case Table 20.1 Vital Signs

BP average (sitting)	115/70	RR	16 and unlabored	HT	5′4″
P	82 and regular	T	98.9°F	WT	143 lbs

Skin

- Normal skin turgor and color
- Warm, moist, and soft
- (−) rashes, bruises, or other lesions

Head, Eyes, Ears, Nose, and Throat

- Normocephalic and atraumatic
- Pupils equal at 3 mm, round, and reactive to light and accommodation
- Extra-ocular muscles intact without nystagmus
- Sclera clear and without icterus
- Fundi within normal limits and without arteriolar narrowing or nicking, hemorrhages, exudates, or papilledema
- External auricular canals clear
- Tympanic membranes within normal limits and without drainage
- Oropharynx well hydrated with moist mucous membranes

Patient Case Question 6. Why is a funduscopic exam appropriate in this patient?

Neck/Lymph Nodes

- Supple
- (−) jugular venous distension, thyromegaly, and carotid bruits
- No nodal involvement

Heart

- Regular rate and rhythm
- Normal S_1 and S_2
- No murmur or extra cardiac sounds

Chest/Lungs

- Chest clear to auscultation
- Normal breath sounds
- Normal diaphragmatic excursions

Abdomen

- (−) hepatosplenomegaly, masses, tenderness, and guarding
- (+) slight distension
- Normoactive bowel sounds

Breasts

- Exam deferred
- (−) mammogram 2 months ago

Rectal

- (−) fissures, hemorrhoids, prolapse, obstructive lesions, and bleeding
- Large amount of stool in rectal vault
- (−) occult blood in stool

Extremities/Muscles

- (+) tenderness in hands bilaterally
- (−) cyanosis, clubbing, and edema
- Capillary refill within normal limits at 2 secs
- 2+ peripheral pulses throughout
- Subnormal strength and limited range of motion in both lower extremities
- Patellar crepitus of both knees
- Right knee incision from prior arthroscopy is well healed with minimal scarring

Neurological

- Alert and oriented to person, place, and time
- Cranial nerves II–XII symmetric and intact
- Deep tendon reflexes normal at 2+

- Normal plantar flexion
- Sensation not impaired

Laboratory Blood Test Results

See Patient Case Table 20.2

Patient Case Table 20.2 Laboratory Blood Test Results

Na	140 meq/L	Cr	0.8 mg/dL	PTH	228 pg/mL
K	4.1 meq/L	Glu, fasting	98 mg/dL	Hb	13.8 g/dL
Cl	105 meq/L	Ca	11.9 mg/dL	Hct	41.5%
HCO_3	25 meq/L	TSH	3.71 μU/mL	WBC	$9.8 \times 10^3/mm^3$
BUN	18 mg/dL	FT_4	17 pmol/L	Plt	$250 \times 10^3/mm^3$

Patient Case Question 7. List a minimum of *nine* risk factors that may be contributing to constipation.

Patient Case Question 8. List *eight* clinical signs and symptoms that are consistent with constipation.

Patient Case Question 9. Why is anemia not a suspected complication of this condition?

Patient Case Question 10. Would a *urinalysis, series of liver function tests,* or *serum uric acid level* be appropriate for this patient?

Patient Case Question 11. Should there be any concern at this time that the patient's hypertension is "out of control"?

Patient Case Question 12. Identify *two* clinical signs that strongly negate the possibility that hypothyroidism is contributing to constipation.

Patient Case Question 13. Why is constipation in this patient not likely the result of irritable bowel syndrome?

CASE STUDY

21 CROHN DISEASE

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

HPI

C.D. is a 32 yo woman with a 14-year Hx of Crohn disease who presents with a three-day Hx of diarrhea and steady abdominal pain. She has been referred by her PCP to the GI clinic. The clinical course of her disease has included obstruction due to small intestine stricture and chronic steroid dependency with disease relapse when attempting to taper steroids. Endocrine tests reveal that she has developed adrenal insufficiency as a result of steroid use and a DEXA scan has demonstrated significant demineralization of bone.

Patient Case Question 1. What is the pathophysiologic mechanism for adrenal insufficiency in this patient?

Patient Case Question 2. What is a potential cause of the abnormal DEXA scan in this patient?

PSH

- Portion of small bowel resected 5 years ago (obstruction from scarring and stricture)
- Ovarian cyst drained, age 18
- Appendectomy, age 13

PMH

- Crohn disease diagnosed 14 years ago (weight loss, severe diarrhea with multiple bowel movements, abdominal pain, dehydration)
- Major depression

FH

No family Hx of IBD

SH

- Has been married for 11 years and has two daughters who are healthy
- Works as a nurse with a local home healthcare agency
- Non-smoker and non-drinker

ROS

- Up to 10 loose to semi-solid stools/day, non-bloody
- Denies chills and canker sores
- Stable weight with good appetite
- Denies joint pain, skin lesions, blurred vision, and eye pain
- Some mild fatigue

Meds

- Prednisone, 40 mg po QD
- Trazodone, 100 mg po BID
- Cyanocobalamin, 250 µg IM Q month

Patient Case Question 3. For which condition has trazodone been prescribed for this patient?

Patient Case Question 4. Why is this patient taking cyanocobalamin IM?

Patient Case Question 5. Based on your analysis of this patient's medication profile alone, what can you deduce about the degree of severity (*mild to moderate* or *severe*) of Crohn disease in this patient?

All

- Codeine → nausea and vomiting
- IV dye → acute renal failure

PE and Lab Tests

Gen

- Overweight white female, somewhat anxious, moderate acute distress from chronic pain
- Cushingoid facial appearance

Patient Case Question 6. What is likely the cause of this patient's cushingoid facial appearance?

Patient Case Question 7. Briefly describe a cushingoid facial appearance.

VS

BP 165/95, P 69, RR 15, afebrile, Ht 61 in, Wt 154 lbs

Patient Case Question 8. What is the most likely cause of the abnormal vital sign of most concern above?

Skin

- Warm and dry with flakiness
- Poor turgor

Patient Case Question 9. What do the examination findings in the skin suggest?

HEENT

- PERRLA
- EOMI
- Mild arteriolar narrowing on funduscopic exam without hemorrhages, exudates, or papilledema
- Sclera without icterus
- TMs intact and clear throughout with no drainage
- Dry mucous membranes

Patient Case Question 10. What does the phrase "sclera without icterus" suggest?

Patient Case Question 11. Identify the two abnormal HEENT findings above and provide a pathophysiologic explanation for each of them.

Neck

- Supple
- No masses, JVD, lymphadenopathy, or thyromegaly

Lungs

CTA, no crackles or rales noted

Heart

RRR with no murmurs, rubs, or gallops

Abdomen

- Truncal obesity with abdominal striae
- Soft abdomen, not distended, and without bruits
- Guarding with pressure to right lower quadrant
- BS hyperactive

Patient Case Question 12. What is a likely cause of "truncal obesity with striae"?

Patient Case Question 13. What are *striae?*

Patient Case Question 14. What is meant by *guarding?*

Rectal

- No perianal lesions or internal masses
- Stool is heme-negative

MS/Ext

- No clubbing, cyanosis, or edema
- Appropriate strength and ROM
- Pulses 2+ throughout
- No femoral bruits

Neuro

- A & O × 3
- No gross motor or sensory deficits noted
- CNs II–XII intact
- DTRs 2+

Laboratory Blood Test Results

See Patient Case Table 21.1

Patient Case Table 21.1 Laboratory Blood Test Results

Sodium	141 meq/L	Aspartate aminotransferase	22 IU/L
Potassium	3.0 meq/L	Alanine aminotransferase	54 IU/L
Chloride	106 meq/L	Total bilirubin	0.8 mg/dL
Bicarbonate	23 meq/L	Total protein	3.9 g/dL
Blood urea nitrogen	19 mg/dL	Albumin	2.4 g/dL
Creatinine	1.0 mg/dL	Calcium	8.7 mg/dL
Glucose, fasting	120 mg/dL	Magnesium	2.9 mg/dL
Hemoglobin	13.8 g/dL	Phosphorus	3.3 mg/dL
Hematocrit	39%	Adrenocorticotropic hormone	2 pg/mL
Platelets	180,000/mm^3	Erythrocyte sedimentation rate	24 mm/hr
White blood cells	11,700/mm^3	C-reactive protein	1.6 mg/dL

Patient Case Question 15. Identify the *four abnormally elevated* laboratory findings above and provide a brief and reasonable pathophysiologic explanation for each of them.

Patient Case Question 16. Identify the *four abnormally low* laboratory findings above and provide a brief and reasonable pathophysiologic explanation for each of them.

CASE STUDY

22 DIARRHEA

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Mother's Chief Complaints

"Our daughter has been vomiting and has had diarrhea for three days. She also has had a fever, but I've been giving her acetaminophen every six hours. The clear liquids and Pedialyte that she has been drinking don't seem to be helping much and she looks so sickly."

HPI

J.L. is a 4½-month-old Asian American female infant who was taken to the emergency room of a local hospital because her parents were concerned about vomiting, diarrhea, fever, and irritability. The patient was in good health until four days prior to presentation when she felt warm to her mother. The patient attends daycare, and other children at the daycare center have had similar symptoms recently.

During the first day of her illness, she continued to take normal feedings of Similac with iron formula (approximately 6 ounces every six hours) and an occasional feeding of rice cereal. However, by the second day, her appetite had decreased significantly and she began to have frequent, loose, and watery stools (i.e., 6–8/day). During the 12 hours prior to presentation, J.L. had eight watery stools. The stools did not appear to contain blood. Early on the morning of the second day of illness, the patient vomited shortly after feeding. The vomitus was non-bloody. She continued to vomit after each feeding for the next two meals and became increasingly more irritable. The mother called her pediatrician, who recommended 12 hours of clear liquids, including weak tea with sugar, Pedialyte, and warm 7-Up. Except for one episode in the past 48 hours, vomiting improved but diarrhea continued despite these measures. Over the following two days, fever was intermittent and the child became more lethargic. The parents continued the clear liquids that the doctor had ordered.

On the day of presentation at the hospital, the mother stated that her daughter had a temperature of 101.5°F, was sleepy but very irritable when awake, and had fewer wet diapers than normal. She also noted that her daughter's skin was cool to the touch, her lips were dry and cracked, and her eyes appeared sunken with dark circles around them. At a doctor's appointment 10 days prior to presentation, the patient's weight was 14.5 lbs.

Patient Case Question 1. Is this patient's diarrhea considered *acute* or *chronic?*

PMH

- Born at 37 weeks' gestation following uncomplicated labor and spontaneous vaginal delivery to a 23 yo Asian American female
- Apgar scores were normal at 9 and 9 at one and five minutes after birth
- Weighed 7.7 lbs at birth
- Benign heart murmur observed at birth; no other complications

Maternal History

- Uncomplicated delivery
- During her pregnancy, she experienced one episode of bacterial vaginosis that responded to metronidazole
- Prenatal medications: prenatal vitamins and iron supplement
- Denies use of alcohol, tobacco, and illicit drugs

Immunizations

Shots are up-to-date, including hepatitis B vaccine

All

NKDA

FH

- Asian American mother (23 yo) and father (35 yo), both in good health
- No siblings

SH

- Both parents work outside of the home and patient attends daycare regularly
- Family has one cat, and their home is supplied with city water

PE and Lab Tests

Gen

Patient is ill-appearing and lethargic but is arousable with stimulation. There is no muscle twitching. The anterior fontanelle is depressed and the eyes are sunken and dark. The skin is cool. Abdominal skin shows poor elasticity (skin remained in folds when pinched).

VS

See Patient Case Table 22.1

Patient Case Table 22.1 Vital Signs

BP	85/55	RR	51	WT	13.0 lbs (10% weight loss in past 10 days)
P	156	T (rectal)	101.1°F	SaO_2	98%

Skin

- No rashes or lesions
- Skin turgor subnormal
- Capillary refill time delayed to 5 seconds

HEENT

- Pupils equal, round, and responsive to light
- TMs gray and translucent
- Nose clear
- Tongue dry and rugged

Neck/LN

Supple and otherwise normal with no enlarged nodes

Lungs/Thorax

- Tachypneic
- No crackles or wheezes

Heart

- Tachycardic
- No murmurs noted

Abd

- Anterior abdominal wall is sunken and presents a concave (rather than normal convex) contour
- (+) BS
- Soft, NT/ND
- No masses or HSM

Genit/Rect

- Normal female external genitalia
- Greenish, watery stool in diaper

MS/Ext

- Weak peripheral pulses
- Muscle tone normal at 5/5 throughout

Neuro

- Lethargic and sleepy but arousable
- Irritable and crying when awake but no tears noted
- No focal defects noted

Laboratory Blood Test Results

See Patient Case Table 22.2

Patient Case Table 22.2 Laboratory Blood Test Results					
Na	137 meq/L	Hb	13.1 g/dL	WBC	12,800/mm^3
K	4.4 meq/L	Hct	40%	• Neutros	33%
Cl	112 meq/L	Plt	220,000/mm^3	• Bands	3%
HCO_3	11 meq/L	ESR	18 mm/hr	• Lymphs	55%
BUN	23 mg/dL	pH	7.31	• Monos	7%
Cr	1.3 mg/dL	PaO_2	96 mm Hg	• Basos	1%
Glu, fasting	95 mg/dL	$PaCO_2$	22 mm Hg	• Eos	1%

UA

Normal except for SG = 1.029

Stool Examination

(−) leukocytes and bacterial pathogens

Patient Case Question 2. The emergency room physician's assessment of the patient's condition was that of *viral gastroenteritis, probably due to rotavirus, with dehydration and metabolic acidosis.* Provide a *minimum of eight* clinical signs and symptoms that support an assessment of viral gastroenteritis.

Patient Case Question 3. Provide a *minimum of fifteen* clinical signs and symptoms that support an assessment of dehydration.

Patient Case Question 4. Provide a *minimum of five* clinical signs and symptoms that support an assessment of metabolic acidosis.

Patient Case Question 5. Is this patient's diarrhea considered *mild* or *severe?*

Patient Case Question 6. Is this patient's diarrhea technically considered *inflammatory* or *non-inflammatory?*

Clinical Course

J.L. was hospitalized and an intravenous catheter was inserted. Fluid loss from emesis and bowel movements was replaced with intravenous D_5W and electrolytes. No oral fluids were given during the first 24 hours. The infant was also placed in isolation to prevent transmission of possible infectious microbes to other patients or to hospital personnel. J.L. became more active and alert. Her heart rate improved to 120, respirations to 40, blood pressure to 90/58, and urine specific gravity to 1.020. On the second hospital day, oral feedings of Pedialyte and one-fourth strength infant formula were introduced. Intravenous fluids were discontinued after determination that oral intake was sufficient to sustain an adequate fluid volume.

J.L. was discharged from the hospital on the fourth day and her parents were instructed to continue oral feedings. The infant was seen in the pediatric outpatient clinic on the fifth day after her discharge. She was taking infant formula without diarrhea (approximately 25 ounces/24 hours) and had gained a half pound since her discharge. Physical examination findings were within normal limits.

Patient Case Question 7. Which of the following factors contributes most prominently to an infant's vulnerability to dehydration?

a. a significantly lower percentage of an infant's total body weight is water when compared with older children and adults

b. an infant's basal metabolic rate is lower than an adult's basal metabolic rate

c. infants normally have a very high rate of water turnover when compared with older children and adults

d. an infant's body weight is composed of a greater proportion of fat than is an adult's body weight

Patient Case Question 8. Which of the following pathophysiologic mechanisms best explains this patient's diarrhea?

a. increased intestinal motility is the result of a neuroendocrine condition

b. an infectious agent in the gastrointestinal tract has probably promoted gastrointestinal secretions while, at the same time, impaired absorption capability

c. both a and b

d. none of the above

Patient Case Question 9. The immediate goal of rapid infusion of intravenous fluids during treatment of dehydration is to replace fluid in which of the following fluid compartments of the body?

a. intracellular

b. intravascular

c. interstitial

d. joint spaces

e. abdominal, pleural, and pericardial cavities

Patient Case Question 10. Vomiting and diarrhea result in hydrogen ion disturbances by causing . . .

a. decreased blood flow and shifting of cells from aerobic metabolism to anaerobic metabolism, which results in the production of lactic acid

b. decreased renal function and decreased excretion of hydrogen ions in the urine

c. a significant bicarbonate loss in diarrheal stools

d. two of the above

e. three of the above

f. none of the above

Patient Case Question 11. Based on the patient's electrolyte levels, which of the following types of dehydration did she have?

a. isonatremic

b. hyponatremic

c. hypernatremic

d. hypokalemic

e. hyperkalemic

Patient Case Question 12. If the patient has a serum osmolality of 280 mmol/kg H_2O, a serum sodium concentration of 140 mmol/L, and a serum potassium concentration of 4.0 mmol/L . . .

a. what is the osmotic gap?

b. can the patient have chronic osmotic diarrhea?

CASE STUDY

23 ESOPHAGEAL VARICES

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

Mr. P.T. is a 62-year-old accountant who has been admitted to the hospital for treatment of acute gastrointestinal bleeding. The patient had a similar episode five weeks ago. An upper endoscopic exam at that time revealed a bleeding esophageal varix for which he received band ligation therapy. He is well known to the medical community for chronic alcohol abuse. He has had a "drinking problem" throughout most of his adult life. He has lost several jobs for drinking in the workplace or showing up for work drunk. He lost his driver's license for drunk driving, and his drinking has placed a significant strain on his marriage. He and his wife are currently separated. He has tried several self-help programs to stop drinking as well as Alcoholics Anonymous, all with little success.

Past Medical History

Mr. P.T. has been hospitalized five times during the past 30 months. Most recently, he was discharged seven weeks ago following treatment for bleeding esophageal varices. He has a 44-year history of cigarette smoking (1 pack per day), was diagnosed 5 years ago with alcoholic cirrhosis, and currently drinks an unknown amount of liquor daily. He had been drinking 1–2 six-packs of beer per day for many years.

On previous admissions, he had been treated for acute pancreatitis twice, alcohol withdrawal seizures, ascites, coagulopathy, esophageal varices, peptic ulcer disease, anemia and gastritis, all of which were related to alcohol abuse. Medications at last discharge included:

- Lactulose 30 mL po QD
- Spironolactone 50 mg po QD
- Furosemide 20 mg po QD
- Propranolol 10 mg po TID
- Famotidine 40 mg QD HS

Current Status

The patient was found unconscious and face down in a pool of bright red, bloody vomitus by his neighbor. He was resuscitated and taken to the hospital by ambulance and admitted to the intensive care unit. Initial vital signs were: BP 90/60, P 112, RR 14, T 98.0°F.

Intravenous infusion with a solution of D_5W and colloid was begun through a central line. Oxygen was started at 3 L/min. Octreotide was administered to help stop the bleeding. A physical examination was performed.

Physical Examination and Laboratory Tests

Skin

- Markedly jaundiced
- (+) spider angiomas on arms
- Normal turgor
- (−) palmar erythema

HEENT

- Icteric sclera
- PERRLA
- EOMI
- TMs intact
- O/P dry
- No erythema or lesions in O/P

Neck

- Supple with no nodules
- (−) JVD, thyromegaly, and lymphadenopathy

Chest

- CTA bilaterally
- Good air exchange bilaterally
- (+) gynecomastia

Heart

- Tachycardia with normal rhythm
- Normal S_1 and S_2 with no additional heart sounds
- No murmurs or rubs heard

Abdomen

- Soft with mild distension and hyperactive bowel sounds
- (+) splenomegaly
- (−) caput medusae
- (−) guarding or rebound tenderness

Genit/Rect

- External genitalia normal
- Stool heme (+)

MS/Ext

- Warm with mild (1+) edema
- Pulses symmetric at 2+
- Muscle tone normal
- Full range of motion throughout

Neuro

- Alert and oriented × 3
- Slow to answer questions
- CNs II–XII intact
- (−) asterixis
- DTRs brisk and equal bilaterally

ECG

Normal sinus rhythm

Patient Case Question 1. Explain the pathophysiology of each of the following clinical manifestations in this patient.

a. spider angiomas

b. gynecomastia

c. splenomegaly

d. edema

e. jaundice and icteric sclera

Patient Case Question 2. Why has the primary care provider noted the absence of the following unusual clinical manifestations?

a. caput medusae

b. asterixis

Laboratory Blood Test Results

See Patient Case Table 23.1

Patient Case Table 23.1 Laboratory Blood Test Results

Blood type	B+	Hematocrit	28%	PT	23 sec
Sodium	135 meq/L	White blood cells	10,100/mm^3	PTT	54 sec
Potassium	4.6 meq/L	Platelets	160,000/mm^3	AST	119 IU/L
Chloride	103 meq/L	Total bilirubin	10.4 mg/dL	ALT	94 IU/L
Bicarbonate	22 meq/L	Indirect bilirubin	9.9 mg/dL	Total protein	4.9 g/dL
BUN	10 mg/dL	Amylase	43 IU/L	Albumin	2.9 g/dL
Creatinine	1.1 mg/dL	PaO_2	85 mm Hg	Calcium	8.9 mg/dL
Glucose, fasting	140 mg/dL	$PaCO_2$	45 mm Hg	Phosphorus	2.8 mg/dL
Hemoglobin	9.4 g/dL	pH	7.38	HIV	(−)
INR	2.3	NH_3	59 µg/dL		

Patient Case Question 3. What is the significance of the renal test results?

Patient Case Question 4. What is the significance of the liver enzyme test results?

Patient Case Question 5. What are the *pathophysiology* and *significance* of the total and indirect bilirubin test results?

Patient Case Question 6. Is blood clotting a concern at this time in this patient?

Patient Case Question 7. Why might hemoglobin concentration and hematocrit be abnormal?

Patient Case Question 8. Does this patient have an arterial blood gas problem?

Patient Case Question 9. Give a reasonable explanation for the pathophysiology of the patient's blood glucose concentration.

Patient Case Question 10. What evidence is provided above that this episode is not associated with another attack of alcohol-induced acute pancreatitis?

Patient Case Question 11. What is the purpose of prescribing lactulose for patients with chronic liver disease?

Patient Case Question 12. Why are diuretics like furosemide and spironolactone appropriate for patients with chronic hepatic disease?

Clinical Course

The patient was further evaluated with upper endoscopy, and the bleeding varices were sclerosed with sodium morrhuate. There were no acute complications of the procedure. The patient recovered satisfactorily in six days and was discharged.

CASE STUDY

24 GASTRIC CANCER

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

A.G. is a 62-year-old Latino male who presents to his family PCP complaining of persistent weakness, fatigue, and lack of energy that began approximately three weeks ago. When questioned about abdominal discomfort or pain, the patient noted that he "seemed to get heartburn more often lately despite taking his medication for GERD." He denied vomiting, weight loss, swelling in the abdomen, and early satiety. A CBC was ordered and revealed a red blood cell count of 3.2 million/mm^3, hematocrit of 31%, and hemoglobin concentration of 10.1 g/dL. A fecal occult blood test was performed and the stool was positive for blood.

Patient Case Question 1. What disorder is suggested by the patient's complete blood count?

Past Medical History

- Benign prostatic hyperplasia
- Asthma
- Gastroesophageal reflux disease

Family History

- Mother is alive at age 82 with type 2 diabetes mellitus and hypertension
- Father died at age 59 from acute myocardial infarction
- Patient has two sisters (ages 60 and 64) who are alive and well
- Maternal grandmother died from breast cancer and an aunt passed away from complications secondary to colon cancer

Social History

The patient is a retired music professor and lives alone since his wife passed away six years ago. He smokes 1½ packs of cigarettes and drinks 3–4 brandy Manhattans daily. He eats a significant amount of hamburger and processed meats, especially wieners. His daily diet does not contain healthy servings of whole grain products, fresh fruits, and vegetables. He does not have a regular exercise program but does "some walking."

Medications

- Omeprazole 20 mg po QD
- Ipratropium bromide 2 puffs QID
- Triamcinolone MDI 2 puffs QID
- Albuterol MDI 2 puffs PRN
- Terazosin 1 mg HS QD

Patient Case Question 2. Which of the drugs listed directly above is the patient taking for benign prostatic hyperplasia?

Patient Case Question 3. Which of the drugs listed directly above is the patient taking for asthma?

Patient Case Question 4. Which of the drugs listed directly above is the patient taking for gastroesophageal reflux disease?

Allergies

Aspirin (upset stomach)

Physical Examination and Laboratory Tests

General

The patient is a pleasant, overweight Latino male in no apparent distress. He appears to be his stated age.

Vital Signs

BP 120/95; P 78; RR 15; T 98.5°F; Wt 182 lbs; Ht 5′6½″

Patient Case Question 5. Are any of the vital signs above abnormal?

Skin

- Warm and dry
- No lesions, bruising, or discoloration
- Normal turgor

Head, Eyes, Ears, Nose, and Throat

- Extra-ocular muscles intact
- (−) nystagmus
- Slightly pale conjunctiva
- Sclera clear
- Normal funduscopic exam without retinopathy
- Auricular canal occluded with wax bilaterally
- Deviated nasal septum without sinus tenderness
- Nose without discharge or congestion
- Oropharynx clear, teeth intact; tongue mid-line and negative for abnormalities; tonsils intact and normal

Neck

- Supple without masses
- No palpable nodes or auscultated bruits
- Normal thyroid
- (−) jugular vein distension

Lungs and Thorax

- Clear to auscultation and percussion
- Breath sounds resonant and equal bilaterally
- Good air entry
- No crackles or wheezing

Heart

- Regular rate and rhythm
- Point of maximal impulse normal at the 5th intercostal space
- Normal S_1 and S_2
- (−) for murmurs, S_3 and S_4

Abdomen

- Soft but tender to palpation
- No masses, swelling, or bruits
- Normal peristaltic activity
- No organomegaly

Genitalia/Rectum

- Normal male genitalia
- Diffusely enlarged prostate without distinct nodules, consistent with benign prostatic hyperplasia

Musculoskeletal/Extremities

- Spooning of fingernails (koilonychia)
- (−) cyanosis, clubbing, and edema
- Limited range of motion upper and lower extremities consistent with degenerative joint disease

- Muscle strength and tone 4/5 bilaterally
- Peripheral pulses palpable bilaterally

Neurological

- Oriented to person, place, and time
- Deep tendon reflexes 2+
- Normal gait
- CNs II–XII intact
- No motor or sensory deficits

Other

- Serology: (+) for *H. pylori* antibodies
- Peripheral blood smear: hypochromic, microcytic erythrocytes

Patient Case Question 6. Identify *five* risk factors for gastric cancer in this patient.

Patient Case Question 7. Which type of deficiency is expected by the clinical data presented above?

Laboratory Blood Test Results

See Patient Case Table 24.1

Patient Case Table 24.1 Laboratory Blood Test Results

Na	139 meq/L	MCH	19 pg	Chol	188 mg/dL
K	4.4 meq/L	MCHC	26 g/dL	Ca	9.1 mg/dL
Cl	101 meq/L	WBC	5,200/mm^3	Iron	34 µg/dL
HCO_3	22 meq/L	AST	93 IU/L	TIBC	720 µg/dL
BUN	14 mg/dL	ALT	112 IU/L	Transferrin sat	7%
Cr	0.6 mg/dL	Total bilirubin	2.1 g/dL	Ferritin	8 ng/mL
Glu, fasting	104 mg/dL	Total protein	7.1 g/dL	Vit B12	790 pg/mL
MCV	70 fL	Alb	4.6 g/dL	Folic acid	340 ng/mL

Patient Case Question 8. Which *ten* laboratory test results from this case study suggest that the patient is iron deficient?

Patient Case Question 9. Why was it appropriate to test for vitamin B12 and folic acid levels?

Patient Case Question 10. What is suggested by the liver function tests above?

Specialized Tests

Upper endoscopy revealed a 5 cm × 3 cm mass in the upper stomach near the junction of the esophagus and stomach. A biopsy of suspicious tissue revealed cellular abnormalities

consistent with *adenocarcinoma*. An endoscopic ultrasound revealed that the stomach mass had penetrated through the wall of the stomach but had not invaded lymph nodes. A chest x-ray was negative, but an abdominal CT scan was positive for multiple liver lesions. An MRI scan of the brain was negative.

Patient Case Question 11. To what stage has this gastric cancer progressed?

Patient Case Question 12. Is the 5-year survival probability for this patient greater than or less than 50%?

Patient Case Question 13. Would chemotherapy be significantly beneficial for this patient?

CASE STUDY

25 GASTROESOPHAGEAL REFLUX DISEASE

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

"My acid reflux is getting worse and my histamine blocker isn't working anymore. About an hour after a meal, I get a burning pain in the middle of my chest. Sometimes, I have trouble getting food down. It seems to get stuck behind my breastbone. I've never had that problem before. My heartburn is affecting my quality of life again and I want it to stop."

HPI

W.R. is a 75 yo male with a significant history of GERD. He presents to the family practice clinic today for a routine follow-up visit. The patient reports that during the past three weeks he has experienced increasing episodes of post-prandial heartburn with some regurgitation and dysphagia. He has also begun using antacids daily in addition to histamine-2-receptor blockers for symptom relief. Despite sleeping with three pillows, the patient has also begun to experience frequent nocturnal awakenings from heartburn and regurgitation.

PMH

- HTN × 15 years
- GERD × 7 years
- Alcoholic cirrhosis × 2 years
- Hiatal hernia

FH

Non-contributory

SH

- Patient is widowed and lives alone; daughter lives in same town, checks on him regularly, and takes him grocery shopping every Saturday

- Patient is a retired college basketball coach
- Enjoys cooking, traveling, gourmet dining, and playing poker
- (+) caffeine; 5 cups coffee/day
- (+) EtOH; history of heavy alcohol use; current EtOH consumption reported is 6 beers with shots/week
- (+) smoking; 55 pack-year history; currently smokes ¾ ppd

Meds

- Verapamil SR 120 mg po QD
- Hydrochlorothiazide 25 mg po QD
- Famotidine 20 mg po Q HS

All

- Citrus fruits and juices (upset stomach)
- Dogs (itchy eyes, runny nose, sneezing)
- Erythromycin (unknown symptoms)

ROS

- (−) H/A, dizziness, recent visual changes, tinnitus, vertigo
- (−) SOB, wheezing, cough, PND
- (+) frequent episodes of burning, non-radiating substernal CP
- (+) dysphagia
- (−) sore throat or hoarseness
- (−) N/V, diarrhea, BRBPR or dark/tarry stools
- (−) recent weight change

PE and Lab Tests

Gen

The patient is a pleasant, talkative Native American man who is wearing a sports jacket, jeans, and tennis shoes. He looks his stated age and does not appear to be in distress.

VS

See Patient Case Table 25.1

Patient Case Table 25.1 Vital Signs

BP	155/90	RR	18 and unlabored	HT	5′8″
P	75 and regular	T	97.9°F	WT	195 lbs

Skin

No rashes or lesions noted

HEENT

- PERRLA
- EOMI

- (−) arteriolar narrowing and A-V nicking
- Pink, moist mucous membranes
- (−) tonsils
- Oropharynx clear

Lungs

CTA

Heart

- Regular rhythm
- (−) additional heart sounds

Abd

- Normoactive BS
- Soft, NT/ND
- (−) HSM
- (−) bruits

Genit/Rec

- (−) hemorrhoids
- (−) rectal masses
- Brown stool without occult blood
- Prostate WNL

Ext

(−) CCE

Neuro

- A & O for person, time, place
- CNs II–XII intact
- Strength 5/5 upper/lower extremities bilaterally

Patient Case Question 1. Which clinical information suggests worsening symptoms of GERD in this patient?

Patient Case Question 2. Which symptom(s) indicates the possible severity of the patient's GERD?

Patient Case Question 3. Are the patient's symptoms *classic* or *atypical*?

Patient Case Question 4. Identify all those factors that may be contributing to the patient's symptoms.

Patient Case Question 5. Why is the drug verapamil a potential contributing factor to the patient's symptoms?

Patient Case Question 6. What non-pharmacologic therapies or lifestyle modifications might be beneficial in the management of this patient's acid reflux disease?

Patient Case Question 7. What pharmacotherapeutic alternatives are available for the treatment of this patient's GERD?

Clinical Course

The patient underwent upper endoscopy, which revealed multiple, circular, confluent erosions of the distal esophagus. There was no evidence of bleeding, ulcerations, stricture, or esophageal metaplasia. The patient was treated with an 8-week course of 30 mg/day lansoprazole and both heartburn and dysphagia resolved. Approximately 10 weeks after PPI therapy was discontinued, the patient reported that his reflux symptoms had returned and that he was again suffering from frequent post-prandial and nocturnal episodes of reflux.

Patient Case Question 8. What therapeutic options are now available for this patient?

Patient Case Question 9. Based on upper endoscopy test results, what grade of esophagitis can be assigned to this patient's condition?

CASE STUDY

26 NAUSEA AND VOMITING

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

"I've been nauseated again and have thrown up several times since yesterday. I also have a constant aching in my stomach and I feel really bloated again."

HPI

J.A. is an 83-year-old man who is a five-day post-status surgical patient for elective repair of an abdominal aortic aneurysm. After nearly nine hours of uncomplicated surgery, the patient was transferred to the surgical intensive care unit. Intravenous methyldopa was used to maintain the patient's systolic blood pressure below 160 mm Hg. He awoke one hour later and was drowsy from the IV morphine sulfate that he was receiving every 90–120 minutes for pain. Vital signs were stable for the next five hours (BP 148/85, P 91, RR 21, Hct 39%) on 40% oxygen by face mask. Then, his abdomen became moderately distended but soft. No bowel sounds were heard during a prolonged period of auscultation. There was no fever or elevated white blood cell count, but there was mild abdominal tenderness with palpation. Plain film radiographs demonstrated a cecal diameter of 10.5 cm (the upper limit of normal cecal size is 9.0 cm) and a diagnosis of acute colonic pseudo-obstruction secondary to surgery was made. Nasogastric and rectal tubes were inserted and low constant suction provided to ensure gastric decompensation. The patient was periodically rolled from side to side and to the prone position in an effort to promote expulsion of colonic gas. Nasogastric output was replaced mL for mL with IV 0.45% saline and 20 meq/L potassium chloride.

On post-operative day 1, repeat abdominal radiographs revealed that cecal diameter remained at 10.5 cm. The patient continued to feel nauseous and vomited twice. Nasogastric output was measured every 4–4½ hours and fluctuated from 50 to 175 mL of green drainage fluid.

Patient Case Question 1. Determine the grade of vomiting during the last 24 hours.

On post-operative day 2, analgesia was maintained with 8 mg morphine IM every 4 hours. Abdominal radiographs showed that cecal diameter had increased to 11.5 cm. Two more

episodes of vomiting occurred. A single dose of 2 mg neostigmine was given IV and significant colonic decompression occurred within 20 minutes. The patient was monitored for possible neostigmine-induced bradycardia, but no adverse effects developed.

On post-operative day 3, cecal diameter was measured at 9.5 cm, a decrease of 2.0 cm from post-operative day 2. The patient felt considerably less nauseated and had not vomited in the past 12 hours. Nasogastric output had slowed to 60 mL/8 hours. He remained on IV saline and KCl, however, and orders of "nothing by mouth." His abdomen was only mildly distended and soft. Bowel sounds were audible by auscultation in all four quadrants. A decision was made to maintain his tubes in place for one more day.

On post-operative day 4, the patient's tubes were removed and he began taking in a clear liquid diet by mouth in the early morning. By noon, however, he began to complain of increasing abdominal discomfort, feeling bloated and nauseous, and suffered three episodes of vomiting a greenish fluid. Respiration rate was 28/minute, heart rate was 105/minute, and both blood pressure and temperature were normal. Bowel sounds, which had been normoactive upon rising, were now absent. The patient did not respond to neostigmine this time, but responded well to placement of a decompression tube. Within 18 hours, however, symptoms had returned once again.

PMH

- HTN × 20 years
- OA × 18 years
- Type 2 DM
- Hyperlipidemia

PSH

- Right nephrectomy for "benign" renal disease, 23 years ago
- Partial colectomy for polyposis, 14 years ago
- Total right hip replacement for worsening hip pain from OA unresponsive to analgesic treatments, 5 years ago

FH

- Mother and younger sister (both deceased) had "high blood pressure"
- Father died from AMI at age 78
- History of AMI and stroke at young ages in maternal grandparents

SH

- Patient lives with wife of 55 years, is a retired civil engineer (retired at age 65), and enjoys gardening and travel
- No tobacco × 15 years
- No EtOH × 15 years

ROS

- (+) nausea, retching, vomiting, epigastric discomfort, dry mouth, and fatigue
- (−) headache, stiff neck, fever, abdominal pain, diarrhea, melena, urinary frequency/urgency/discomfort, weakness, SOB, numbness/tingling in extremities

Meds

- Amlodipine 10 mg po Q AM
- Glyburide 10 mg po Q AM, 5 mg po Q PM
- EC ASA 325 mg po QD
- Gemfibrozil 600 mg po BID

Patient Case Question 2. How does amlodipine work to relieve hypertension?

Patient Case Question 3. How does glyburide work to control blood sugar in type 2 diabetes mellitus?

Patient Case Question 4. What are the *two major* contributing factors for nausea and vomiting in this patient?

All

No known drug or food allergies

PE and Lab Tests

Gen

- White male who looks his stated age in moderate distress
- Ill-appearing and slightly lethargic in his hospital bed
- The patient's face is ashen and the eyes are noticeably sunken

VS

See Patient Case Table 26.1

Patient Case Table 26.1 Vital Signs

BP	85/60 supine, right arm	RR	25 and unlabored	HT	5′7″
P	105 and regular	T	95.3°F	WT	154 lbs (160 lbs 5 days ago)

Skin

- Color: gray
- Temperature: cold
- Turgor: poor, some skin tenting noted
- Feel: dry
- No rash, petechiae, or lesions

HEENT

- PERRLA
- EOMI
- Fundi benign

- Sclera without icterus
- TMs intact
- Mucous membranes dry

Neck/LN

- Supple
- Thyroid WNL
- (−) adenopathy, bruits, and JVD

Lungs/Thorax

- Tachypnea prominent
- Lungs clear to auscultation

Cardiac

- Sinus tachycardia
- (−) murmurs, rubs, and gallops

Abd

- Soft and moderately distended with hypoactive BS
- Pain is elicited on light palpation of RLQ
- (−) HSM, rebound tenderness, and masses

Genit/Rect

- Genital exam not performed
- Normal sphincter tone
- Rectal exam WNL
- No bright red blood or masses visible
- Stool guaiac-negative

MS/Ext

- Extremities are cold and gray
- Pulses hypoactive at 1+ throughout
- (−) edema and clubbing

Neuro

- (+) lethargy
- (−) visual abnormalities
- Cranial nerves intact
- DTRs 2+
- Strength is equal bilaterally in all extremities

Laboratory Blood Test Results

See Patient Case Table 26.2

Patient Case Table 26.2 Laboratory Blood Test Results

Na	147 meq/L	Glu, fasting	71 mg/dL	Amylase	31 IU/L
K	3.2 meq/L	Mg	1.8 mg/dL	Hb	14.6 g/dL
Cl	95 meq/L	PO_4	2.4 mg/dL	Hct	41.2%
HCO_3	31 meq/L	Ca	8.9 mg/dL	Plt	206 × $l0^3$/mm^3
BUN	30 mg/dL	T Bilirubin	0.8 mg/dL	WBC	3.5 × $l0^3$/mm^3
Cr	1.2 mg/dL	T Protein	7.6 g/dL	• PMNs	58%
				• Bands	0%
				• Lymphs	33%
				• Monos	6%
				• Eos	2%
				• Basos	1%

Patient Case Question 5. List *twelve* clinical manifestations in this patient that are consistent with a diagnosis of *dehydration*.

Patient Case Question 6. Has the patient developed *hypokalemia*?

Patient Case Question 7. Why can *acute pancreatitis* be ruled out as a cause of nausea and vomiting in this patient?

Patient Case Question 8. Perforation of the cecum often occurs when cecal diameter >10 cm. Severe abdominal pain, fever, and leukocytosis are clinical manifestations of perforation. Has the cecum perforated in this patient?

Patient Case Question 9. What is believed to be the pathophysiologic mechanism that underlies acute colonic pseudo-obstruction?

Patient Case Question 10. Are respiratory and reflex signs *consistent* or *inconsistent with* metabolic alkalosis?

CASE STUDY

27 PEPTIC ULCER DISEASE

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

History of Present Illness

M.S. is a 56-year-old Hispanic male who presents with complaints of a four-week history of gradually increasing upper abdominal pain. He describes the pain as "burning" in nature, localized to the epigastrium, and that previously it had been relieved by drinking milk or Mylanta. The pain is much worse now and milk or antacids do not provide any relief. He scores the pain as a "7" on a scale of 1–10. The patient does not feel the pain radiating into his back and has not noticed any blood in his stools. He denies any nausea, vomiting, weight loss, shortness of breath, neurologic symptoms, or chest pain with exercise. He maintains that his appetite is excellent.

He has been taking 400 mg ibuprofen almost daily for knee pain for the last 18 months. He injured his right knee in a car accident 15 years ago. He also takes daily doses of 81 mg aspirin "for his heart," although this has not been prescribed. He does not take any other prescribed or OTC medications. The patient smokes 1½ packs of cigarettes every day and has done so for 5 years since his wife passed away. He does not drink alcohol or use illegal drugs. The patient is allergic to meperidine and develops a skin rash when he is treated with it.

He admits to feeling "stressed out" as he recently lost his job of 20 years as an insurance salesman and has had difficulty finding another. Furthermore, his unemployment compensation recently lapsed.

M.S. has been feeling a bit tired lately. He was diagnosed with HTN (stage 1) three years ago and has been managing his elevated BP with diet and regular workouts at the gym. His younger brother also has HTN and both his parents suffered AMIs at a young age. M.S. has a history of gallstones and laparoscopic removal of his gallbladder six years ago. He also has a history of migraine headaches.

Patient Case Question 1. Identify *three* factors that may have contributed to a peptic ulcer in this patient.

Patient Case Question 2. From your list of factors in Question 1 above that may have contributed to a peptic ulcer in this patient, which factor has likely played the most significant role?

Patient Case Question 3. Why might the healthcare provider have inquired about possible shortness of breath or chest pain with exercise?

PE and Lab Tests

The patient is a heavy Hispanic male in mild acute distress. He is rubbing his chest and upper abdomen. Height 5′10″, weight 206 lbs, T = 98.8°F po, P = 90 and regular, RR = 18 and unlabored, BP = 156/98 left arm sitting.

Patient Case Question 4. Is this patient *underweight, overweight, obese,* or is his weight *healthy* for his height?

Patient Case Question 5. Why might the PCP order an ECG for this patient?

HEENT, Neck, Skin

- PERRLA, fundi w/o vascular changes
- Pharynx and nares clear
- Neck supple w/o bruits over carotid arteries
- No thyromegaly or adenopathy
- No JVD
- Skin warm with good turgor and slightly diaphoretic w/o cyanosis
- Yellowed teeth

Lungs, Heart

- Good lung expansion bilaterally
- Breath sounds clear
- Percussion w/o dullness throughout
- RRR
- No murmurs, gallops, or rubs
- S_1 and S_2 prominent

Abdomen, Extremities

- No abdominal bruits, masses, or organomegaly
- Positive bowel sounds present throughout with no distension
- Epigastric tenderness w/palpation but w/o rebound or guarding
- No cyanosis, clubbing, or edema
- Peripheral pulses 2+ throughout

Rectal Examination

- No hemorrhoids present
- Prostate slightly enlarged but w/o nodules that suggest cancer
- Stool sample submitted for heme testing

Neurological

- Alert and oriented to time, place, and person, appropriately anxious
- Cranial nerves II to XII intact
- Strength 5/5 bilaterally
- DTRs 2+ and symmetric
- Touch sensation intact
- Gait steady

Laboratory Test Results

- All blood chemistries including Na, K, Ca, BUN, and Cr normal
- WBC = 7500/mm^3 w/NL WBC Diff
- Hct = 37%
- ALT, AST, total bilirubin normal
- Amylase = 90 IU/L
- ECG = normal sinus rhythm w/o evidence of ischemic changes
- Stool heme-positive

Patient Case Question 6. What is the significance of the WBC count?

Patient Case Question 7. What is the significance of the Hct?

Patient Case Question 8. What is the significance of the serum amylase concentration?

Patient Case Question 9. Why might tests for ALT and AST be appropriate in this patient?

Endoscopy Results

- Normal appearing esophagus
- 1-cm gastric ulcer w/evidence of recent bleeding but no signs of acute hemorrhage in the ulcer crater
- Rapid urease test negative

Patient Case Question 10. What is the significance of the urease test result?

Patient Case Question 11. What type of management would be appropriate for this patient?

CASE STUDY

28 ULCERATIVE COLITIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

HPI

X.P. is a 24-year-old man, who presents to the urgent care clinic with complaints of rectal bleeding and weakness. Five days ago he noticed bright red blood in his stools. Furthermore, daily bowel movements have increased to five or six with significant diarrhea. He states that urges to move his bowels have rapid onset, but there has been no incontinence. He has been weak for approximately 2½ days. He has not traveled outside of the city, been hospitalized, or received antibiotics recently.

Patient Case Question 1. What is the relevance of the last sentence directly above?

PMH

- Chronic sinus infections since age 15
- Ventricular septal defect at birth, surgically repaired at age 1 year

FH

- Strong positive family history of autoimmune disease on maternal side
- Mother has SLE
- Maternal grandmother (deceased) had Graves disease
- Aunt has myasthenia gravis

Patient Case Question 2. What is the significance of the patient's family history?

SH

- College graduate
- Recently discharged after 3 years of active military service in Afghanistan
- Currently employed as user consultant in information technology division at local community college
- Social alcohol use only
- Denies tobacco and IV drug use

ROS

- Negative for lightheadedness and feeling faint with standing
- Negative for nausea, vomiting, visual changes or eye pain, abdominal distension with gas, and joint pain
- Positive for occasional malaise, mild abdominal cramps, loss of appetite, and weight loss of 4 lbs during the past month

Meds

None

All

NKDA

PE and Lab Tests

Gen

A & O, pleasant, young, white male in NAD; skin color is pale

VS

BP (sitting, left arm) 120/75, P 93 bpm, RR 20/min, T 99.4°F, SaO_2 95% on RA, Wt 161 lbs (usual weight 165 lbs), Ht 5′10″

Patient Case Question 3. What is the significance of the pulse oximetry findings above?

Skin

- Warm and dry with satisfactory turgor
- Positive for pallor
- No rashes or other lesions

Patient Case Question 4. What is a reasonable explanation for pallor in this patient?

HEENT

- PERRLA
- EOMI
- Negative for uveitis
- Funduscopic exam normal
- TMs intact
- Nose clear and not inflamed
- Moist mucous membranes

Patient Case Question 5. What is the significance of the findings described as *satisfactory turgor* and *moist mucous membranes*?

Chest

Lungs CTA & P

Heart

- RRR
- Normal first and second heart sounds
- No m/r/g or extra heart sounds

Abd

- BS (+)
- Soft and NT/ND
- No palpable masses
- No HSM
- No bruits

Rectal

- Somewhat tender
- No hemorrhoids or other lesions
- Heme (+) stool

MS/Ext

- Equal motor strength at 5/5 in both arms and legs
- Sensation normal
- No CCE
- Peripheral pulses normal

Neuro

- A & O × 3
- Sensory and motor levels normal
- CNs II–XII intact

- DTRs 2+
- Babinski response negative

Patient Case Question 6. What constitutes a positive Babinski sign and why is a positive Babinski sign significant?

Laboratory Blood Test Results

See Patient Case Table 28.1

Patient Case Table 28.1 Laboratory Blood Test Results

Na^+	143 meq/L	BUN	20 mg/dL	Plt	315,000/mm^3	AST	33 IU/L
K^+	3.2 meq/L	Cr	1.1 mg/dL	ESR	24 mm/hr	ALT	41 IU/L
Cl^-	108 meq/L	Hb	10.8 g/dL	CRP	1.5 mg/dL	T bilirubin	0.9 mg/dL
HCO_3^-	18 meq/L	Hct	36%	Ca^{+2}	8.9 mg/dL	PT	11.3 sec
Glu, fasting	132 mg/dL	WBC	9,400/mm^3	PO_4^{-3}	4.0 mg/dL	Alb	3.1 g/dL

Patient Case Question 7. Identify *eight* abnormal laboratory blood test values and provide a brief pathophysiologic explanation for each of them.

Patient Case Question 8. Does the patient have signs of liver disease?

Clinical Course

The patient received 1 L of 0.9% saline with 30 meq KCl IV for 4 hours and was discharged with instructions to return to the urgent care clinic or immediately contact his PCP if symptoms developed again. The patient was referred to the GI clinic.

Patient Case Question 9. Why was the patient treated with an IV solution?

Patient Case Question 10. Why is the concentration of saline that was infused important?

A proctosigmoidoscopy was conducted three days after the patient's discharge from the acute care clinic. Significant pseudopolyp formation could be seen. Biopsies of the colon revealed erosions of the mucosa and ulcerations into the submucosa with mixed acute (i.e., neutrophils) and chronic (lymphocytes and macrophages) inflammatory cells. No dysplastic cells suggesting the development of colon carcinoma were seen. No multinucleated giant cells suggesting Crohn disease were seen. Inflammation and ulceration were limited to the rectum and sigmoid colon only. Crypts of Lieberkühn were intensely inflamed. Marked hemorrhaging of capillaries in the mucosa was also observed.

Pathologist's Dx

Ulcerative colitis

Patient Case Question 11. Based on laboratory tests, physical examination, and the patient's medical history, would disease activity be considered *mild, moderate,* or *severe*? How did you arrive at your answer?

Patient Case Question 12. What is an appropriate initial pharmacotherapeutic approach for this patient?

Patient Case Question 13. If the patient responds unsatisfactorily during three weeks of treatment, what is an appropriate pharmacotherapeutic option?

Patient Case Question 14. Is surgery warranted in this patient?

CASE STUDY

29 VIRAL HEPATITIS

For the Disease Summary for this case study, see the CD-ROM.

PATIENT CASE

Patient's Chief Complaints

"I don't really feel seriously sick, but my wife insisted that something is wrong and that I should see a doctor. I've been a bit tired and weak now for nearly three weeks. I've not been working more than usual, my appetite is good, and I'm only 52—so it can't be old age setting in already. Also, and this may be nothing, but I'm a little sore under my right ribcage—not really pain, but it is uncomfortable when I jog."

HPI

D.H. is a 52 yo white male with no significant past medical history, except for a severe bout of cholecystitis seven years ago that resolved following laparoscopic cholecystectomy. He states that he has been healthy until three weeks ago, when he noticed some fatigue and weakness. He does not recall a past history of liver problems.

PMH

- MVA in 1996 that required a blood transfusion
- Cholecystitis and cholecystectomy, 7 years ago

FH

- No known family history of liver disease
- Mother was alcoholic; died 8 years ago in car accident
- Father, age 77, has type 2 DM
- Two younger siblings are alive and well

SH

- Divorced, but re-married 3 years ago
- Has 5 children from first marriage (three are still living at home)
- No tobacco use
- Drinks a 6-pack of beer on weekends
- Minimal caffeine consumption
- Has been employed as an information technology consultant at the university in town for the past 11 years
- Has a significant history of IV drug use and cocaine snorting as a young adult but has "been clean now for 15 years"
- Denies any recent international travel
- Exercises daily (jogging and golf in summer, bowling and basketball in winter)
- Denies knowledge of having unprotected sex or living with anyone diagnosed with viral hepatitis

ROS

- (+) progressive fatigue and weakness
- (+) slightly elevated liver enzymes during last physical examination 10 months ago; was advised to seek follow-up at the liver clinic—which he failed to do, because he "felt fine"
- (−) yellowing of the skin/sclera; bleeding and bruising; swelling; gynecomastia; decrease in sexual drive; impotence; palmar erythema; spider veins; high blood pressure; rash or other type of skin lesion; itching; loss of appetite; changes in bowel or bladder function; and changes in stool or urine color

Meds

None

All

No known drug or food allergies

PE and Lab Tests

Gen

- WDWN muscular, white male in NAD
- Wears glasses
- Patient is friendly, soft-spoken, and cooperative and appears to be his stated age
- He appears to be of ideal body weight

VS

See Patient Case Table 29.1

Patient Case Table 29.1 Vital Signs

BP	138/80	RR	16 and unlabored	HT	6 ft-1 in
P	69 and regular	T	98.3°F	WT	174 lbs