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FIFTH EDITION

CASE FILES®
Pediatrics

Eugene C. Toy, MD
Assistant Dean for Educational Programs
Professor and Vice Chair of Medical Education
Department of Obstetrics and Gynecology
University of Texas Medical School at Houston
Houston, Texas

Mark D. Hormann, MD
Associate Professor of Pediatrics
Vice Chair for Education and Training
Division of Community and General Pediatrics
Department of Pediatrics
University of Texas Medical School at Houston
Houston, Texas

Robert J. Yetman, MD
Professor of Pediatrics
Vice Chair of Clinical Operations
Director, Division of Community and General Pediatrics
Department of Pediatrics
University of Texas Medical School at Houston
Houston, Texas

Margaret C. McNeese, MD
Professor of Pediatrics
Vice Dean for Admissions and Student Affairs
Division of Community and General Pediatrics
Department of Pediatrics
University of Texas Medical School at Houston
Houston, Texas

Sheela L. Lahoti, MD
Associate Professor of Pediatrics
Associate Dean for Admissions and Student Affairs
Division of Community and General Pediatrics
Department of Pediatrics
University of Texas Medical School at Houston
Houston, Texas

Mark Jason Sanders, MD
Assistant Professor of Pediatrics
Division of Community and General Pediatrics
Department of Pediatrics
University of Texas Medical School at Houston
Houston, Texas

Abby M. Geltemeyer, MD
Assistant Professor of Pediatrics
Division of Community and General Pediatrics
Department of Pediatrics
University of Texas Medical School at Houston
Houston, Texas

Mc Graw Hill Education

New York Chicago San Francisco Athens London Madrid
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DEDICATION

To our most precious and youngest pediatric patients,
the newborn babies, and to their mothers;

To the Honorable Senator Lois Kolkhorst of Brehnam, Texas,
whose passion and dedication to our patients gave birth to the Perinatal
Advisory Council, charged with elevating the healthcare of Texans;

To my colleagues of the Perinatal Advisory Council: the talented doctors,
Drs. Briggs, Cho, Guillory, Harvey, Honrubia, Hollier, Patel, Saade, Speer,
Stanley, and Xenakis; the super-nurses, Ms. Greer, Perez, Stelly, and Torvik; and our
two brilliant hospital administrators, Mr. Harrison and Woerner;

To our amazing state staff David Williams and Matt Ferrera, and Jane Guerrero
and Elizabeth Stevenson, without whom we could not succeed;

You are all the unselfish members of a team that beats as the heart
and soul of perinatal medicine in our great state of Texas.

—Eugene C. Toy

Subha Amatya, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Slipped Capital Femoral Epiphysis

Michelle Bailey, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Nursemaid's Elbow (Subluxation of Radial Head)

Natasha Bhagwandin, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Cerebral Palsy
Rectal Bleeding

Kelly Casteel, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Klinefelter Syndrome
Megaloblastic Anemia

Nitish Chourasia, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Child Abuse
Esophageal Atresia

Mary Kate Claiborne, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Inflammatory Bowel Disease

Meghan Dupre, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Rickets

Kristin Ernest, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Concussion

Edward Espineli, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Attention Deficit Hyperactivity Disorder
Muscular Dystrophy

Brittany Faron, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Rhabdomyolysis

Keely Fitzgerald, DO
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Group B Streptococcal Infection
Growth Hormone Deficiency

Charisma Garcia, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Acute Lymphoblastic Leukemia
Lead Ingestion (Microcytic Anemia)

Hunaid Gurji, DO, PhD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Appendicitis
Ventricular Septal Defect

Sadiya Jamal, DO
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Cystic Fibrosis
Infant of a Diabetic Mother

Annie Joleen Kayanickupuram, DO
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Macrocytic Anemia (B12 Deficiency due to Short Gut Syndrome)
Pneumonia

Ana Lacarra, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Abnormal Uterine Bleeding
Subdural Hematoma

Marcelino Latina, DO
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Ambiguous Genitalia
Precocious Puberty

Farah McCorvey, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Malrotation
Posterior Urethral Valves

William Miller, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Immunodeficiency

Stacy Nayes, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Asthma Exacerbation
Sudden Infant Death Syndrome

Thao Nguyen, DO
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Acute Otitis Media
Neonatal Resuscitation

Raymond Parlar-Chun, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Truncus Arteriosus

Minal Patel, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Neuroblastoma
Retropharyngeal Abscess

Heather Peto, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Acne Vulgaris
Failure to Thrive

Christopher Reinhackel, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Adolescent Substance Use Disorder

Rebecca Sabates, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Neonatal Hyperbilirubinemia

Anita Priya Shankar, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Migraine without Aura

Mauricio Smart, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Systemic Lupus Erythematosus

Jeanene Smith, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Acute Poststreptococcal Glomerulonephritis
Bacterial Meningitis

Claudia Soler-Alfonso, MD
Fellow in Pediatric Genetics
University of Texas Medical School at Houston
Houston, Texas
Acute Epstein-Barr Virus Infection (Infectious Mononucleosis)
Bacterial Enteritis

Jane A. Stones, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Turner Syndrome

Yen X. Tran, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Obstructive Sleep Apnea Syndrome

Stephanie Treme, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Diabetic Ketoacidosis
Sickle Cell Disease with Vaso-occlusive Crisis

Shaun S. Varghese, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Complex Febrile Seizures

Jennifer Variste, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Stevens-Johnson Syndrome

Michael Wang, DO
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Kawasaki Disease
Neonatal Herpes Simplex Virus Infection

Aravind Yadav, MD
Fellow in Pediatric Pulmonology
University of Texas Medical School at Houston
Houston, Texas
Transient Tachypnea of the Newborn

Yaxi Zeng, MD
Pediatric Resident
University of Texas Medical School at Houston
Houston, Texas
Congenital Cataracts

PREFACE

We appreciate all the kind remarks and suggestions from the many medical students over the past 3 years. Your positive reception has been an incredible encouragement, especially in light of the short life of the *Case Files*® series. In this fifth edition of *Case Files*®: *Pediatrics*, the basic format of the book has been retained. Improvements were made in updating many of the sections, including grouping of the cases in a more logical order for students to more easily cross-reference cases. We have also used case correlations to assist further. We reviewed the clinical scenarios and revised several of them, keeping their "real-life" presentations patterned after actual clinical experience. The multiple-choice questions have been carefully reviewed and rewritten to ensure that they comply with the National Board and USMLE format, and added an entire new section of Review Questions (Section IV) for the student to test their knowledge after reading the book. Through this fifth edition, we hope that the reader will continue to enjoy learning how to diagnose and manage patients through the simulated clinical cases. It certainly is a privilege to be teachers for so many students, and it is with humility that we present this edition.

The Authors

ACKNOWLEDGMENTS

The clerkship curriculum that evolved into the ideas for this edition was inspired by two talented and forthright students, Philbert Yao and Chuck Rosipal, who have since graduated from medical school. It has been a tremendous joy to work with the excellent pediatricians at the University of Texas Medical School at Houston. I am greatly indebted to my editor, Catherine Johnson, whose exuberance, experience, and vision helped to shape this series. I appreciate McGraw-Hill's believing in the concept of teaching through clinical cases, and I would like to especially acknowledge Catherine Saggese for her production expertise, Cindy Yoo for her editorial guidance, and Anupriya Tyagi for her excellent production skills. At the University of Texas Medical School at Houston, we appreciate Giuseppe N. Colasurdo, MD and president of the University of Texas Health Sciences Center for his support and dedication to student education. Without the encouragement from my chairman Dr. Sean Blackwell, a wonderful clinician, administrator, scientist, and leader, and Dr. Patricia Butler, Vice Dean for Educational Programs, who inspires us all to be excellent educators, I could not have succeeded in this endeavor. Most of all, I appreciate my ever-loving wife Terri, and my four wonderful children Andy, Michael, Allison, and Christina, for their patience and understanding in the writing process.

Eugene C. Toy, MD

Mastering the cognitive knowledge within a field such as pediatrics is a formidable task. It is even more difficult to draw on that knowledge, procure and filter through the clinical and laboratory data, develop a differential diagnosis, and finally form a rational treatment plan. To gain these skills, the student often learns best at the bedside, guided and instructed by experienced teachers, and inspired toward self-directed, diligent reading. Clearly, there is no replacement for education at the bedside. Unfortunately, clinical situations usually do not encompass the breadth of the specialty. Perhaps, the best alternative is a carefully crafted patient case designed to stimulate the clinical approach and decision making. In an attempt to achieve that goal, we have constructed a collection of clinical vignettes to teach diagnostic or therapeutic approaches relevant to pediatrics. Most importantly, the explanations for the cases emphasize the mechanisms and underlying principles, rather than merely rote questions and answers. This book is organized for versatility. It allows the student "in a rush" to go quickly through the scenarios and check the corresponding answers, while allowing the student who wants more thought-provoking explanations to go at a more measured pace. The answers are arranged from simple to complex: a summary of the pertinent points, the bare answers, an analysis of the case, an approach to the topic, a comprehension test at the end for reinforcement and emphasis, and a list of references for further reading. The clinical vignettes are purposely placed in random order to simulate the way that real patients present to the practitioner. A listing of cases is included in Section III to aid the student who desires to test his or her knowledge of a specific area or who wants to review a topic, including basic definitions. Finally, we intentionally did not primarily use a multiple-choice question format in our clinical case scenarios because clues (or distractions) are not available in the real world. Nevertheless, several multiple-choice comprehension questions are included at the end of each case discussion to reinforce concepts or introduce related topics.

HOW TO GET THE MOST OUT OF THIS BOOK

Each case is designed to simulate a patient encounter with open-ended questions. At times, the patient's complaint is different from the most concerning issue, and sometimes extraneous information is given. The answers are organized into four different parts:

PART I

1. **Summary:** The salient aspects of the case are identified, filtering out the extraneous information. Students should formulate their summary from the case before looking at the answers. A comparison to the summation in the answer will help to improve their ability to focus on the important data while appropriately discarding the irrelevant information—a fundamental skill in clinical problem solving.

2. A straightforward **Answer** is given to each open-ended question.
3. The Analysis of the case is composed of two parts:
   a. **Objectives:** A listing of the two or three main principles that are crucial for a practitioner to manage the patient. Again, the students are challenged to make educated "guesses" about the objectives of the case upon initial review of the case scenario, which helps to sharpen their clinical and analytical skills.
   b. **Considerations:** A discussion of the relevant points and brief approach to the specific patient.

PART II

Approach to the disease process consists of two distinct parts:

a. **Definitions:** Terminology pertinent to the disease process.
b. **Clinical Approach:** A discussion of the approach to the clinical problem in general, including tables, figures, and algorithms.

PART III

Comprehension Questions: Each case contains several multiple-choice questions, which reinforce the material or introduce new and related concepts. Questions about material not found in the text have explanations in the answers.

PART IV

Clinical Pearls: Several clinically important points are reiterated as a summation of the text. This allows for easy review, such as before an examination.

SECTION I

How to Approach Clinical Problems

Part 1 Approach to the Patient

Part 2 Approach to Clinical Problem Solving

Part 3 Approach to Reading

Part 1. Approach to the Patient

The transition of information from the textbook or journal article to the clinical situation is perhaps the most challenging in medicine. Retention of information is difficult; organization of the facts and recall of myriad data to apply to the patient are crucial. This text aids in the process. The first step is gathering information, otherwise known as establishing the database. This consists of taking the history (asking questions), performing the physical examination, and obtaining selective laboratory and/or imaging tests.

The history is the single most important method of establishing a diagnosis. Depending on the age of the child, the information may be gathered solely from the parent, from both the parent and the child, or solely from the adolescent. The student should remember not to be misled by the diagnosis of another physician or by a family member. A statement such as "Johnnie has pneumonia and needs antibiotics" may or may not be correct; an astute clinician will keep an open mind and consider other possibilities, such as upper respiratory tract infection, aspirated foreign body, reactive airway disease, or even cystic fibrosis. The art of seeking the information in a nonjudgmental, sensitive, and thorough method cannot be overemphasized.

HISTORY

1. **Basic information:**
   a. **Age, gender, and ethnicity** are important because some childhood illnesses occur with increased regularity at various ages, with higher frequency in one gender or more commonly in one ethnic group. For instance, anorexia nervosa is more common in white adolescent females, whereas complications of sickle cell anemia are more common in African American children of both genders.

2. **Chief complaint:** This is usually the response that the patient or the patient's family member gives to the question: "Why are you seeing the doctor today?"

3. **History of present illness:** The onset, duration, and intensity of the primary complaint, as well as associated symptoms, exacerbating and relieving factors, and previous attempts at therapy should be determined. For children, especially adolescents, a hidden agenda must be considered; **it is not uncommon for the adolescent to actually have questions about sexuality when the stated reason for the office visit is totally unrelated.** Both positive findings (the stool was loose, voluminous, and foul smelling) and negative findings (without blood or mucus) are appropriate.

4. **Past history:**
   a. **Pregnancy and delivery:** The age of the mother, the number of pregnancies, the route of delivery, and the gestational age of the infant often can provide clues as to the etiology of pediatric conditions. For instance, a large, full-term infant born by cesarean delivery who then develops an increased

respiratory rate and streakiness on chest radiograph is more likely to have **transient tachypnea of the newborn** than is an infant born vaginally at 28-week gestation with similar symptoms where a diagnosis of surfactant deficiency is the more likely cause of respiratory symptoms. Similarly, a history of drug use (including over-the-counter, prescription, and illicit drugs) or infections during pregnancy should be obtained.

b. **Neonatal history:** Any problems identified in the neonatal period, such as severe jaundice, infections, feeding difficulties, and prolonged hospitalization, should be reviewed, especially for the younger pediatric patients in whom residua of these problems may remain.

c. **Surgical history:** When, where, and for what reason the surgery was performed should be explored. Complications should be noted.

d. **Medical history:** Whereas minor illnesses (such as occasional upper respiratory infections) can be reviewed quickly, more serious illnesses (such as diabetes mellitus) should be investigated fully. The age at diagnosis, treatments prescribed, and response to therapies can be reviewed. The number and nature of hospitalizations and complications are often important. For instance, a diabetic patient with frequent hospitalizations for ketoacidosis may indicate a lack of education of the family or underlying psychosocial issues complicating therapy. A child with a history of frequent, serious accidents should alert the physician of possible child abuse.

e. **Developmental history:** For preschool children, a few questions about **language and fine motor, gross motor, and psychosocial skills** will provide good clues about development. For school-aged children, school performance (grades) and areas of strength and weaknesses are helpful.

5. **Allergies:** Reactions to medications should be recorded, including severity and temporal relationship to medications.

6. **Immunizations:** Dates for primary and booster series of immunizations should be recorded, preferably by reviewing the immunization cards or accessing the state's immunization registry. If the child is in school, a presumption about state laws regarding immunization completion can be made while the immunization card is being retrieved.

7. **Medications:** List the names of current medications, dosages, routes of administration and frequency, and durations of use. Prescription, over-the-counter, and herbal remedies are relevant.

8. **Sexual history of adolescents:** Details of an adolescent's sexual habits, contraceptive use, pregnancies, and sexually transmitted diseases should be determined.

CLINICAL PEARL

- The adolescent must be treated with sensitivity, respect, and confidentiality to foster the optimal environment for medical care.

9. **Family history:** Because many conditions are inherited, the ages and health of siblings, parents, grandparents, and other family members can provide important diagnostic clues. For instance, an obese child with a family history of adult-onset diabetes is at high risk for developing diabetes; early intervention is warranted.
10. **Social history:** Living arrangements, economic situations, type of insurance, and religious affiliations may provide important clues to a puzzling diagnostic case or suggest important information about the acceptability of therapeutic options.
11. **Review of systems:** A few questions about each of the major body systems allows the practitioner to ensure that no problems are overlooked and to obtain crucial history about related and unrelated medical conditions.

Physical Examination

1. **General appearance:** Well versus poorly nourished; evidence of toxemia, including lethargy (defined as poor or absent eye contact and refusal to interact with environment), signs of poor perfusion, hypo- or hyperventilation, and cyanosis; or stigmata of syndromes (such as Down or Turner).
2. **Skin:** In smaller children, checking the color of the skin for evidence of pallor, plethora, jaundice, or cyanosis is important. Abnormalities such as capillary hemangiomas (eg, "stork bites" in a newborn), café-au-lait spots, pigmented nevi (eg, "Mongolian spots"), erythema toxicum, or pustular melanosis can be identified. In older children, macules, papules, vesicles, pustules, wheals, and petechiae or purpura should be described, and evidence of excoriation, crust formation, desquamation, hyperpigmentation, ulceration, scar formation, or atrophy should be identified.
3. **Vital signs:** Temperature, blood pressure (generally begin routine measurement after 3 years), heart rate, respiratory rate, height, weight, and head circumference (generally measured until age 3 years). Measurements are plotted and compared to normals for age.
4. **Head, eyes, ears, nose, mouth and throat:**
   a. **Head:** For the neonate, the size of fontanelles and presence of overriding sutures, caput succedaneum (superficial edema or hematoma that crosses suture lines, usually located over crown), or cephalohematoma (hematoma that does not cross suture lines) should be noted. For the older child, the size and shape of the head as well as abnormalities such as swellings, depressions, or abnormal hair quality or distribution may be identified.
   b. **Eyes:** For infants, abnormalities in the size, shape, and position of the orbits, the color of the sclera (blue sclera, for instance, may indicate osteogenesis imperfecta), conjunctival hemorrhages, or the presence of iris defects (such as coloboma) may be found. The visual acuity of older children should be determined.

c. **Ears:** For all children, abnormalities in the size, shape, and position of the ears can provide important diagnostic clues. Whereas tympanic membranes are difficult to assess in newborns, their integrity should be assessed in older children. For all children, the quality and character of discharge from the ear canal should be documented.

d. **Nose:** The size, shape, and position of the nose (in relation to the face and mouth) can provide diagnostic clues for various syndromes, such as a small nose in Down syndrome. Patency of the nostrils, especially in neonates who are obligate nose breathers, is imperative. Abnormalities of the nasal bridge or septum, integrity of the mucosa, and the presence of foreign bodies should be noted. A butterfly rash around the nose can be associated with systemic lupus erythematosus (SLE), and a transverse crease across the anterior portion of the nose is seen with allergic rhinitis.

e. **Mouth and throat:** The size, shape, and position of the mouth and lips in relation to other facial structures should be evaluated. In infants, common findings of the mouth include disruption of the palate (cleft palate syndrome), Epstein pearls (a tiny white papule in the center of the palate), and short frenulum ("tongue-tied"). For all children, the size, shape, and position of the tongue and uvula must be considered. The number and quality of teeth for age should be assessed, and the buccal mucosa and pharynx should be examined for color, rashes, exudate, size of tonsils, and symmetry.

5. **Neck:** The neck in infants usually is short and sometimes hard to evaluate. Nonetheless, the size, shape, and preferred position of the neck can be evaluated for all children. The range of motion can be evaluated by gentle movement. Symmetry of the muscles, thyroid gland, veins, and arteries is important. An abnormal mass, such as a thyroglossal duct cyst (midline above the level of the thyroid) or brachial cleft cyst (along the sternomastoid muscle), or unusual findings, such as webbing in Turner syndrome, can be identified.

6. **Chest:** General examination of the chest should include an evaluation of the size and shape of the structures along with identification of obvious abnormalities (such as supernumerary nipples) or movement with respirations. **Respiratory rate varies according to age** and ranges from 40 to 60 breaths/min in the neonate to 12 to 14 breaths/min in the toddler. **The degree of respiratory distress can be stratified, with increasing distress noted when the child moves from subcostal to intercostal to supraclavicular to suprasternal retractions.** Palpation of the chest should confirm the integrity of the ribs and clavicles, and any swelling or tenderness in the joints. Percussion in older children may reveal abnormalities, especially if asymmetry is noted. The chest should be auscultated for air movement, vocal resonance, rales, rhonchi, wheezes, and rubs. In adolescent girls, symmetry of breast development and presence of masses or nipple discharge should be evaluated.

7. **Cardiovascular:** The precardium should be inspected for abnormal movements. The chest should be palpated for the location and quality of the cardiac impulse, and to determine if a thrill is present. The presence and quality of the

first and second heart sounds, including splitting with respirations, should be noted. Murmurs, clicks, rubs, and abnormalities in the heart rate (which vary by age) or rhythm should be identified. The peripheral perfusion, pulses, and color should be assessed.

8. **Abdominal examination:** The abdomen should be inspected to determine whether it is flat or protuberant, if masses or lesions such as striae are obvious, or if pulsations are present. In older children, the abdomen usually is flat, but in the neonate a very flat abdomen in conjunction with respiratory distress may indicate diaphragmatic hernia. The umbilicus, especially for neonates, should be evaluated for defects, drainage, or masses; a small umbilical hernia often is present and is normal. In the newborn, one umbilical vein and two umbilical arteries are normal. **In the neonate, palpation of the abdomen may reveal a liver edge about 2 cm below the coastal margin, a spleen tip, and using deep pressure, kidneys.** In older children, these structures are not usually palpable except in pathology. Depending on the history, other masses must be viewed with suspicion for a variety of conditions. Bowel sounds are usually heard throughout the abdomen except in pathology. In adolescent girls, the lower abdomen should be palpated for uterine enlargement (pregnancy).

9. **Genitalia:** Examination of the male for the size and shape of the penis, testicles, and scrotum is important. The position of the urethral opening should be assessed. In newborn girls, the labia majora usually is large and completely encloses the labia minora; the genitalia usually is highly pigmented and swollen with an especially prominent clitoris. A white discharge is usually present in the first days of life, and occasionally a blood-tinged fluid is also seen. In toddlers, examination of the genitalia can be challenging. Placing the toddler in a frog-leg position while the toddler sits in the parent's lap (or on the examination table) often allows successful viewing of external genitalia. In older girls, the knee-chest position affords an excellent view of the external genitalia. In girls outside the newborn period, the labia minora are smaller compared to the remainder of the external genitalia, and the vaginal mucosa is red and appears thin. The hymen, which is just inside the introitus, should be inspected. Abnormalities of the hymen, such as imperforation or tags, vaginal discharge, foreign bodies, and labial adhesions, may be noted. A speculum examination should be performed for sexually active adolescent girls. Tanner staging for pubertal development should be done for both boys and girls. Inguinal hernias should be identified; normalcy of anus should be confirmed.

10. **Extremities:** For all children, the size, shape, and symmetry of the extremities should be considered; muscle strength should be evaluated. Joints may be investigated for range of motion, warmth, tenderness, and redness. Normalcy of gait for age should be reviewed. For infants, recognition of dislocated hips is of critical importance, because lifelong growth abnormalities may result. For adolescents, identification of significant scoliosis is important to prevent the debilitating complications of that condition. Athletes require evaluation of the integrity of their joints, especially those joints that will be used in sporting activities.

11. **Neurologic:** Neurologic evaluation of the older child is similar to that in adults. Consciousness level and orientation are determined as a starting point. The cranial nerves should be assessed. The motor system should be evaluated (including strength, tone, coordination, and involuntary movements). Superficial and deep sensory systems, and deep tendon reflexes should be reviewed. **In younger infants, a variety of normal primitive reflexes (Moro, parachute, suck, grasp) can be found, but ensuring that these reflexes have extinguished by the appropriate age is equally important.**

LABORATORY ASSESSMENT

The American Academy of Pediatrics recommends a few laboratory screening tests be accomplished for pediatric patients. These tests vary according to the child's age and risk factors.

1. **Newborn metabolic screening** is done in all states, usually after 24 hours of age, but the exact tests performed vary by state. Conditions commonly screened for include hypothyroidism, phenylketonuria, galactosemia, hemoglobin type, and adrenal hyperplasia. Other conditions that may be assessed include maple syrup urine disease, homocystinuria, biotinidase deficiency, cystic fibrosis, tyrosinemia, and toxoplasmosis. Some states require a second newborn screen be performed after 7 days of age.
2. **Measurement of oxygen saturation** in all newborn infants is accomplished to assess for critical congenital heart defects.
3. **Hemoglobin or hematocrit levels** are recommended for high-risk infants (especially premature infants and those with low birth weight), at about 12 months of age, and as needed yearly if the risk of blood loss (such as menstruating adolescents) is high.
4. **Lead screening** is done, especially in high-risk areas, at 9 to 12 months of age and again at 2 years of age.
5. **Cholesterol screening** is performed in high-risk patients (those with positive family histories) older than 24 months.
6. **Sexually transmitted disease screening** is performed yearly on all sexually active patients.

Other specialized testing is accomplished depending on the child's age, risk factors, chief complaint, and conditions included in the differential diagnosis.

IMAGING PROCEDURES

1. **Plain radiographs** offer the advantage of inexpensive testing that reveals global views of the anatomy. Unfortunately, fine organ detail sometimes is not revealed which requires further radiographic study. Bone films for fracture, chest films for pneumonia, and abdomen films for ileus are common uses of this modality.

2. **Ultrasonography** is a fairly inexpensive modality that requires little or no sedation and has no radiation risks. It offers good organ and anatomic detail, but it can be operator dependent. Not all organs are accessible to sonography. Common examinations include the head for intraventricular hemorrhage (IVH) in the premature infant, the abdomen for conditions such as pyloric stenosis or appendicitis, and the kidneys for abnormal structure.
3. **Computerized tomography** (CT) provides good organ and anatomic detail and is quick, but it is fairly expensive, may require contrast, and does involve radiation. Some children require sedation to complete the procedure. This test is often performed on the abdomen or head in trauma victims.
4. **Magnetic resonance imaging** (MRI) is expensive but does not involve radiation. Because it is a slow procedure, sedation is often needed for younger children, and contrast is sometimes required. It allows for superb tissue contrast in multiple planes, and excellent anatomic and functional imaging. It is frequently used to provide detail of the brain in patients with seizures or developmental delay, or to provide tissue detail on a mass located virtually anywhere in the body.
5. **Nuclear scan** is moderately expensive and invasive. It provides functional information (usually organ specific) but poor anatomic detail. Radiation is involved. Common uses include bone scans for infection and renal scans for function.

Part 2. Approach to Clinical Problem Solving

There are generally **four steps** to the systematic solving of clinical problems:

1. Make the diagnosis.
2. Assess the severity of the disease.
3. Render a treatment based on the stage of the disease.
4. Follow the response to the treatment.

MAKING THE DIAGNOSIS

This is achieved with careful sifting of the database, analysis based on the risk factors present, and development of a list of possibilities (the differential diagnosis). The process includes knowing which pieces of information are more meaningful and which can be discarded. Experience and knowledge from reading help to guide the physician to key in on the most important concerns. **A good clinician also knows how to ask the same question in several different ways and using different terminology,** because patients at times will deny having been treated for asthma but will answer affirmatively to being hospitalized for wheezing. A diagnosis can be reached by systematically reviewing each possible cause and reading about each disease. The patient's presentation is then matched up against each of these possibilities and either placed higher up on the list as a potential etiology or lower down because

of the disease frequency, the patient's presentation, or other clues. A patient's risk factors may influence the probability of a diagnosis. Usually a long list of possible diagnoses can be pared down to two or three top suspicions, based on key laboratory or imaging tests. For example, an adolescent presenting with a fever as the chief complaint can have an extensive differential diagnosis reduced to far fewer possibilities when the history reveals an uncle in the home with cough that contains blood, weight loss, and night sweats, and the physical examination shows an increased respiratory rate, lymphadenopathy, and right lower lobe lung crackles. In this case, the patient likely has tuberculosis.

ASSESSING THE SEVERITY OF THE DISEASE

The next step is to characterize the severity of the disease process. In asthma, this is done formally based on guidelines promulgated by the National Heart, Lung, and Blood Institute (NHLBI). Asthma categories range from mild intermittent (least severe) to severe persistent (most severe). For some conditions, such as syphilis, the staging depends on the length of time and follows along the natural history of the infection (ie, primary, secondary, or tertiary syphilis).

RENDERING TREATMENT BASED ON THE STAGE OF THE DISEASE

Many illnesses are stratified according to severity because prognosis and treatment vary based on the severity. If neither the prognosis nor the treatment was affected by the stage of the disease process, it would not make much sense to subcategorize something as mild or severe. As an example, mild intermittent asthma poses less danger than does severe persistent asthma (particularly if the patient has been intubated for asthma in the past). Accordingly, with mild intermittent asthma, the management would be intermittent short-acting β-agonist therapy while watching for any worsening of the disease into more serious categories (more severe disease). In contrast, a patient with severe persistent asthma would generally require short-acting β-agonist medications as well as long-acting β-agonists, inhaled steroids, and potentially oral steroids.

Group A β-hemolytic streptococcal pharyngeal infection ("strep throat") is associated with complications including poststreptococcal glomerulonephritis and rheumatic fever. The presence of group A β-hemolytic streptococcus confers an increased risk of problems, but neither the prognosis nor the treatment is affected by "more" group A β-hemolytic streptococcus or "less" group A β-hemolytic streptococcus. Hence, **the student should approach new disease by learning the mechanism, clinical presentation, how it is staged, and how the treatment varies based on stage.**

FOLLOWING THE RESPONSE TO TREATMENT

The final step in the approach to disease is to follow the patient's response to the therapy. **Whatever the "measure" of response, it should be recorded and monitored.** Some responses are clinical, such as a change in the patient's pain level or temperature, or results of pulmonary examination. Obviously the student must