

UROLOGY

A CORE TEXTBOOK

Stephen N. Rous, A.B., M.D., M.S. (Urology), F.A.C.S., F.A.A.P.

UROLOGY

A CORE TEXTBOOK

Stephen N. Rous, A.B., M.D., M.S. (Urology), F.A.C.S., F.A.A.P.
Professor and Chairman, Department of Urology
Medical University of South Carolina, Charleston, South Carolina
Urologist-in-Chief, Medical University Hospital;
Consultant in Urology, Veterans Administration Hospital,
Charleston, South Carolina
Colonel, United States Air Force Reserve, Medical Corps
and Military Consultant for Urology to the Surgeon General,
United States Air Force



APPLETON-CENTURY-CROFTS/Norwalk, Connecticut

0-8385-9317-8

Notice: Our knowledge in clinical sciences is constantly changing. As new information becomes available, changes in treatment and in the use of drugs become necessary. The author(s) and the publisher of this volume have taken care to make certain that the doses of drugs and schedules of treatment are correct and compatible with the standards generally accepted at the time of publication. The reader is advised to consult carefully the instruction and information material included in the package insert of each drug or therapeutic agent before administration. This advice is especially important when using new or infrequently used drugs.

Copyright © 1985 by Appleton-Century-Crofts
A Publishing Division of Prentice-Hall, Inc.

All rights reserved. This book, or any parts thereof, may not be used or reproduced in any manner without written permission. For information, address Appleton-Century-Crofts, 25 Van Zant Street, East Norwalk, Connecticut 06855.

85 86 87 88 89/10 9 8 7 6 5 4 3 2 1

Prentice-Hall of Australia, Pty. Ltd., Sydney
Prentice-Hall Canada, Inc.
Prentice-Hall Hispanoamericana, S.A., Mexico
Prentice-Hall of India Private Limited, New Delhi
Prentice-Hall International (UK) Limited, London
Prentice-Hall of Japan, Inc., Tokyo
Prentice-Hall of Southeast Asia (Pte.) Ltd., Singapore
Whitehall Books Ltd., Wellington, New Zealand
Editora Prentice-Hall do Brasil Ltda., Rio de Janeiro

Library of Congress Cataloging in Publication Data

Rous, Stephen N. (Stephen Norman), 1931-
Urology : a core textbook.

Rev. ed of: Urology in primary care. 1976.
Includes bibliographies and index.

1. Genito-urinary organs—Diseases. 2. Urology.

I. Rous, Stephen N. (Stephen Norman), 1931-

Urology in primary care. II. Title. [DNLM: 1. Urologic Diseases. WJ 100 R863u]

RC871.R687 1985 616.6 85-3894
ISBN 0-8385-9317-8

Design: Jean M. Sabato-Morley

PRINTED IN THE UNITED STATES OF AMERICA

Preface

It is fitting and proper that this textbook should have a different title and a different publisher than the one I wrote in 1976, which was called "Urology in Primary Care." The present book has been rewritten extensively, many new sections have been added, most of the illustrations are new, and the remarkable advances of the last several years in urologic diagnosis and management have been incorporated into the text. Notwithstanding the foregoing, however, the purpose of this book remains the same as it was for its predecessor—that is to address and to cover that body of urologic knowledge worthy of assimilation and mastery by both the medical student and primary care physician. Moreover, this book remains faithful to the basic concept of learning by specific educational objectives rather than by immersion or total inundation in the subject. This book is *not* intended to cover the entire field of urology *nor* is it intended to serve as a text or guide for the practicing urologist or urology resident.

Many medical textbook authors seek to put *all* of their knowledge into a literary effort and make no attempt at all to transmit information selectively based upon the audience for whom the book is intended. They may be motivated by a desire to be honored by their peers for having written a comprehensive text; it should not be forgotten, however, that it is generally easier to be all inclusive in a textbook than it is to discriminate selectively between items that are germane for the intended audience and those that are not. Certainly, there is no disagreement among *any* authors about the fact that the expected level of learning in urology (or any other academic discipline) is quite different for a medical student than it is for a urology resident or a practicing urologist. The problem, then, would appear to be in defining the body of knowledge (see Introduction) necessary for the medical student and then incorporating it in a text while making a conscious effort to *omit* those things that may be vitally important to the urologist but are simply not germane to the needs of the medical student.

This text, therefore, remains faithful to the earlier text in its commitment to selective learning by educational objectives while including the most recent changes and advances in urology, as well as the revisions, and the cumulative suggestions that have arisen in the 9 years of continuous use by hundreds of third-year medical students that the author has been privileged to teach. Some objectives have been reworded, others have been better combined, and still others have been brought abreast of the progress of medical science as regards diagnosis and management. Totally new in this book, since they were not included in the earlier book, are sections on the genitourinary history and physical exam and the section on diagnostic procedures has been greatly expanded to include the newer modalities that were not in use just a few short years ago. Studies such as computed tomography (CT)

scanning, ultrasonography, nuclear magnetic resonance, urodynamic examinations, and some of the newer forms of renal scanning are all noted in this section. Newer forms of diagnosis and therapy for urolithiasis and advances in chemotherapy for certain cancers are also noted.

I am most appreciative of the understanding, the patience, and the help of Dr. Robert Nelson, Dr. Lee Nyberg, and Dr. William Turner, my colleagues in the urology department at the Medical University of South Carolina. I am particularly indebted to Dr. Turner for his invaluable assistance and his suggestions in preparing the chapter in this book on Pediatric Urology.

Dr. Nancy Curry of our radiology department has been tremendously helpful in sharing her expertise in diagnostic imaging with me. I would like to thank her, as well as her radiology department colleagues, Dr. Leone Gordon and Dr. John Stanley, for their help in locating certain x-rays that were so necessary for this book. Dr. Newton C. Brackett, a member of the nephrology division and an expert in the field of hypertension, was of invaluable assistance in reading over the material in the book relating to renal and adrenal hypertension and in suggesting appropriate changes, and I would also like to thank Dr. Edmund Farrar, Dr. Joseph John, and Dr. Victor DelBene of the infectious diseases division for their gracious assistance in helping me with the material on antimicrobials and micro-organisms. Dr. C. T. Fitts, Dr. P. R. Rajagopalan, and Ms. Donna Priester of the transplantation division were most gracious and helpful in assembling the material on end-stage renal disease and transplantation. Dr. Edward Bannister of the Department of Laboratory Medicine kindly shared with me some of his slides of the urinary sediment and Dr. Richard Dobson of the Dermatology Department was equally kind in providing needed slides of certain venereal lesions.

I also acknowledge with appreciation the suggestions regarding material to be covered in the field of urodynamics that were made by Dr. David Barrett of the Mayo Clinic and Dr. Frank Hinman of the University of California at San Francisco.

I am particularly indebted to Betty Goodwin, Chief of Illustration and Design in the Division of Audio-Visual Production, for her splendid art work and to the photography section of that same division for their excellent cooperation.

Chapter 17 of this book includes an evaluation and self-assessment protocol that has been taken, almost unchanged, from the 1976 textbook for which it was originally prepared. This protocol was assembled by Ms. Donna Edison and Dr. Sara A. Sprafka, who at that time were with the Office of Medical Education, Research, and Development at Michigan State University. Donna Edison is no longer at Michigan State and is now Dr. Donna Edison, a resident in psychiatry, and Dr. Sara Sprafka, still at Michigan State University, is now in the Department of Biomechanics.

Last, but far from least I wish to express my enormous gratitude to my secretary, Mrs. Susan Pullen, whose capacity for work is remarkable and whose cheerfulness and willingness to type, retype, and again retype made the task of putting this book together infinitely more pleasant than it might otherwise have been. I thank her.

Introduction

The objective of this book is to assist the medical student and perhaps the primary care physician in the recognition, assimilation, and mastery of those aspects of urology that are necessary for good patient care. These goals are as applicable to the primary care physician as they are to the graduating medical student since neither are likely to receive any additional instruction in urology.

A comprehensive text on a given subject is often far easier to write than a book for the primary care physician or the medical student. When writing for the specialist, an author can present every bit of available and conceivable knowledge about the subject that is known to him or her. In writing for the medical student, however, using a vast and ever-expanding body of knowledge, how does the author attempt to grasp and to emphasize those items that are essential but not redundant, encompassing but not superfluous? Moreover, once the desired body of knowledge has been defined, how should it best be presented for maximum learning and, most important, for adequate evaluation as to whether it has been learned. For example, if hematuria is considered to be an essential topic, it is not sufficient merely to say that all medical students must *know* about hematuria; this is ambiguous to the learner and difficult to evaluate. Know *what* about hematuria? Medical students need to know specifics about hematuria—color, urologic and non-urologic conditions causing it, diagnostic workup, and treatment, and each of these specifics must be clearly stated.

The concepts of deriving, stating, using, and examining by educational objective is not new to the professional educator, but it is new to physicians involved in medical education and to this date there are *still* very few departments in very few medical schools that actually teach by educational objectives. These objectives in the discipline of urology (or in any other discipline) must state precisely what the medical student must be able to *do*, such as list, describe, discuss, palpate, recognize, and identify; for example, the medical student must be able to *list the causes* of hematuria originating in the bladder.

When educational objectives are clearly and thoughtfully drawn up and presented in this manner, learning is greatly enhanced because (1) the learner knows exactly what is expected of him, (2) the faculty knows exactly what it is supposed to teach; (3) if the objective is clear, the best means to reach it are more readily determined (for example, if the objective is for the physician to be able to palpate a carcinoma of the prostate gland and identify it as such, then clearly the physician should practice using patient mannequins), (4) the likelihood of redundancy and duplication in teaching efforts among departments of a medical school is decreased if each has clearly stated educational objectives, and (5) the process of evaluation is made more precise and specific—individuals are evaluated precisely on those things

deemed important enough to be educational objectives. For example, if an educational objective is to list the causes of hematuria originating in the bladder, then the evaluation of that objective simply involves taking that objective and making a question out of it. I feel that it is totally unfair to evaluate medical students on material that they have not been specifically told is subject to evaluation and it is even more unfair to evaluate medical students on material that has not been specifically covered.

Those educational objectives deemed "absolutely necessary" for every graduating medical student are clearly listed in this book at the beginning of each chapter in which those objectives are discussed and also at the very end of the book, in Chapter 17, where they will precede a self-assessment protocol that the student may study at his or her leisure. By perusing the educational objectives as each chapter is studied, the student will be aware of what he or she is expected to learn from the reading. Moreover, the material related to each educational objective is presented in such a manner that, hopefully, the learner will be able to understand the pathophysiology involved and thereby derive the answer to a given objective rather than learn it by rote.

Finally, one arrives at the key question: What material should be included in the educational objectives that have already been defined as "absolutely necessary" for every graduating medical student? Traditionally, the teaching content of medical disciplines has been developed by the professor, acting alone or in consultation with members of the full-time faculty. Commendable as these efforts have been, I feel that it is unrealistic to expect any one individual or group of individuals whose involvement with urology (or any other discipline) is exclusively academic to draw up a set of educational objectives that are applicable to every graduating medical student and will also have relevance to the real world of clinical urology as practiced by nonurologists. Academic urologists are not in an advantageous position to identify the urologic knowledge that will be necessary for the majority of medical school graduates who do not specialize in urology but who are involved in the delivery of primary health care, whether as family physicians, internists, obstetricians and gynecologists, or pediatricians.

Assuming that we train physicians for the purpose of caring for the sick, it should be the practicing primary care physician who tells us what material we should be teaching; that is, what material they have already found to be "absolutely necessary" for the successful outcome of their practice and what material they would like to know in order to better carry out their function.

Establishment of urologic objectives that are fundamental to all physicians regardless of their field of practice is a large endeavor. The starting point for determining which to present in this book was a comprehensive list of educational objectives that would cover virtually every aspect of urology up to and including material that a chief resident in urology would be happy to consider knowledge already mastered! Not included in this master list were objectives pertinent to actual surgical procedures because these are usually and properly carried out by specialists only. Also not included were objectives that could be considered as pure, basic science. A list of approximately 500 objectives was developed in this manner and then expanded upon by numerous academic urologists in an attempt to make it as comprehensive as possible. This was to be, then, the "master list" that presumably covers virtually all facets of urology (except as just noted) and from which the educational objectives necessary for the primary care physician would be derived. With the

assistance of a team of computer experts and statisticians, this master list was then randomized as follows to 2200 practicing physicians across the United States: 500 members of the American Academy of Family Physicians in private practice, 500 board-certified pediatricians in private practice, 500 board-certified internists in private practice, 500 board-certified urologists in private practice, and the entire membership (200) of the Society of University Urologists. Those objectives deemed "necessary" for every graduating medical student by 70 percent or more of all respondents, plus those objectives felt to be necessary by 70 percent or more of the family physicians (the group identifying the largest number of "necessary" objectives) made up the final list of objectives, which numbered about 160. These constituted the required urologic educational objectives for medical students and formed the basis for the earlier textbook.

Although the original list of educational objectives was derived in the mid-1970s, I am certain that they are as germane today as they were then and as they will be 10 years from now. The objectives themselves are timeless: it is only the responses to these objectives that, in many cases, have changed and will continue to change. For example, "list the symptoms of acute cystitis," or "list the preferred antimicrobials in the treatment of acute cystitis" are objectives that do not change with time. The proper responses, however, obviously *do* change and will continue to do so, and one of the main reasons for writing the present book is to make the proper "responses" to the educational objectives current. In putting the present book together, I have felt it practical to combine some of these objectives and to add some as they applied to newer and changing methods of diagnosis and treatment in urology. For example, "list the indications for a CT scan of the kidneys" is an objective that obviously could not have been derived 10 years ago, but that is most important at this time.

It is my intention to discuss these objectives in sufficient detail in this book to allow the medical student to obtain a full and genuine comprehension of their meanings. I intend also to present these objectives, either visually or in a cognitive manner, in sufficient depth that they may be mastered by the student. This mastery may then be evaluated by means of the assessment test included in this book or, alternatively, the student can convert the educational objectives into questions and test his or her understanding by attempting to answer them.

I would point out that undoubtedly there are certain subjects discussed in this book that are not listed in the master list of educational objectives because, in my opinion, these subjects are so closely related to the objectives that failure to include them would have resulted in an inadequate presentation of the subject. It is of interest to note that in the intervening years since this list of "necessary" educational objectives was derived, it has been endorsed by the Education Council of the American Urological Association as recommended core material for medical students.

Contents

<i>Preface</i>	xi
<i>Introduction</i>	xiii
1. The Diagnostic Approach to the Urologic Patient	1
Introduction/2; History/2; Physical Examination of the Genitourinary tract/5; Diagnostic Procedures/17; Radioisotope Studies/41	
2. Infection and Inflammation of the Urinary Tract	65
Introduction/66; Definitions and General Comments/66; General Considerations in Interviewing and Examining the Patient/67; Upper Tract Infection and Inflammation/68; Lower tract Infec- tion and Inflammation/79	
3. Infection and Inflammation: Gram-Negative Sepsis and Gram-Negative Shock	103
Etiology/104; Symptoms and Signs/105; Treatment/105; Summary/107	
4. Infection and Inflammation: Antibiotics	109
Most Common Microorganisms in Urologic Practice/109; Drugs of Choice/110; Culture Media for Gram-Positive Organisms and Gram-Negative Organisms/111; Long-Term Suppressive Therapy/112; Renal Failure/112; Antimicrobials/113	
5. Pediatric Urology	121
Urinary Tract Infection and Inflammation/121; Acute Glomerulonephritis/126; Hematuria/129; Abdominal Masses/129; Voiding Problems (Dysfunctional Voiding)/131; External Genitalia/132; Undescended Testicles (Cryptorchidism)/133; Valves of the Prostatic Urethra/134; Hypospadias, Chordee with Hypospadias, and Epispadias/134	

6. Malignant Neoplasms of the Genitourinary Tract	137
Cancer of the Prostate Gland/137; Cancer of the Bladder/144; Cancer of the Kidney/148; Cancer of the Testis/157; Cancer of the Penis/160	
7. Benign Prostatic Hyperplasia	161
Anatomy of the Prostate Gland/162; Surgical Treatment of BPH/163; Symptoms and Signs/164; Physical Examination/168; Diagnostic Methodology/170; Treatment/173; Psychological Con- siderations/175; Postoperative Delirium/175	
8. Stone Disease	177
Incidence/177; Etiology/178; The One-Time Stone Former/178; The Patient with Recurrent Urolithiasis/179; Evaluation of the Patient with Recurrent Urolithiasis/179; Obstruction and Infec- tion/182; Bladder Calculi/183; Diagnostic Methodology for the Patient Thought to Have Urolithiasis/184; Management of the Pa- tient with a Documented Urinary Tract Calculus/187; Examina- tion of the Recovered Stone/190; Medical Management of the Patients with Recurrent Urolithiasis/191	
9. Renal and Adrenal Hypertension and Related Adrenal Problems	195
Hypertension/195; Renal Mechanisms of Hypertension/195; Renal Artery Narrowing/196; Renal Adrenal Mechanisms of Hyperten- sion: Renin-Angiotensin—Aldosterone Axis/197; Treatment of Hypertension Caused by Renal Arterial Lesions/198; Adrenal Mechanisms/199; Diagnosis and Management of Adrenal Hypertension/201; Cortisol: Normal and Abnormal Actions/202; Adrenal Failure/203	
10. Genitourinary Tract Trauma	205
Renal Trauma/205; Trauma to the Uterer/208; Trauma to the Bladder and Urethra/210; Trauma to the Penis/213; Trauma to the Scrotum/213; Trauma to the Testis/213	
11. Intrasrotal Problems	215
Palpatory Findings/215; Torsion of the Spermatic Cord/215; Torsion of the Testicular Appendages/226; Hydrocele/228; Inguino Scrotal Hernia/231; Spermtocele/233; Varicocele/233; Hematocele/236; Carcinoma of the Testis/236	

12. Sexually Transmitted and Other Cutaneous Lesions of the External Genitalia in Males	241
Herpes Progenitalis (Genital Herpes)/241; Primary Chancere (Syphilis)/244; Chancroid/244; Lymphogranuloma Venereum/246; Granuloma Inguinale/247; Differential Diagnosis of the Diseases Producing Genital Ulcers/248; Sebaceous Cysts of the Skin of the Genitalia/249; Verrucae (Condyloma Acuminatum)/249; Cancer of the Penis/252; Balanitis and Balanoposthitis/254; Phimosis/257; Paraphimosis/258	
13. End-Stage Renal Disease, Hemodialysis, and Transplantation	261
End-Stage Renal Disease/261; Hemodialysis/262; Renal Transplantation/263	
14. Sexual Problems, Incontinence, and Fertility Regulation	267
Sexual Problems/267; Prosthesis for Incontinence/274; Fertility Regulation/275	
15. Findings and Abnormalities in Urinary Composition and Output	283
Collection/283; Refrigeration and Culturing/286; Examination of the Urine Sediment/286; Abnormalities of Urine Composition/291; Measurement of Glomerular Function/300; Abnormalities in Urine Output/303	
16. Hematuria	307
Establishing the Presence of Hematuria/307; Sites of Origin of Hematuria/307; History and Interpretation/308; Physical Examination/309; Generalities about the Causes of Hematuria/310; Asymptomatic Microscopic Hematuria/311; Checklist of Causes of Microscopic and Gross Hematuria/312	
17. Educational Objectives for Undergraduate Urology: Self-Assessment and Evaluation	313
Educational Objectives/313; Exercise No. 1/319; Exercise No. 2/321; Exercise No. 3/323; Exercise No. 4/325; Exercise No. 5/328; Exercise No. 6/331; Exercise No. 7/333; Exercise No. 8/334; Exercise No. 9/334; Exercise No. 10/337; Exercise No. 11/338; Exercise No. 12/342	
<i>Index</i>	345

1

The Diagnostic Approach to the Urologic Patient

EDUCATIONAL OBJECTIVES

1. List the various symptoms that a patient might have in connection with the following kidney diseases: infection/inflammation, stones, kidney cancer.
2. Explain specifically why each of the symptoms just listed occurs.
3. List the symptoms that a patient might have in connection with infection/inflammation of the bladder.
4. Explain why each of the symptoms just listed occurs.
5. Examine a penis and scrotum (and contents) for normalcy.
6. List the symptoms that a patient might have in connection with the following diseases of the prostate: benign enlargement, acute infection, chronic infection.
7. Explain why each of the symptoms just listed occurs.
8. Discuss the procedure to be used in attempting to palpate the kidney.
9. Explain the procedure to be followed in doing a digital rectal examination of the prostate.
10. List the specific things to be looked for in doing a digital rectal examination of the prostate.
11. Explain the significance of the bulbocavernosus reflex.
12. List the indications for an excretory urogram.
13. Recognize and identify a normal excretory urogram.
14. Explain the significance of a unilateral delay in visualization on the nephrogram phase of the excretory urogram.
15. List the indications for cystoscopy.
16. List the indications for bladder catheterization.
17. Pass a catheter into a bladder atraumatically.
18. List the indications for radioisotope studies of the kidneys (renal scanning).
19. List the indications for CT scanning of the kidneys.
20. List the indications for ultrasonography in urology.
21. List the indications for renal angiography.
22. Describe the two basic functions of the detrusor (bladder).
23. List, in broad terms, the innervation of the detrusor.
24. Discuss the location and the specific type of muscle found in each of the two urinary sphincters.
25. List the available tests that are used to quantitate voiding (urodynamics).
26. Explain and give an example to illustrate the statement that voiding dysfunction may be a result of disease processes originating outside of the urinary tract.
27. Estimate the level of anxiety of a patient over procedures involving manipulation of the genitalia.

INTRODUCTION

Urology, as much as or perhaps even more than any other discipline, consists of disease processes that produce signs and symptoms that, if accurately and properly elicited, will go far towards helping the knowledgeable physician to make an accurate diagnosis. It has often been said that one will never make a correct diagnosis unless one first thinks of it, and this truism applies to urologic disease as well as to any other. The purpose of this chapter is to familiarize the student, in the very broadest sense, with the panoply of urologic signs, symptoms, physical findings, and diagnostic procedures so that he or she will be able to sift through these in order to arrive at an appropriate differential diagnosis. The contents of this chapter and, indeed, of the rest of this book are so structured that hopefully the student will ultimately be able to take an accurate urologic history, perform a urologic physical exam, and then transmit to his or her own brain (the best computer of all) the data accumulated in order to arrive at an appropriate differential diagnosis. After this, those diagnostic studies, be they laboratory, radiographic, or other, can be utilized in the most economical manner possible to reinforce the initial differential diagnosis and, ultimately, lead to a single diagnosis. It is rare indeed in urology that one must resort to an "exploratory" operation in order to reach a diagnosis!

The broad categories of disease that can affect the genitourinary tract are no different than those diseases that can affect any other organ system or any other structure within the body. These categories are neoplasia (which includes benign as well as malignant growths), infection/inflammation (it is convenient, even if not absolutely correct etiologically to include immunologic disease in this category), tuberculosis (this category could alternatively be listed under infection/inflammation), foreign body, such as calculi, or the like, congenital, and traumatic.

The structures involved in the genitourinary tract are the kidneys, the ureters, the bladder, and the urethra in females, and all of the above structures in males, in addition to the prostate gland, the scrotum and intrascrotal contents, the ejaculatory mechanism, and the penis. If the reader becomes familiar enough with the signs and symptoms produced by the more common examples of diseases found in each of the above major disease categories in relation to the specific structure involved, then he or she will be well on the way to a logical thought process by which a given sign or symptom or a group of signs or symptoms elicited from a patient will trigger a logical, and hopefully accurate, differential diagnosis.

HISTORY

The Kidney

Signs and symptoms of the various forms of kidney disease are highly variable and may be localized to the kidney (flank pain or flank mass); they may be quite distant from the kidney (skin or subcutaneous nodules, particularly about the head and neck, which may represent metastatic renal cell cancer); or they may be suggestive of urinary tract disease in general but not specifically kidney disease (microscopic or gross hematuria).

When a patient experiences pain that is referable to the kidney it is because of a stretching of the renal capsule with its sympathetic innervation. Pain may be produced if there is parenchymal edema stretching the renal capsule (as in acute pyelonephritis) or may result from distension of the renal collecting system bringing increased pressure to bear on the renal capsule (as in a sudden hydronephrosis

that might be caused by a stone). Disease processes within the kidney that do not bring about any stretching of the renal capsule do not, generally speaking, produce any discomfort or pain referable to the kidney. If a palpable flank mass is noted by the patient, it is likely to be firm in consistency and should bring to mind the possibility of a kidney tumor. A large hydronephrosis could also conceivably be noticed by the patient and it is important to note that either of these conditions may be accompanied by flank pain or by no pain at all depending upon whether the renal capsule was stretched acutely (pain present) or chronically over a long period of time (pain absent). Most often, the flank mass is not accompanied by any particular pain although the patient may claim to be aware of a certain degree of discomfort. Generalized and systemic symptoms may be the first manifestation of renal cell cancer in that it is not unusual for this "great imitator" to present with a fever of unknown origin, metastatic skin nodules, weight loss, anorexia, anemia, or a generalized malaise. Acute glomerulonephritis may present with little else than a periorbital edema noted in the morning upon arising or an ankle edema later on in the day, although this condition will almost always additionally cause micro or gross hematuria.

Hematuria arising in the kidney may produce absolutely none of the signs or symptoms already mentioned or may be accompanied by one or more of the above findings. If blood clots pass down the ureter, these may be accompanied by moderate to severe renal colic simulating the passage of a kidney stone.

Fever, of course, is a totally nonspecific sign, although it is usually present with acute infectious processes involving the kidney such as pyelonephritis.

The foregoing is certainly not a complete listing of the signs and symptoms that can accompany any and all kidney diseases, but it does represent the most common ones and should offer students guidelines regarding those signs and symptoms about which they must ask if they are to learn as much as possible during the course of taking a good urologic history.

The Ureter

Ureteral disease produces relatively few signs and symptoms that are specific for this structure. The most important symptom is probably a colicky pain which may be caused by a calculus moving from the kidney down to the bladder. The pain will be high up in the anterior abdomen or in the flank when the calculus is in the upper ureter, it may be localized in the mid anterior abdomen when the calculus is in the middle portion of the ureter, and it will be in the lower quadrant of the abdomen when the calculus is in the lower ureter. Urgency and frequency may also be present when the stone is in the intramural portion of the ureter (just prior to passing into the bladder) and these symptoms are the ones usually produced whenever there is trigonal inflammation or irritation. If gross or microscopic hematuria originates from a lesion in the ureter, it is usually not possible to discern this from the history of hematuria alone. Obstruction to the ureter caused by an extrinsic lesion (enlarged lymph nodes) or an intrinsic lesion (a ureteral tumor) will usually produce the symptoms of kidney pain if a hydronephrosis has developed rapidly or it may produce no symptoms at all if the obstruction to the kidney has been insidious.

The Bladder

Disease processes involving the bladder generally produce symptoms that are localized to the area of the bladder and that are commonly associated with bladder disease. Suprapubic pain, for example, may be present, as may urgency, frequency,

dysuria, stranguria, or hematuria. Urgency, frequency, and dysuria usually suggest an infectious or inflammatory process within the bladder, but it may also be present in the face of bladder cancer. Suprapubic pain may be associated with infection or inflammation within the bladder or with an overdistention of the bladder because of incomplete bladder emptying. A suprapubic mass must, first of all, be considered as a distended bladder until proven otherwise. Stranguria refers to extreme pain on voiding and most often is caused by the presence of a stone in the bladder. Dysuria is pain or discomfort on voiding and is usually caused by infection/inflammation of the bladder mucosa. Gross or microscopic hematuria originating from the bladder may be accompanied by absolutely no other symptoms, in which case bladder cancer is always a major concern, or it may accompany symptoms of infection or inflammation, such as urgency, frequency, and dysuria. Incontinence of urine in an adult man is most often due to bladder outlet obstruction and a "paradoxical" or overflow incontinence. It may also be secondary to extreme urgency, as with infection and inflammation, or (in women) it may be due to a weakening of the support in the region of the bladder neck such that a "stress" incontinence results. Far less frequently is the incontinence due to any sort of neurologic problem.

The Prostate Gland

The prostate gland, the primary function of which is to produce about 90 percent of the fluid that is found in the ejaculate, can become the site of acute or chronic infection/inflammation, benign or malignant neoplasia, foreign bodies (calculi) and even traumatic injuries that may sever it, partially or completely, from the urethra at its distal margin. Perineal pain or discomfort, rectal pain or discomfort, suprapubic pain, inguinal pain, and scanty, but abnormal, urethral discharge can all be caused by chronic infection in the prostate gland or a nonbacterial engorgement of the gland. All of these symptoms plus high fever, malaise, and even acute urinary retention can be caused by an acute prostatic infection.

Hesitancy, intermittency, nocturia, frequency, incontinence, terminal dribbling, hematuria, and urgency and frequency are all symptoms associated with benign prostatic hyperplasia.

The Testes

Patients are generally not able to differentiate signs and symptoms caused by disease processes in the testis from those caused by diseases of the epididymis or the other cord structures and so these are discussed together. Although there are many different forms of intrascrotal pathology, the only ones that would present as signs or symptoms would be conditions that produce pain or enlargement. Intrascrotal pain may be acute in onset, as with torsion of the spermatic cord, or it may be more vague, with gradually increasing severity over a period of hours or even days, as with an epididymitis or an orchitis. The pain of epididymitis and of orchitis both result when the affected structures become edematous secondary to infection and the edematous tissue in turn presses against a fairly rigid capsule with its sympathetic innervation. Far more serious is the case of a patient who has detected (often by serendipity, as when showering) a mass or a swelling within the scrotal sac that is totally nontender. It is very rare that he is able to tell you if this mass or swelling is testicular or belonging to an adjacent structure, but this sign alone should alert the clinician to the absolute necessity of a careful physical examination (see below).

The Penis

The more common penile lesions are readily visible since they are on the skin of the penis although they may be completely concealed under the foreskin in uncircumcised men. A thorough urologic history usually consists simply of ascertaining whether or not the patient has ever noted any lesions on the penis; it is also prudent to inquire about any penile curvature during erection, as well as the adequacy of erections and the patient's sexual life in general. Sexual difficulties, such as erectile dysfunction, are very often the underlying reason for the patient's visit to the urologist but the patient is loathe to volunteer this information and it will only be forthcoming under direct questioning.

The Urethra

Any sort of an abnormal discharge from the urethra, be it mucoid or purulent, suggests inflammation within the urethra. Additional signs of urethral infection/inflammation can be burning, pain, and itching which the patient localizes to the urethra.

PHYSICAL EXAMINATION OF THE GENITOURINARY TRACT

The physical examination is conducted in four parts: (1) the examination of the abdomen and suprapubic area; (2) the examination of the penis and intrascrotal contents; (3) percussion of the kidneys; and (4) palpation of the prostate via digital rectal examination and repeat examination of the intrascrotal contents and inguinal canals. Note that the first and second parts of the examination are best done with the patient lying on his back, and the third part with the patient sitting up on the examining table, leaning forward. The final part of the examination (the fourth part) is best done with the patient in the standing position. It is always a good idea to wash one's hands in front of the patient before beginning the physical exam, as many patients may wonder where the physician's hands may have been just prior to his own examination. Not only will a thorough washing make the patient feel psychologically a little more comfortable but if warm water is used for this purpose the patient's physical comfort will be increased, for the physician will be placing warm (and not cold) hands on the patient during the examination.

The patient should be made comfortable lying on his back, and this may be best done by having him bring his knees up. This position relaxes the rectus abdominus muscles and softens the abdomen. It is also helpful to have the patient cross his hands on his chest: this serves the purpose of preventing him from raising his head by putting his hands behind his neck in order to see what you are doing, a maneuver that tightens the rectus abdominus muscles and makes the examination more difficult. Throughout the procedure, remember to expose only that area of the body that you are examining; this, of course, applies both to men and to women. No one likes to feel completely naked in front of a stranger.

The examination is begun with a visual inspection of the abdomen. Since the human is basically symmetrical, it is important to look for any asymmetry—any lumps, bulges, or unusual findings on one side that are not present on the other.

Palpate the abdomen with whichever hand you prefer, placing your other hand on top of the palpating hand, and use a rolling motion. This makes it possible to feel over a relatively large area with minimal changing of the position of your hand and it is also more comfortable for the patient. Feel for any abdominal masses or signs of guarding or tenderness. Guarding refers to involuntary tenseness of the rec-

tus abdominus muscles and will be present if there is any peritoneal inflammation (peritonitis) such as would result from appendicitis or other pathologic conditions within the peritoneal cavity. Peritonitis, if present, will usually cause the rectus abdominus muscle to go into spasm when it is palpated. Voluntary guarding or rigidity of the rectus abdominus muscles may also result if the patient is ticklish but it is not difficult to differentiate voluntary from involuntary guarding. If the situation is a voluntary one, it is helpful to talk to the patient in order to distract his attention as you palpate more deeply through the rectus muscle. Gradually the muscle will become softer as the patient relaxes. In contrast, the muscles that are made rigid by a true pathologic process resulting in peritonitis will not relax as you talk to the patient in an attempt to distract his attention.

Next, palpate the midline of the lower abdomen for signs of bladder distention. A distended bladder may reach all the way to the umbilicus and is often mistaken for a midline abdominal tumor. It is not unusual to obtain 1 to 2 liters of urine from a bladder in the patient who is suffering from acute urinary retention due to an enlarged and obstructing prostate. An empty bladder that is normally in a collapsed state will lie behind the symphysis pubis and will not be palpable. In a normal individual who perceives that his bladder is "full," the bladder might reach half way to the umbilicus and yield approximately 500 ml of urine should the patient's voided volume be measured. Percussion of the lower abdomen over a distended bladder will result in a dull sound, but percussion of the abdomen over a nondistended bladder will result in a more tympanitic sound because you are really percussing over loops of bowel with air in them. In other words, percussion can serve as another means of demonstrating whether or not the bladder is distended by recognizing the difference between the dull sound of percussion over fluid and the tympanitic sound of percussing over loops of bowel that are filled with air and realizing that when the bladder is empty loops of bowel will most likely be under the percussing fingers in the midline of the lower abdomen.

Next, an attempt should be made to palpate the kidneys, recognizing that in most normal individuals, neither kidney is palpable. It is extremely difficult and unusual to be able to palpate the left kidney, which lies slightly higher than the right kidney (Fig. 1-1). The left kidney is generally only palpable in an extremely thin individual or in pathologic states where there is abnormal enlargement of the kidney, particularly of the lower pole. The right kidney is palpable more often than the left one, but it is still most unusual to be able to feel it unless it is abnormally enlarged. Before beginning to palpate the kidneys, ask the patient to take a deep breath and then to slowly exhale. When the patient inhales, the kidney moves down, but the abdominal muscles also become tense, preventing adequate palpation. Therefore the best time to palpate the kidney (if it is at all palpable) is to wait until the patient exhales and then to try to trap the kidney between your hands. To do this, push up from under the 11th rib with your posterior hand and press down just under the rib cage with your anterior hand (Fig. 1-2). Use the balls of your fingers where the sensory fibres are maximal. If you use the tips of your fingers, you will not feel as well and you also run the risk of hurting the patient if your fingernails are too long. The objective is to bring the fingers of each hand as close together as possible, which obviously is more difficult in very muscular men. If you can feel any mass at all between your fingers, it is very likely kidney. The large bowel normally collapses between your fingers and should not be palpable unless the patient has some impacted barium from a recent barium enema or has very firm stools in the ascending or descending colon, which is usually not the case.