

ADVANCED HEALTH ASSESSMENT & CLINICAL DIAGNOSIS IN PRIMARY CARE

7TH
EDITION

JOYCE E. DAINS
LINDA CIOFU BAUMANN
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Finally, we want to express our profound appreciation for those students, faculty, and clinicians who have discovered and used this book, for those who have shared their enthusiasm with us, and for those who have offered helpful suggestions and comments that have enhanced the content of this text. Thank you.

*Joyce E. Dains
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Introduction

This text is designed for students and beginning clinicians who will be using history and physical examination skills in primary care settings. Its purpose is to take the student to the “next step” of health assessment, that is, beyond basic history and physical examination to using a diagnostic reasoning process. The book is intended to fill the gap between basic physical examination texts and the medical texts that are aimed primarily at disease management. It is not intended as a substitute for a clinical management text, nor does it address management of disorders or diseases. Rather, it is designed specifically to focus on the clinical evaluation of common problems that present in primary care settings using the tools of history and physical examination to engage in the process of clinical diagnosis.

The seventh edition of this text has several changes to further assist the transition to that “next step” of health assessment. The chapter on care of transgender patients (Chapter 42) has been substantially updated to ensure inclusion of gender-diverse people and the most up-to-date content. This edition has three new chapters. The chapter on contemporary approaches in primary care (Chapter 3) describes the evolving application of public health science and perspectives to clinical reasoning in primary care settings, as well as the use of technology. Consistent with the rest of the text, a new chapter on scrotal pain and masses (Chapter 32) provides health history questions and physical examination considerations to guide in the differential diagnosis. A chapter on veterans’ health (Chapter 43) guides history questions designed to screen for common health concerns of military veterans. We continue to include *Evidence-Based Practice* boxes in each chapter, and we have added new boxes and updated many of the previous boxes.

The focus of *Advanced Health Assessment* is primary care patients. Both adults and children are included, with divergence in questions, examination, or interpretation of findings noted when pertinent. This text does not attempt to address all possible patient concerns, but rather seeks to focus on the most common concerns as exemplars of the diagnostic reasoning process.

HOW TO USE THIS BOOK

Each chapter is structured in the context of a commonly occurring chief concern rather than a specific diagnosis or disease entity. Patients generally seek care for relief of symptoms and undiagnosed conditions. The initial challenge for primary care providers is to begin the process of differential diagnosis to determine the cause of a problem based on history and physical examination and laboratory and other diagnostic tests. However, the steps of the diagnostic reasoning process are seldom articulated in a sequence that reflects the clinician’s thought process. Novice clinicians are often left to their own devices to figure out, for example, which history questions are the most important, which should be asked first, and which can be left for later, or to determine which parts of the physical examination must be done as opposed to which will yield little information for a given concern. This text tries to articulate the reasoning process, order the history questions in a meaningful way, and focus the physical examination for a specific chief concern.

The diagnostic or clinical reasoning process is woven into each presenting problem. Each symptom begins with a brief introduction, providing an overview of causative mechanisms and processes. The clinical problem-solving process begins with *Focused History*, which walks through the thinking

process involved in obtaining a pertinent, relevant, problem-specific history that will assist with differential diagnosis. The section is designed around questions that experienced clinicians ask themselves to order and organize the questions to be asked of the patient. These “self-questions” are structured according to what information the clinician needs first or most immediately about the presenting complaint, followed by self-questions that help sort through the possible differential diagnoses. The content and order of the self-questions vary, depending on the presenting problem. Sometimes the self-questions are based on what the condition is most likely to be; sometimes they are based on what is too important to miss.

For each of the self-questions there is a list of *Key Questions* to ask the patient, or about the patient if a family member is giving the history. The *Key Questions* are followed by an interpretation or explanation of what the patient responses might signify. For ease of format, the *Key Questions* are written as though the clinician were addressing the patient. Certainly, with young children and sometimes with adults, the clinician will be asking questions of another person about the patient. The intent is to convey what questions to ask rather than to provide every possible format for each question.

Following these two sections is the *Focused Physical Examination* section. It instructs you in what focused physical examination to perform to assist the diagnostic process. The section is not intended to teach

basic physical examination; it assumes you know how, using the techniques of inspection, auscultation, percussion, and palpation. This section, rather, provides focus for the examination, explains how to do more advanced maneuvers, and offers an interpretation of the findings.

Following is the section titled *Laboratory and Diagnostic Studies*. This section provides a brief outline of what kinds of laboratory or diagnostic studies would be appropriate for the chief concern or suspected diagnosis. Because the goal of the text is clinical diagnosis, the laboratory and diagnostic studies included are those that would be a logical starting point, although perhaps not an ending point.

The final section of each presenting concern is the *Differential Diagnosis*. It contains the most common differential diagnoses for the chief concern and summarizes, in a narrative format, the history and physical examination findings, along with the laboratory and diagnostic studies indicated. The section finishes with one or more *Differential Diagnosis* tables, mirroring the narrative summary, which can be used as a quick reference. An index to the *Differential Diagnosis* tables is provided in the text inside the back cover.

Perfecting advanced health assessment skills is a lifelong endeavor. It is our hope that this edition continues to assist you in expanding the diagnostic reasoning process.

Joyce E. Dains
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CHAPTER

1

Clinical Reasoning, Evidence-Based Practice, and Symptom Analysis

Basic health assessment involves the application of the practitioner's knowledge and skills to identify and distinguish normal from abnormal findings. Basic assessment often moves from a general survey of a body system to specific observations or tests of function. Such an approach to assessment and clinical decision making uses a deductive process of reasoning. For example, a specialist examining a patient with known hyperthyroidism would conduct a physical examination to test for deep tendon reflexes. Brisk or hyperreflexic reflexes would lead the practitioner to conclude that a hyperthyroid state is a likely cause of these findings. This would greatly narrow the choices of diagnostic tests and treatment decisions.

Advanced assessment builds on basic health assessment yet is performed more often using an inductive or inferential process (i.e., moving from a specific physical finding or patient concern to a more general diagnosis or possible diagnoses based on history, physical findings, and the results of laboratory and diagnostic tests). The practitioner gathers further evidence and analyzes this evidence to arrive at a hypothesis that will lead to a further narrowing of possibilities. This is known as the process of diagnostic reasoning.

DIAGNOSTIC REASONING

Diagnostic reasoning is a scientific process in which the practitioner suspects the cause of a patient's symptoms and signs based on previous knowledge. The practitioner gathers relevant information, selects necessary tests, makes an accurate diagnosis, and recommends therapy. The difference between an average and an excellent practitioner is the speed and

focus used to arrive at the correct conclusion and initiate the best course of evidence-based treatment with minimum harm, cost, inconvenience, and delay. This expertise of the practitioner is acquired through knowledge and a skill set developed through experience in clinical practice. Repeated practice with real cases helps to develop memory schemes for relating clinical problems and store them in long-term memory.

By using diagnostic reasoning, the practitioner is able to accomplish the following:

- Determines and focuses on what needs to be asked, what data need to be obtained, and what needs to be examined
- Performs examinations and diagnostic tests accurately
- Clusters all pertinent findings
- Analyzes and interprets the findings
- Develops a list of likely or differential diagnoses

THE DIAGNOSTIC PROCESS

The Primary Care Context

The process of assessment in the primary care setting begins with the patient or caregiver stating a reason for the visit or a chief concern. Most contacts with primary care providers involve concerns or symptoms presented by the patient, such as an earache, vomiting, or fatigue. The initial evidence is collected through a patient history. Demographic information, such as gender, age, occupation, and place of residence, is obtained to place the patient in a risk category that may rule out certain diagnoses immediately. In most primary care settings, routine vital signs are obtained, such as height and weight, temperature, pulse, respiratory rate, blood pressure,

last menstrual period, and smoking status. While obtaining the history, the practitioner also makes observations of the patient's appearance, interaction with family members, orientation, and mental and physical condition. The practitioner notes any unusual presentations that could help to focus the assessment process.

Symptom Analysis

Presenting symptoms need to be explored with further questions. One useful mnemonic for gathering this information is COLDSPA.

Character: How does it feel, look, smell, sound?

Onset: When did it start?

Location: Be specific. Where is it? Does it radiate?

Duration: How long does it last? Does it recur?

Severity: How do you rate your pain on a scale from 0 (no pain) to 10 (worst pain I have ever had)?

Pattern: What makes it better? What makes it worse? What have you done and did it help?

Associated factors: What other symptoms do you have? How much does it interfere with your usual activities?

Another mnemonic is OLDCARTS: **onset**, **location**, **duration**, **character**, **aggravating** or **associated factors**, **relieving factors**, **temporal factors**, and **severity**.

Information can also be gleaned from the review of systems. A final step is to ask about the patient's or caregiver's perception of the meaning of the symptom(s). The practitioner then clusters the information into logical groups based on prior knowledge of symptom clusters associated with specific diagnoses or body systems. At the conclusion, the history of the presenting concerns should give the practitioner a good idea of the most likely differential diagnoses. These hypotheses may be further strengthened during the physical examination.

Performing a Physical Examination

Physical examination may be conducted as a complete head-to-toe examination or as a focused or localized examination that emphasizes the body or organ systems most likely affected by the patient's presenting symptoms.

Formulating and Testing a Hypothesis

The practitioner then formulates a hypothesis based on expertise and knowledge of possible pathologic, physiologic, or psychological processes. Further interpretation of evidence refines the hypothesis to a working or probable diagnosis. Hypothesis generation begins during the assessment of the patient's age, gender, race, appearance, and presenting problem. Age is often the most significant variable in narrowing the probabilities of a problem. Hypothesis generation forms the context in which further data are collected. This context includes the setting in which care is delivered, such as in a hospital, in an outpatient setting, or in another community-based setting where more than a single individual could be affected. Clinical decision making can be filled with uncertainty and ambiguity. Because available evidence is almost never complete, hypothesis formation involves some element of subjective judgment.

The hypothesis must then be tested and assessed for the following characteristics.

- **Coherence:** Are the physiologic links, predisposing factors, and complications for this disease present in the patient?
- **Adequacy:** Does the suspected disease encompass all of the patient's normal and abnormal findings?
- **Parsimony:** Is it the simplest explanation of the patient's findings? The surest way to make this determination is to ask the patient or the caregiver the reason for seeking care and the current understanding of the problem and possible treatment options. This is a crucial step because patients must find the treatment recommendation acceptable.
- **Diagnostic probability:** Is the diagnosis confirmed by radiographic or laboratory tests? A rational diagnostic hypothesis is one that, if confirmed by the select tests, limits the need for additional confirmation.
- **Eliminate a competing hypothesis:** What other diseases could explain the patient's symptoms?

To confirm the hypothesis, the practitioner establishes a "most likely" diagnosis as a basis for a treatment plan and evaluates the outcome. The goal of a clinical decision is to

choose an action that is most likely to result in the health outcomes the patient desires. This step of the decision-making process involves personal preference as to whether the benefits outweigh the harms involved, whether the cost is reasonable, and whether the most desired outcomes are short or long term.

Practitioners make extensive use of heuristics, or rules of thumb, to guide the inductive or inferential process of diagnostic reasoning. Heuristics are generally accurate and useful rules to make the task of information gathering more manageable and efficient—rules such as familiarity, salience, and resemblance to a patient who has a known disease. However, on occasion, heuristics can be faulty, particularly if the presentation is atypical or the condition is rare. The practitioner must always be open to a low probability of a serious diagnosis. Heuristics can have negative effects when stereotypes or biases influence judgment. For example, assuming that a patient is heterosexual can lead to errors in clinical reasoning and differential diagnosis when evaluating the symptom of rectal pain.

EXPERT VERSUS NOVICE PRACTITIONERS

Students of advanced assessment have a variety of backgrounds, with many coming from specialized areas of clinical practice. Such students could have difficulty broadening the scope of their observations and clinical possibilities. In any case, nonexperts tend to be nonselective in data gathering and in the clinical reasoning strategies they use. However, experts are able to focus on a problem, recognize patterns, and gather only relevant data, with a high probability of a correct diagnosis. The goal for a novice practitioner is to aim for competence and expertise.

A competent practitioner will execute the following steps:

1. *Identify the most important cues.* These cues are obtained largely through thorough symptom analysis (e.g., COLSDPA or OLDCARTS), functional assessment, and history to assess the patient's beliefs and understanding or explanatory model of the illness. Research evidence shows that a

person's beliefs or explanatory models of an illness or a symptom include a cause, an opinion about the timeline (acute or chronic), consequences of the condition (minor or life threatening), and some type of verbal label used to identify the cluster of symptoms or sensations (e.g., "the flu," "the blues"). Practitioners need to distinguish between the presence of disease, which has a biologic basis, and illness, which is the human experience of being sick that could have little correlation with the objective evidence available.

2. *Understand and perform advanced examination techniques.* These techniques can include special maneuvers and closer observation of fine details during the physical examination, more in-depth interviews using valid and reliable instruments to assess the patient's risk for a specific diagnosis, and "gold standard" diagnostic tests for the identification of a specific disorder.
3. *Test differential or competing diagnoses.* A differential diagnosis results from a synthesis of subjective and objective findings, including laboratory and diagnostic tests, with knowledge of known and recognized patterns of signs and symptoms. When using the "rule-out" strategy, the practitioner looks for the absence of findings that are frequently seen with a specific condition; the absence of a sensitive finding is strong evidence against the condition being present. When using the "rule-in" strategy, the practitioner looks for the presence of a finding with high specificity (low false-positive and high true-negative values); the presence of this finding is strong evidence that the condition is present.
4. *See a pattern in the information gathered.* A pattern or cluster of findings can emerge from the subjective and objective data. This pattern could be evident during one patient encounter, or it could depend on a pattern of signs and symptoms that develops over time. Often an expert practitioner can eliminate competing diagnoses only after the initial treatment prescribed is ineffective or after the symptoms either disappear sooner than expected or persist longer than expected.

DEVELOPING CLINICAL REASONING

Clinical reasoning is a situational, practice-based form of reasoning that acknowledges the many variables that are present in an actual clinical situation, such as environmental and social factors involving the patient, family, community, and a team of health care providers. Clinical reasoning involves developing a brief summary in which patient-specific details are translated into appropriate diagnostic terminology. This process requires a background of scientific and evidence-based knowledge about general cases and a practical ability to evaluate the relevance of the evidence behind scientific and technical knowledge and how it applies to a particular patient. In doing so, the practitioner considers the patient's particular clinical trajectory; concerns, values, and preferences; and particular vulnerabilities (e.g., having multiple comorbidities) and sensitivities to care interventions (e.g., known drug allergies and past responses to therapies) when formulating clinical decisions or conclusions.

NEGOTIATING GOALS AND EXPECTATIONS OF A PATIENT ENCOUNTER

It is important, especially in an ambulatory care setting, to identify the patient's goals, expectations, and resources to determine what needs to be achieved during an encounter. A patient who seeks care because of a bothersome symptom could be more interested in having the symptom relieved by a particular date than in knowing the cause or diagnostic explanation for the symptom. Other patients might want reassurance that a symptom or sign is not a serious condition and yet do not expect treatment to alleviate the sensations they are experiencing. An explicit discussion between the practitioner and patient is necessary to establish what the goals and focus of an encounter will be. Goals can be mutually negotiated to assure clinicians that serious conditions can be "ruled out" and to assure patients that their needs and desires are acknowledged.

EVIDENCE-BASED PRACTICE

Evidence-based practice (EBP) is the integration of clinical expertise with the most current, relevant, and sound research evidence to guide clinical practice decisions. Using evidence-based guidelines in practice, informed through research evidence, improves patient outcomes. EBP integrates the best research evidence with clinical expertise and the patient's values and preferences and involves the use of simple rules of logic to apply evidence from research to an individual patient. Some of these rules include evaluating the validity, reliability, and generalizability of the evidence. The levels of evidence range from the "gold standard" of the randomized clinical trial to case studies, correlational studies, and expert opinion. Practitioners and patients increasingly gather evidence from web-based sources, such as the Cochrane Library, which includes databases of systematic reviews of a clinical topic, abstracts of reviews of effectiveness, a controlled trial registry, and review methodology. These databases have gathered the "best evidence" related to clinical problems.

Access to web-based data requires that the practitioner develop skills in health informatics—the application of computer technology to health care delivery—to develop skills in searching for and appraising evidence in the literature to guide care for a specific patient in a specific clinical context.

Evidence-Based Practice Boxes

A feature of this text is the inclusion of Evidence-Based Practice boxes in each chapter. The studies cited represent evidence from epidemiologic studies, meta-analyses, systematic reviews, and randomized clinical trials that informs and guides primary care practitioners in delivering clinical services.

SUMMARY

In the context of primary care practice, the orientation to the patient should be holistic and general and toward the most prevalent or common conditions in a particular population group. This orientation requires that the expert practitioner develop skills in inductive

EVIDENCE-BASED PRACTICE <i>Web Sources</i>		
National Guideline Clearinghouse	www.guideline.gov	Evidence-based practice guidelines and best practices
The Cochrane Collaboration	www.cochrane.org	Cochrane Library of systematic literature reviews about treatments and interventions
Cumulative Index to Nursing and Allied Health Literature	www.cinahl.com	CINAHL database on all aspects of nursing, allied health, alternative health, and community medicine
Medscape (from WebMD)	www.medscape.com	MEDLINE database maintained by the National Library of Medicine for biomedical content for dentistry, veterinary medicine, and nursing
Agency for Healthcare Research and Quality	www.ahrq.gov	A resource for information related to improving quality, safety, efficiency, and effectiveness of care
US Preventive Services Task Force	www.ahrq.gov/clinic/uspstfix.htm	Evidence-based guidelines for screening children and adults in primary care settings
British Medical Journal Clinical Evidence	www.bmj.com/specialties/clinical_evidence	A compendium of resources for informing treatment and patient care decisions
UpToDate	www.uptodate.com	Evidence-based clinical decision support database useful at the point of care
ConsultGeri	www.consultgeri.org	A clinical website developed by The Hartford Institute for Geriatric Nursing

reasoning to arrive at a diagnosis and to develop a treatment plan that is acceptable to the patient. An ongoing relationship with the patient over time greatly enhances the database from which the practitioner works to arrive at the best clinical judgments. Treatment plans in primary care settings rely on low-level technology and stress prevention and encourage self-care behaviors as well as open and effective patient-provider communication.

Practitioners need to be able to search for and evaluate the best evidence to guide assessment, treatment, and evaluation of diagnostic efficacy on health outcomes. A practitioner can progress from novice to expert and become more efficient in exercising clinical judgment by asking the right questions, seeking pertinent and high-quality information from available scientific evidence, and using clinical reasoning to apply the best evidence to clinical practice.

Evidence-Based Clinical Practice Guidelines

Although most primary care is related to acute symptoms, the focus of this chapter is health screening conducted in primary care settings on asymptomatic adults and children and the process of developing evidence-based clinical practice guidelines for prevention, counseling, and screening interventions. The National Academy of Medicine defines clinical practice guidelines as “recommendations intended to optimize patient care, informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options.” The benefits of delivering evidence-based services include improving the quality of care, achieving desired health outcomes, and reducing health care costs. The ability to analyze and evaluate evidence requires a knowledge base and critical thinking skills.

STEPS IN EVIDENCE-BASED PRACTICE

First, begin with a clinical problem. To examine the suitability of exploring a topic to develop practice guidelines, assess its public health importance, including the burden of having a disorder on a population and the anticipated effectiveness of a preventive service or intervention to reduce that burden.

Second, pose a clinical question that focuses on a patient problem and potential preventive service. A useful format that incorporates key components of a well-constructed question is PICO: *problem*, *intervention* or *exposure*, *comparison*, and *outcome*.

An analytic framework can be useful in illustrating the chain of evidence that needs to be evaluated in moving from a screening or preventive intervention to health outcomes, such as improved quality and quantity of life (Fig. 2.1). Following the overarching question of “Does screening for X reduce morbidity

and/or mortality?” (key question 1) is a series of questions to establish the clinical logic to support the implementation of a preventive service in a primary care setting:

1. Can a group at high risk for X be identified by clinical characteristics?
2. Are there accurate (i.e., sensitive and specific) screening tests available?
3. Are treatments available that make a difference in intermediate outcomes when the disease is caught early or detected by screening?
4. Are treatments available that make a difference in morbidity or mortality when the condition is caught early or detected by screening?
5. How strong is the association between the intermediate outcomes and patient health outcomes?
6. What are the harms of the screening test?
7. What are the harms of the treatment?

When evaluating the chain of evidence, both certainty and magnitude of evidence for each key question is assessed to address the multiple opportunities for bias.

Third, select appropriate resources and conduct a literature search of each of the key questions that discuss comparisons of interventions and strategies used to examine outcomes of interest. Appraise the evidence for its validity and applicability. To begin a search, large databases such as PubMed or the Cochrane Library will access primary sources. Secondary sources such as the American College of Physicians (ACP) Journal Club, Essential Evidence Plus, and BMJ Clinical Evidence provide assessments of the original study (see Chapter 1). In analyzing the results, consider the following terms:

- *Relative risk (RR)* is the ratio of risk in the experimental group compared with the risk in the control group.

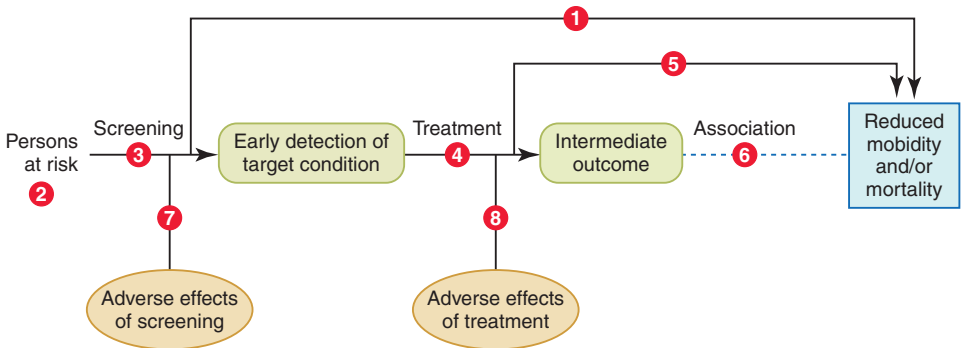


FIGURE 2.1 Template of an analytic framework. See text discussion for the key questions that correspond to the numbers in the template. (From U.S. Preventive Services Task Force. *Methods and Processes: Procedure Manual* (Figure 4). n.d. Retrieved from <https://www.uspreventiveservicestaskforce.org/uspstf/about-uspstf/methods-and-processes/procedure-manual>)

- *Clinical versus statistical significance* can be a matter of judgment and often depends on the magnitude of the effect being studied. “Is the difference between groups large enough to be worth achieving?”
- *Odds ratio (OR)* is the odds of previous exposure in a case divided by the odds of exposure in a control patient. For example, an OR of 3.0 means that the control cases were three times more likely to have been exposed than were treatment patients.
- *Confidence intervals (CIs)* are a measure of the precision of results. Wider CIs indicate lower precision. For example, “36 (CI, 27–51)” indicates that if the trial were repeated 100 times, 95% of the time the values would be between 27 and 51.

Finally, apply this knowledge to patients and their preferences. It is important to assess whether the population from which the evidence is gathered matches that of a patient. For example, population-based mammography screening guidelines would not be applied to a person with a history of breast cancer.

SOURCES OF EVIDENCE

A hierarchy of evidence refers to study designs that allow for less bias or systematic error and may lead to a wrong conclusion. Randomized controlled trials (RCTs) can provide sound evidence of cause and effect and can control for bias. Some limitations of

RCTs are threats to the representativeness of the study population and consistency of implementation of the intervention. Meta-analysis examines a number of valid studies on a topic and mathematically combines the results to report them as if they were one large study. Expert opinion is evidence based on clinical experience, collective experience, and knowledge of professional organizations, such as the American Heart Association or the American College of Obstetrics and Gynecology. Case reports, cohort studies, and qualitative research provide less robust evidence of cause and effect and have less reliability and validity than higher levels of evidence.

LEVELS OF PREVENTION

The three levels of prevention are primary, secondary, and tertiary. Primary prevention involves activities directed at improving general well-being while also providing specific protection for selected diseases. Interventions can include screening, counseling, or preventive medicines, such as immunizations or dental sealants. Counseling about behavioral risks, such as using seat belts or bicycle helmets, can reduce injury and death. A common model used to guide behavioral counseling is the five *As* model: **a**sk about the behavior, **a**dvice about health risks and benefits of change, **a**gree to set a goal, **a**ssist with identifying and overcoming barriers, and **a**rrange for follow-up.

The goal of secondary prevention is to identify and detect disease in its earliest stages before symptoms appear. Screening interventions can identify elevated blood pressure or risk of diabetes with a hemoglobin A1C measurement. With early detection and diagnosis, it may be possible to cure a disease, slow its progression, prevent or minimize complications, and limit disability.

Tertiary prevention programs aim to improve the quality of life for people with various conditions by limiting complications and disabilities, reducing the severity and progression of disease, and providing rehabilitation therapy to maximize functionality and self-sufficiency. Tertiary prevention can occur over a long period of time, such as optimizing treatment for chronic conditions such as asthma, physical or cognitive disability, and diabetes.

POPULATION VERSUS TARGETED SCREENING

Population screening includes all members of a particular population; for example, all newborns are screened for congenital hypothyroidism at birth. Targeted screening is more selective and focuses on a population at risk. An example is sexually transmitted infection (STI) screening done in sexually active adolescents and young adults in a specific age group (e.g., those 24 years and younger have the highest rates of infection) and who have increased risk factors for STI such as new or multiple sexual partners, inconsistent condom use, and sex work.

ETHICAL GUIDELINES FOR SCREENING

Not all diseases or conditions are appropriate for screening. The purposes of screening must be ethically acceptable, information must be used for appropriate purposes, tests must be of high quality, individuals should know what is taking place and be informed of their results, counseling must be available to interpret results, and results must be kept confidential. In addition, genomic medicine has created a new urgency in recognition and application of screening guidelines to assess

the value of population screening for genetic susceptibility to diseases and conditions.

Guidelines for determining if a disease or condition warrants screening include the following:

Is the condition significant in the community?

The condition must have a significant impact on the quality or quantity of life, must be measured using morbidity and mortality data, and must be measured by the quality of life. The incidence, or the number of new or undiagnosed cases, of the condition must be sufficient to justify the cost of screening.

Can the condition be screened?

Tests that are acceptable to patients must be available at a reasonable cost to detect the condition in its asymptomatic period. Measures used to determine acceptability of tests include sensitivity (ability to provide a true positive) and specificity (ability to provide a true negative), as well as measures of reliability (reproducibility) and validity (does it measure what you think it measures?). Other considerations include potential harms of screening (e.g., labeling and stigma), morbidity associated with the screening test, as well as patient preference.

Should the condition be screened?

Before screening can be recommended, acceptable treatments must be available. Contextual variables, such as ethnicity and cultural beliefs and practices, socioeconomic conditions, and geographic location, need to be considered. The disease or condition must have an asymptomatic period and a period in which detection and treatment significantly improve health outcomes compared with a diagnosis obtained based on symptoms. Hypertension is an asymptomatic condition that affects a large number of adults, blood pressure can be measured accurately with minimal harm, and evidence-based risk reducing behavioral counseling and medications can improve health outcomes.

United States Preventive Services Task Force

The US Preventive Services Task Force (USPSTF) was established in 1984 as an independent group of experts in prevention and evidence-based medicine. The work of the task force is to make recommendations about clinical preventive services such as screenings, counseling, and preventive medications.

The USPSTF works with Evidence-Based Practice Centers (EPCs) that conduct in-depth

systematic reviews of the available evidence and develop an analytic framework or research plan that includes a set of key questions and outcomes of interest that the review must answer (see Fig. 2.1). After deliberation with input and comments from the public and other experts, a recommendation is reached by calculating the balance between the certainty and magnitude of the net benefit (Table 2.1) and is then assigned a grade (Table 2.2). Box 2.1 contains the six questions posed when evaluating

Table 2.1 Matrix for Arriving at a Grade Recommendation

		MAGNITUDE OF NET BENEFIT		
CERTAINTY OF NET BENEFIT	SUBSTANTIAL	MODERATE	SMALL	ZERO/NEGATIVE
High	A	B	C	D
Moderate	B	B	C	D
Low	Insufficient			

From U.S. Preventive Services Task Force. *Procedure Manual*. n.d. <https://www.uspreventiveservicestaskforce.org/>

Table 2.2 What the USPSTF Grades Mean and Suggestions for Practice

GRADE	GRADE DEFINITIONS	SUGGESTIONS FOR PRACTICE
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer or provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer or provide this service.
C	The USPSTF recommends selectively offering (or providing) this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer or provide this service for selected patients depending on individual circumstances.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I Statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.	Read “Clinical Considerations” section of USPSTF Recommendation Statement. If offered, patients should understand the uncertainty about the balance of benefits and harms.

USPSTF, US Preventive Services Task Force.

Grade Definitions. U.S. Preventive Services Task Force, Rockville, MD. (Current as of November 2017). <https://www.uspreventiveservicestaskforce.org/Page/Name/grade-definitions>

Box 2.1 **Questions to Consider
When Evaluating
Evidence**

1. Do the studies have the appropriate research design to answer the key question(s)?
2. To what extent are the existing studies of high quality?
3. To what extent are the results of the studies generalizable to the general US primary care population and situation?
4. How many studies have been conducted that address the key question(s)?
5. How consistent are the results of the studies?
6. Are there additional factors that assist with drawing conclusions?

evidence. The USPSTF recommendations are considered the gold standard for clinical preventive services.

Prevention Task Force is a resource that practitioners can use to electronically access USPSTF recommendations. It is designed to assist primary care practitioners in determining

appropriate clinical preventive services for their patients (see <http://epss.ahrq.gov/PDA/index.jsp>).

The National Guideline Clearinghouse (guideline.gov) is a public resource maintained by the Agency for Health Care Research and Quality that provides summaries of guidelines from major medical and specialty organizations. To be included in the Clearinghouse, guidelines must meet criteria of incorporating a systematic review and including an assessment of the harms and benefits.

SUMMARY

Evidence alone was never meant to replace experience and intuition. There are always the human concerns to account for in clinical decision making. However, primary care practitioners will increasingly be engaged in delivering both preventive and acute care services. Practitioners need to be aware of evidence-based practice guidelines and make clinical decisions based on good-quality scientific evidence as well as clinical judgment considerations with individual patients and families.

Contemporary Approaches in Primary Care Settings

APPLYING A PUBLIC HEALTH PERSPECTIVE

Primary care clinicians develop assessment and clinical reasoning skills often restricted to the immediate concerns of an individual patient or family. This perspective can result in inaccurate diagnoses and missed opportunities to deliver high-quality, patient-centered care by not adequately considering the social determinants of health (SDOH). An understanding of public health principles can help providers to better assess patients, anticipate health risks, and engage in meaningful and well-aimed health promotion. Core principles of public health include equity, social justice, and participation. The primary method used in public health is epidemiology, the science of the incidence, distribution, associated risk of diseases, and other factors relating to health.

The benefits of this relationship are reciprocal. Preparing providers to practice with an awareness that extends beyond the individual and family to include the wider community stands to enrich the quality, accuracy, and potential impacts of primary care as well as the workings of public health. This chapter will describe the evolving responsibilities of the public health workforce, and the application of public health science and perspectives to clinical reasoning in primary care settings.

UNITED STATES HEALTH CARE

A recent study of international health systems found that the processes of care in the United States are some of the best in the world, char-

acterized by high-technology interventions, research-based practice guidelines, accountability metrics, enterprising innovations in service delivery, financing, and care management. However, health outcomes are worse than those of international peers. Persistent health disparities, disappointing birth outcomes, and rising rates of obesity, chronic disease, vaccine-preventable illness, premature death, suicide, and substance abuse contribute to the low ranking of the United States on a global scale.

Historical trends of increasing life expectancy since the early 1900s have recently reversed course. In the United States, rates of healthy birth outcomes are behind those of other wealthy countries and are worse for Black Americans. Across nearly all measures of health, the greatest burdens are disproportionately borne by people with less income, with lower levels of education, and of color. Life expectancy for Black men in the United States is 4.4 years shorter than that of their White counterparts. Black females can be expected to die 2.9 years earlier than White females.

The COVID-19 pandemic exposed the vulnerabilities of the US health care system. Structural inequities, chasms of distrust between academic health care and communities of color, and differences in exposure risks, available resources, access to care, and accurate information contributed to higher rates of infection and fatality in Black, Native American, and Hispanic communities, as well as among those with lower rates of income and educational attainment.

PUBLIC HEALTH COMPETENCIES IN PRIMARY CARE PRACTICE

The 2012 passage of the Affordable Care Act and a series of recommendations from the National Academy of Medicine have changed expectations and funding streams for public health and clinical health care. In 2016, the US Department of Health and Human Services launched *Public Health 3.0*. The net result of these changes in public policy, priorities, and models of practice has refocused the work of public health on systems and interagency collaboration. Responsibilities for the direct care of individuals and families once served by public health have transitioned to clinical health care.

The National Academy of Medicine paired its counsel to public health with calls to improve the outcomes and cost-effectiveness of care by shifting from an episodic illness model to one of health. Expected competencies include assessment of biopsychosocial needs across the lifespan, applied principles of health promotion and disease prevention, population-based approaches to care, and recognition of community-level socioeconomic drivers of health and inequities. Primary care providers can help to meet these goals through adoption of a public health lens in their clinical practice.

PRIORITY PERSPECTIVES OF PUBLIC HEALTH

Public health and primary care providers share values, including health promotion, prevention of disease and injury, elimination of health disparities, and well-coordinated, cost-effective health services. At a population level, public health uses aggregated data to monitor the health of populations, evaluate services, and identify risks and emerging threats.

It takes an interdisciplinary team to provide the *Essential Public Health Services* that protect and promote the health of all people and emphasize health equity (Box 3.1).

PUBLIC HEALTH FRAMEWORKS

Systems Thinking

Public health professionals perform assessments at a population and systems level,

Box 3.1 Ten Essential Public Health Services, Revised 2020

1. Assess and monitor population health status, factors that influence health, and community needs and assets
2. Investigate, diagnose, and address health problems and hazards affecting the population
3. Communicate effectively to inform and educate people about health, factors that influence it, and how to improve it
4. Strengthen, support, and mobilize communities and partnerships to improve health
5. Create, champion, and implement policies, plans, and laws that impact health
6. Utilize legal and regulatory actions designed to improve and protect the public's health
7. Ensure an effective system that enable equitable access to the individual service and care needed to be healthy
8. Build and support a diverse and skilled public health workforce
9. Improve and innovate public health functions through ongoing evaluation, research, and continuous quality improvement
10. Build and maintain a strong organizational infrastructure for public health

Source: <https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html>

viewing health as a product of history, context, individual physiology, socioeconomic determinants, organizational structure, and public policy. The conditions in which we live, grow, work, and play are key determinants of well-being. Public health practitioners work upstream, seeking to improve these contexts as a means to more sustainably promote health, prevent illness, and foster health equity.

SOCIOECOLOGICAL MODEL

Application of the socioecological model (SEM) to individual patients assists providers to systematically identify relationships and

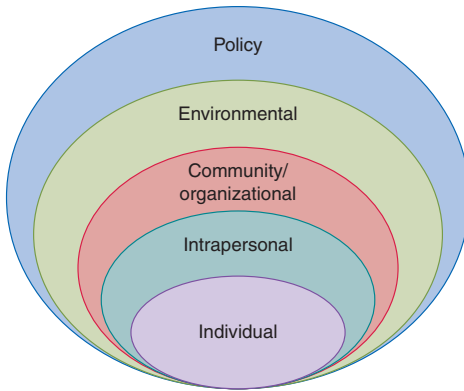


FIGURE 3.1 Socioecological model.

contextual factors that may help or hinder health. A rich understanding of patients' social and environmental circumstances—who they live with, the conditions of their housing, the safety of their neighborhood, their access to resources, and the nature and demands of their work—allows for more nuanced risk assessments and tailored, person-centered interventions. The SEM helps identify additional points of intervention for greater leverage and sustainability in the promotion of self-management and behavior change. (Fig. 3.1).

The World Health Organization (WHO) defines social determinants as "...the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life." The United States Department of Health Services groups SDOH into five domains: Economic Stability, Education Access and Quality, Health Care Access and Quality, Neighborhood and Built Environment, and Social and Community Contexts (Healthy People 2030) (Fig. 3.2). To learn more about a strategic plan to embed racial justice and advance health equity, view <https://www.ama-assn.org/about/leadership/ama-s-strategic-plan-embed-racial-justice-and-advance-health-equity>.

APPLICATION TO PRACTICE

In an effort to contain costs and bring about better outcomes, providers are now being asked to address social and economic drivers

of health as part of routine primary care practice. The US Preventative Task Force (USPSTF) identifies social factors in many of its guidelines. In 2019, the National Academy of Science and Medicine called for the integration of social care into clinical practice and suggested five strategies to better address social needs. These include steps to increase awareness of social needs, improve care delivery, provide direct help to patients, bridge clinical services with those of the larger community, and address systemic barriers and shortcomings that contribute to inequity. These activities, referred to as the "five As": awareness, adjustment, assistance, alignment, and advocacy (Table 3.1).

TELEHEALTH

Strategies to promote access to care includes the use of telehealth. In the early months of the COVID-19 pandemic, many providers emergently transitioned to care delivery using telehealth. Although there were clear benefits, there were also some observed inequities and challenges. Urban areas are likely to have robust broadband internet access, whereas this is not the case in many rural areas of the United States. Similarly, although many households own a number of connected devices and could readily identify a quiet space to meet with their provider online, these were not the circumstances of others. Finally, technologic skills and knowledge vary. These differences contributed to patterns of telehealth use that echo health inequities in the United States, suggesting that perhaps those most vulnerable were less likely to have received care. Providers need to be mindful of these issues when using distance technology in practice.

ADVERSE CHILDHOOD EXPERIENCES AND TOXIC STRESS

The science around childhood adversity suggests that the conditions of childhood are pivotal to lifelong health and well-being. Adverse childhood experiences (ACEs) include violence, abuse, neglect, bullying, household dysfunction, or losing a primary caregiver.



FIGURE 3.2 Social determinants of health (Healthy People 2030. *U.S. Department of Health and Human Services*. Office of Disease Prevention and Health Promotion. Retrieved from <https://health.gov/healthy-people/objectives-and-data/social-determinants-health>. Accessed December 12, 2021.)

Table 3.1 Five As

AWARENESS			
ASK PEOPLE ABOUT THEIR ACCESS TO RELIABLE TRANSPORTATION			
ADJUSTMENT	ASSISTANCE	ALIGNMENT	ADVOCACY
Reduce the need for in-person health care appointments by using other options such as telehealth appointments.	Provide transportation vouchers so that patients can travel to health care appointments. Vouchers can be used for ridesharing services or public transit.	Invest in community ride sharing or time-bank programs.	Work to promote policies that fundamentally change the transportation infrastructure within the community.

Adapted from National Academies of Sciences, Engineering, and Medicine. *Integrating Social Care into the Delivery of Health Care: Moving Upstream to Improve the Nation's Health*. 2019. <https://pubmed.ncbi.nlm.nih.gov/31940159>.

Through epigenetic and developmental mechanisms, toxic stress in childhood can alter expected patterns of brain maturation and behavior, as well as the long-term functioning of immune, neurologic, and endocrine systems.

Cognitive, social, and emotional impairments predispose individuals who have

experienced significant ACEs to higher rates of mental illness, substance use, unplanned pregnancies, accidents, delinquency, and poor academic performance. Chronic activation of the hypothalamic-pituitary-adrenal (HPA) axis can lead to neuroendocrine and immune dysfunction and greater allostatic

load, translating to poorer overall health. ACEs are cumulative in their detrimental impacts on health and well-being.

It is important that providers recognize the prevalence of ACEs and apply that knowledge to practice. Up to 45% of US children younger than the age of 18 are reported to have at least one type of ACE, and 10% of US children report three or more. In multiple surveys, well over 50% of US adults report experiencing at least one type of ACE, and one in six have experienced more than four. Childhood adversity is not evenly distributed across the population, with higher rates among Black and Hispanic children, in certain geographies, and within families chronically challenged by high levels of stress, intergenerational trauma, a lack of social support, or significant poverty. More information can be found at <https://www.acesaware.org/>.

PUBLIC HEALTH SCIENCE— SURVEILLANCE AND EPIDEMIOLOGY

Through the ongoing and systematic collection, analysis, and interpretation of aggregate data, the practice of public health is driven by the science of epidemiology. Epidemiologic strategies seek to identify and describe the distribution, associated factors, and determinants of health or health-related conditions in select populations or geographies. Using analytic and descriptive methods, epidemiologic studies aim to identify the causes of disease, the mechanisms by which disease is spread, the natural course of illness, and the characteristics of those who are most vulnerable. Epidemiologic studies may be retrospective or prospective and typically adhere to a rigorous research design. This scientific approach underpins the effectiveness of public health by providing evidence for practice, identifying associated risks and causative factors, and helping to refine targets for intervention. In addition, epidemiologic findings support more effective communication with the public and key decision makers (Table 3.2).

Recent examples of how patient care delivery integrates with public health include findings from population-level epidemiologic studies of COVID-19 that described the

average time between exposure to the virus and development of symptoms, individual characteristics and comorbidities associated with COVID-related hospitalization and death, and the safety and efficacy of COVID vaccines. Information sharing and collaboration across sectors have led to enormous progress in the recognition, control, and treatment of COVID-19 infections.

Public health data are aggregated, identified, and robust and generally available at the local, state, and federal level. Coupled with health organizational data, public health surveillance data and analytics can significantly enrich the perspective of primary care providers, allowing them a greater sense of the context of primary care practice through the addition of geographic, social, and economic factors and normative community health trends.

PUBLIC HEALTH SURVEILLANCE

Surveillance is a core function of public health. Data are systematically gathered through ongoing passive surveillance. These processes generate information to describe the status of population health, identify emerging threats, inform decisions, guide and prioritize practice, and evaluate the impact of interventions. Public health surveillance systems are used to appraise a broad range of health-related community factors and social determinants, as well as measures relevant to infectious and chronic disease, injuries, and environmental health.

PRIMARY CARE PROVIDERS AND SURVEILLANCE

Aggregated public health data provided by individual health care providers show emerging trends. US states and territories have a list of reportable diseases. When a disease is novel or poses a significant threat, surveillance may extend to an international level, as was the case with COVID-19 as it spread from one country to the rest of the world. The COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU) provides an

Table 3.2 Key Epidemiologic Terms and Applications

Birth	Crude Birth Rate	Dividing the number of live births in a specific year by the total midyear population. The ratio is multiplied by 1000 to arrive at a reported birth rate.
Measures of Morbidity (<i>Illness or Injury</i>)	Incidence	An estimate risk of acute or episodic events, within a given time frame, incidence is calculated by dividing the number of NEW cases by the number of people at risk
	Prevalence	A measure of disease burden calculated by dividing the number of all cases of disease (new and existing diagnoses) by the number of persons in the population at a select point or period in time.
	Attack Rates	Used to estimate the infectious potential of a foodborne or communicable disease, calculated by dividing the number of people who become ill by the number of initially healthy persons who were exposed.
Measures of Mortality	Infant Mortality	Calculated by dividing the number of deaths among infants younger than 1 year of age by the number of live births reported during the same period of time. Infant mortality is typically reported as a rate per 1000 live births.
	Case-Fatality Rates	Indicates severity by calculating the proportion of people who die from the condition. Calculated by dividing the number of fatal cases by the number of people diagnosed during a defined time period. Multiple by 100 to arrive at a percentage.
	Mortality Rate	The number of all-cause deaths divided by the number of people in the population at midyear. Generally multiplied by 100,000.
	Proportional Mortality Rate	This is used to estimate the impact of a select condition on all-cause mortality. Calculated by dividing the number of persons who died from an identified cause by all deaths that occurred during the same time period. Generally multiplied by 100,000
	Relative Risk	Compares the risk of a poor outcome for a select group to the level of risk in another population. Often expressed as a ratio of risk associated with an identified exposure.

excellent example of a global infectious disease surveillance system, using case counts and geography to represent the international spread of the pandemic. See <https://gisand-data.maps.arcgis.com/apps/dashboards/bda7594740fd40299423467b48e9ecf6>.

Reportable Diseases

Lists of state-specific reportable diseases and expected methods of reporting are available through local and state health departments. For a list of nationally reportable infectious diseases, visit the Centers for Disease Control National Notifiable Diseases Surveillance System (NNDSS) at <https://www.cdc.gov/nndss/>.

Vaccine Adverse Event Reporting System

At a national level, provider-generated data also help to ensure vaccine safety. The CDC and US Food and Drug Administration (FDA) co-manage a passive surveillance system to detect vaccine-related concerns and assure public safety. The *Vaccine Adverse Event Reporting System* (VAERS) tracks vaccine-related events that may indicate safety issues or new concerns and identify characteristics or comorbidities that may increase a patient's risk for vaccine-related adverse events. The database is open to the public and can be helpful to providers in explaining or estimating vaccine risks. Anyone can file a vaccine-related concern, but in some cases, providers

are mandatory reporters. There is a list of specific vaccine-related adverse events that providers are mandated to report, available on the VAERS website (https://vaers.hhs.gov/docs/VAERS_Table_of_Reportable_Events_Following_Vaccination.pdf).

SURVEILLANCE, EPIDEMIOLOGY, ENVIRONMENTAL HEALTH, AND A PUBLIC HEALTH PERSPECTIVE IN PEDIATRIC PRIMARY CARE: THE CASE OF FLINT, MICHIGAN

Many of the skills and perspectives described in this chapter have been demonstrated as effective strategies in primary care, most notably by Dr. Mona Hanna-Attisha, the pediatrician who recognized and alerted the public to the water crisis in Flint, Michigan. Educated in both public health and medicine, she used systematic surveillance, epidemiologic analysis, theoretical frameworks, evidence-based prevention strategies, and strategic communication to intervene and protect the health of the community.

In 2011, the City of Flint, Michigan had high rates of unemployment and socioeconomic disadvantage. Public services dependent on tax levy struggled, crime rates rose, and the cash-strapped city fell, for the second time, under state emergency management control. One cost-saving measure implemented by that administration was a switch in the public water supply from Lake Huron to the Flint River. City residents soon began to complain about the water's color, odor, and taste. Emergency managers addressed those concerns by adding more chlorine to the water. Public reassurances were made that the water was safe, but the state began supplying its employees in Flint with bottled water.

In the summer of 2015, Dr. Hanna-Attisha learned from a friend with expertise in water sanitation that Flint's water was likely to contain lead. The pediatrician began a systematic review of her patients' medical records, comparing recent lead levels with those from before the municipality had changed its water source. She discovered that blood lead levels were higher and that children from the most disadvantaged areas had experienced the

greatest rise. Overall, the proportion of children younger than the age of 5 years with elevated blood levels in her practice had nearly doubled, increasing from 2.1% to 4%.

Lead exposure has been linked to delayed growth and development, impaired neurologic function, and learning and behavior problems. There is no level of lead that is recognized as "safe" in children. Dr. Hanna-Attisha recognized the cumulative adversities and socioeconomic barriers that children in Flint were already facing. The threat of lead exposure through the public water supply motivated her to share her findings broadly and to advocate for her patients by demanding action. As a result of her sound analysis and effective communication, federal action was taken.

Hanna-Attisha's work continues to focus on safeguarding the health and development of children through interventions that address social needs and inequity. She reports early education, quality childcare, childhood nutrition, and parental education. She has written about her experiences in the book, *What the Eyes Don't See*.

SUMMARY

Providers of public health and primary care share many of the same priorities. As the care of populations shifts from public to private sectors, primary care is increasingly focused on accountability and cost-effectiveness. Public health strategies help providers apply a systems- or population-level perspective to the care of individual patients to use in assessment and treatment plans. Primary care providers with an awareness of emerging health issues and epidemiologic trends in the community can engage preventive strategies and more readily recognize emerging or novel disease. Knowledge of community resources and public health partners positions providers to help clients access resources and manage their own care. Primary care providers who understand their role and value within a more integrated system can enhance the work of public health through surveillance and reporting, cross-sector collaboration, and leveraging their relationship with patients to promote population health.

CHAPTER

4

Abdominal Pain

Abdominal pain is a subjective feeling of discomfort in the abdomen that can be caused by a variety of problems. The goal of the initial clinical assessment is to distinguish acute life-threatening conditions from chronic/recurrent or acute mild, self-limiting conditions. Assessment is complicated by the dynamic rather than static nature of acute abdominal pain, which can produce a changing clinical picture, often over a short period of time. In addition, both children and older adults tend to deviate from the usual and anticipated clinical pattern of abdominal pain. The following three processes can produce abdominal pain: (1) tension in the gastrointestinal (GI) tract wall from muscle contraction or distention, (2) ischemia, and (3) inflammation of the peritoneum. Pain can also be referred from within or outside the abdomen.

Colic is a type of tension pain. It is associated with forceful peristaltic contractions and is the most characteristic type of pain arising from the viscera. Colicky pain can be produced by an irritant substance, from infection with a virus or bacteria, or by the body's attempt to force its luminal contents through an obstruction. Another type of tension pain is caused by acute stretching of the capsule of an organ, such as the liver, spleen, or kidney. The patient with this visceral pain is restless, moves about, and has difficulty getting comfortable.

Ischemia produces intense, continuous pain. The most common cause of intestinal ischemic pain is strangulation of the bowel from obstruction.

Inflammation of the peritoneum usually begins at the serosa covering the affected and inflamed organ, causing visceral peritonitis. The pain is a poorly localized aching. As the inflammatory process spreads to the adjacent parietal peritoneum, it produces localized parietal peritonitis. The pain of parietal peritonitis

is more severe and is perceived in the area of the abdomen corresponding to the inflammation. A patient with parietal pain usually lies still and does not want to move.

Pain can be referred from within the abdomen or from other parts of the body ([Box 4.1](#)).

Referral of pain occurs because tissues supplied by the same or adjacent neural segments have the same common pathways inside the central nervous system. Thus, stimulation of these neural segments produces the sensation of pain. For example, nerves that supply the appendix are derived from the same source as those that supply the small intestine, resulting in the onset of appendicitis pain in the epigastric area.

Abdominal pain in adults can be classified as acute, chronic, or recurrent. The term “acute abdomen” refers to any acute condition within the abdomen that requires immediate attention and may require surgical intervention. Acute abdominal pain refers to a relatively sudden onset of pain that is severe or increasing in severity and has been present for a short duration. Chronic pain is characterized by its persistent duration or recurrence. Recurrent episodes of pain can be either acute or chronic in nature.

In adults, acute pain requiring immediate surgical intervention is commonly caused by appendicitis, perforated peptic ulcer, intestinal obstruction, peritonitis, perforated diverticulitis, ectopic pregnancy, or dissection of aortic aneurysm. Other common causes of acute pain include cholelithiasis, gastroenteritis, peptic gastroduodenal syndrome, pancreatitis, pelvic inflammatory disease (PID), or urinary tract infection (UTI). Chronic or recurrent pain can be caused by GI disorders, such as Crohn disease, irritable bowel syndrome (IBS), diverticulitis, or esophagitis; pelvic disorders, such as dysmenorrhea or uterine fibroids; genitourinary disorders, such

Box 4.1 Some Causes of Pain Perceived in Anatomical Regions

RIGHT UPPER QUADRANT

- Duodenal ulcer
- Hepatitis
- Hepatomegaly
- Pneumonia
- Cholecystitis

LEFT UPPER QUADRANT

- Ruptured spleen
- Gastric ulcer
- Aortic aneurysm
- Perforated colon
- Pneumonia

PERIUMBILICAL

- Intestinal obstruction
- Acute pancreatitis
- Early appendicitis
- Mesenteric thrombosis
- Aortic aneurysm
- Diverticulitis

RIGHT LOWER QUADRANT

- Appendicitis
- Salpingitis
- Ovarian cyst
- Ruptured ectopic pregnancy
- Renal or ureteral stone
- Strangulated hernia
- Meckel diverticulitis
- Regional ileitis
- Perforated cecum

LEFT LOWER QUADRANT

- Sigmoid diverticulitis
- Salpingitis
- Ovarian cyst
- Ruptured ectopic pregnancy
- Renal or ureteral stone
- Strangulated hernia
- Perforated colon
- Regional ileitis
- Ulcerative colitis

Modified from Judge R, Zuidema G, Fitzgerald F. *Clinical Diagnosis*. 5th ed. Boston: Little Brown; 1988.

as recurrent UTI or chronic prostatitis; or conditions outside the abdomen, such as costochondritis, hip disease, or hernia.

In children, abdominal pain can be classified as acute or recurrent. Common causes of acute pain include appendicitis, food poisoning, UTI, viral gastroenteritis, and bacterial enterocolitis. Recurrent abdominal pain (RAP) is defined as more than three episodes of pain in 3 months in children older than 3 years. It affects 10% to 15% of children between the ages of 3 and 14 years; of these children, 90% will not have an organic etiology.

DIAGNOSTIC REASONING: FOCUSED HISTORY

Is this an acute condition?

Key Questions

- How long ago did your pain start?
- Was the onset sudden or gradual?
- How severe is the pain (on a scale of 1 to 10)?
- If a child: What is the child's level of activity?
- Does the pain wake you up from sleep?
- What has been the course of the pain since it started? Is it getting worse or better?
- When was your last bowel movement?
- Have you ever had this pain before? What was diagnosed? How was it treated?

Onset and Duration

Acute onset of pain that is getting progressively worse could signal a surgical emergency. In general, patients who present with severe pain 6 to 24 hours from the onset probably have an acute surgical condition. Acute abdominal pain can signal a few potentially life-threatening conditions that must be considered first. The following are possible surgical emergencies that require immediate evaluation and intervention:

- *Perforation or ruptured appendix*: look for signs and symptoms of peritonitis ([Box 4.2](#))
- *Ectopic pregnancy*: suspect in any woman of childbearing age

Box 4.2 Features of Peritonitis

P	Pain: front, back, sides, shoulders
E	Electrolytes fall; shock ensues
R	Rigidity or rebound of the anterior abdominal wall
I	Immobile abdomen and patient
T	Tenderness with involuntary guarding
O	Obstruction
N	Nausea and vomiting
I	Increasing pulse rate, decreasing blood pressure
T	Temperature falls and then rises; tachypnea
I	Increasing girth of the abdomen
S	Silent abdomen (no bowel sounds)

Modified from Shipman JJ. *Mnemonics and Tactics in Surgery and Medicine*. 2nd ed. Chicago: Mosby; 1984.

- **Obstruction:** sudden onset of crampy pain usually in the umbilical area
- **Ruptured abdominal aortic aneurysm:** when back pain is present
- **Intussusception:** in infants and children younger than 3 years.
- **Malrotation:** in infants usually younger than 1 month old

The pain of sudden onset is more likely associated with colic, perforation, or acute ischemia (torsion, volvulus). Slower onset of pain generally is associated with inflammatory conditions, such as appendicitis, pancreatitis, and cholecystitis.

Acute pain that comes and goes can be related to intestinal peristalsis. The onset of pain in relation to food ingestion provides diagnostic clues: pain occurring several hours after a meal suggests a duodenal ulcer (pain with the stomach empty), but pain immediately after eating occurs with esophagitis.

In children, RAP occurs in attacks usually lasting less than 1 hour and rarely longer than 3 hours and frequently interferes with daily routines. Between episodes, the pain resolves completely. When interviewing a child, remember that the child might not be old enough to have a clear sense of time.

Severity and Progression

Severity is the most difficult symptom to evaluate because of its subjective quality. It is helpful

to use a scale of 1 to 10 for adults. Children often respond to the use of the FACES pain scale or the Oucher pain scale (Fig. 4.1).

Determine whether the pain is an acute episode or a chronic or recurrent episode. Acute abdominal pain requires immediate attention because it can signal an acute surgical condition in the abdomen. Chronic or recurrent episodes of pain can be handled in a more temperate manner.

Pain that is steady, severe, and progressive is worrisome. Pain that causes one to awake from sleep is serious. A sudden pain severe enough to cause fainting suggests a perforated ulcer, ruptured aneurysm, or ectopic pregnancy. A severe knifelike pain usually indicates an emergency. Tearing pain is characteristic of an aortic aneurysm. Appendicitis is often described as an initial ache that gets progressively worse. Colicky pain that becomes steady can indicate appendicitis or strangulating intestinal obstruction.

Children are poor historians regarding the severity of pain. The caregiver should indicate how severe the child's pain is by a description of the activity level of the child. In general, avoidance of favorite activities or motions indicates an organic problem. Organic disease awakens the child from sleep.

Last Bowel Movement

Obstipation (the absence of stools) occurs with complete obstruction, but diarrhea can be present with partial obstruction. Lack of a bowel movement for 3 days could signal constipation. Children have a poor sense of stool patterns and may not know what it means to be constipated. Parents often do not recognize abnormal stooling patterns in the child. The onset of constipation can cause severe abdominal pain.

Previous Pain

Chronic pain could result when a potential surgical event is partially controlled but is not totally resolved. Chronic pain that has been present for longer than 1 year generally is not caused by a neoplasm; consider instead IBS or colorectal, endometrial, or inflammatory causes.

Recurrent attacks of acute pain could be caused by inflammation and exacerbation of a

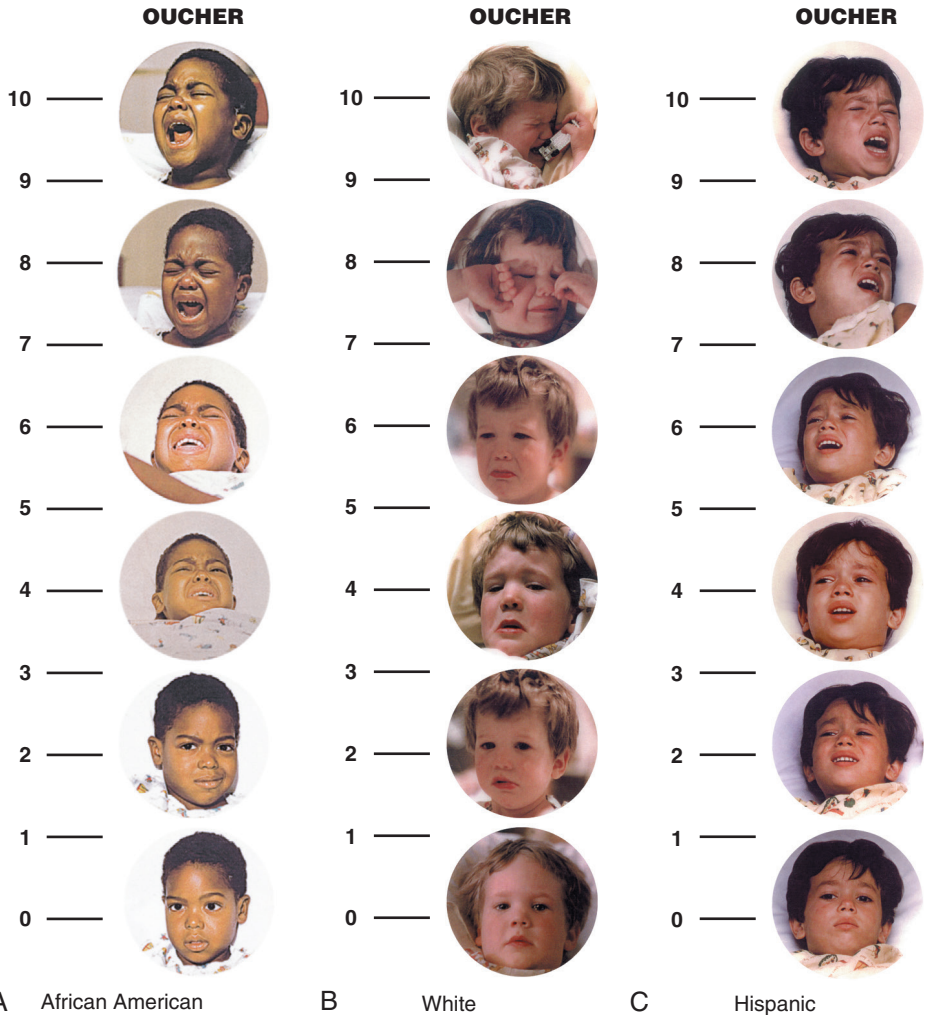


FIGURE 4.1 The Oucher Pain Scale illustrated with African American (A) white (B) and Hispanic (C) children to best fit the child's cultural identity. The African American child version of the Oucher was developed and copyrighted in 1990 by Mary J. Denyes, PhD, RN, FAAN (Wayne State University) and Antonia Villarruel, PhD, RN, FAAN (University of Michigan) at the Children's Hospital of Michigan. Cornelia P. Porter, PhD, RN and Charlotta Marshall, MSN, RN contributed to the development of this scale. The white child version of the Oucher was developed and copyrighted in 1983 by Judith E. Beyer, PhD, RN, currently at Graceland University School of Nursing in Independence, Missouri. Photographs were taken by Lynn Juliano, RN, BSN at Martha Jefferson Hospital in Charlottesville, Va. The Hispanic child version of the Oucher was developed and copyrighted in 1990 by Antonia M. Villarruel, PhD, RN (University of Michigan) and Mary J. Denyes, PhD, RN (Wayne State University). Photographs were taken at the Children's Hospital of Michigan in Detroit.

chronic condition, such as functional colonic pain, IBS, cholecystitis, chronic pancreatitis, diverticulitis, or ulcer disease. Other causes of acute attacks of pain are recurrent infection, such as pyelonephritis or cystitis, and urinary tract stones.

Will the location of pain give me any clues?

Key Questions

- Where is the pain? Can you point to it?
- Does it travel (radiate) anywhere?

Location of the Pain

The viscera are innervated bilaterally so that pain is perceived in the midline. It is often described as a deep, dull, diffuse pain. Visceral pain originates from epigastric, periumbilical, and hypogastric causes; from intraabdominal, extraperitoneal organs (pancreas, kidneys, ureters, great vessels, pelvic organs); or a referred source.

Parietal (also known as peritoneal or somatic) pain is more localized and is described as a sharp pain. Parietal pain originates from intraabdominal and intraperitoneal organs.

Inflammation (e.g., with appendicitis) can produce either visceral or parietal peritonitis. Initially, the inflammation is limited to the serosa covering an inflamed organ. The pain is visceral and is felt diffusely. As the inflammation progresses to the adjacent parietal peritoneum, it produces a more severe localized pain that is perceived in the corresponding area of the abdomen. Children generally have a poor ability to localize pain and are not helpful in the majority of cases.

The Apley rule states that the further the localization of pain from the umbilicus, the more likely it is that there is an underlying organic disorder.

When blood, pus, or gastric fluid suddenly floods the peritoneal cavity, the pain is frequently reported as “all over the abdomen” at first. However, the maximum intensity of pain at the onset is likely to be in the upper abdomen with gastric problems and the lower abdomen with tubal and appendix rupture. Irritating fluid from a perforated duodenal ulcer produces pain in the right hypochondrium, lumbar, and iliac regions.

Pain arising from the small intestine is felt in the epigastric and umbilical areas of the abdomen. The 9th and 11th thoracic nerves supply the small intestine via the common mesentery nerve. Appendicular nerves are derived from the same source as those that supply the small intestine, resulting in the onset of pain in the epigastric area with appendicitis.

Table 4.1 describes the structures involved in specific pain locations.

Radiation of Pain

Radiation of pain can help in diagnosis. Pain that radiates will do so to the area of distribution of the nerves coming from that segment of the spinal cord that supplies the affected area. Whereas biliary colic or gallbladder pain

Table 4.1 Pain Location and Involved Structures	
PAIN LOCATION	INVOLVED STRUCTURES
Epigastric	Esophagus, stomach, duodenum, liver, gallbladder, pancreas, spleen
Upper abdominal	Esophagus, stomach, duodenum, pancreas, liver, gallbladder, or thorax
Right upper quadrant	Usually esophagus, stomach, duodenum, pancreas, liver, gallbladder, or thorax; often indicates acute cholecystitis
Left upper quadrant	Spleen
Periumbilical	Jejunum, midgut, ileum, appendix, ascending colon; pain caused by inflammation, ischemic spasm, or abnormal distention
Lower abdominal	Colon, sigmoid colon, rectum, and genitourinary structures—bladder, uterus, prostate
Right lower quadrant	Appendix, fallopian tube, ovary
Left lower quadrant	Sigmoid colon, fallopian tube, ovary
Flanks	Kidney(s)
Localized	Occurs from local inflammation of skin or peritoneum, as with appendicitis; lateralized pain occurs in paired organs—kidneys, ureters, fallopian tubes, gonads
Generalized	Produced by diffuse inflammation of the gastrointestinal tract, peritoneum, or abdomen wall

is frequently referred to the region just under the right scapula (eighth dorsal segment), renal colic in males is frequently felt in the testicle of the same side. Pain from a ruptured spleen is often referred to the top of the left shoulder.

What do the pain characteristics tell me?

Key Questions

- Can you describe the pain (e.g., burning, sharp, achy, crampy)?
- What makes it worse or better?

Character of Pain

Colicky or cramping pain occurs with obstruction of a hollow viscus that produces distention. Generally, there are pain-free intervals when the pain is much less intense but still present, although it is subtle. During the painful episodes, the patient is exceedingly agitated and restless and often pale and diaphoretic. The pain from obstruction of the small intestine is rhythmic, peristaltic pain with intermittent cramping. When the obstruction site is in the proximal small intestine rather than in the more distal portion, the paroxysms of cramping occur with greater frequency.

Steady pain is associated with perforation, ischemia, inflammation, and blood in the peritoneal cavity. Burning pain is characteristic of esophagitis. Pain from a duodenal ulcer has been described as burning or “gnawing.” Pain of pancreatic origin is steady, epigastric, and prostrating. Pricking, itching, or burning pain comes from superficial causes such as herpes zoster. Dull, aching pain indicates deeper pain. In children, abdominal pain is generally characterized as colicky or inflammatory.

Remember, however, that despite descriptions of characteristic or typical abdominal pain, presentation in children and older adults is often atypical and might not fit any pattern.

Precipitating or Aggravating Factors

Lying down or bending forward often produces pain from esophagitis. Alcohol can aggravate gastritis or an ulcer. Eating before sleeping can aggravate gastroesophageal reflux.

Pain that is made worse by deep inspiration and is stopped or diminished by a respiratory

pause indicates a pleuritic origin. If the cause is peritonitis, intraperitoneal abscess, or abdominal distention from intestinal obstruction, the pain will increase on deep inspiration. Biliary colic is made worse by forced inspiration. The pain from biliary colic often causes inhibition of movement of the diaphragm.

A patient with visceral pain is restless, moves about, and has difficulty getting comfortable. A patient with parietal pain usually lies still and does not want to move. Children with inflammatory pain secondary to peritoneal irritation usually appear quiet and motionless because movement exacerbates the pain.

Relieving Factors

Food or antacids can relieve pain caused by an ulcer or gastritis. Antacids often relieve pain from gastroesophageal reflux disease (GERD). Both colicky pain and inflammatory pain are alleviated significantly with analgesics. However, the pain of a vascular accident will not respond to analgesics.

Are there any precipitating events that will help narrow my diagnosis?

Key Questions

- Is the pain related to any other activity (e.g., eating, lying down)?
- Can you identify any triggers?

Relation to Other Events

Pain that is relieved by defecation, flatus, laxatives, or diet changes implicates the intestine. Pain associated with meals implicates the GI tract.

Pain with sexual activity (dyspareunia) suggests a pelvic origin. Pain that occurs with position changes can be referred from the spine, hips, sacroiliac joint, pelvic bones, or abdominal musculature. Exertional pain can be of cardiac origin.

What does the presence of vomiting or diarrhea tell me?

Key Questions

- Are you vomiting? Did the vomiting start before or after the pain?

- What does the vomitus look like?
- What do your stools look like?
- How frequent are your stools?

Vomiting

Vomiting that precedes the onset of abdominal pain is unlikely to signal a problem requiring surgery. Vomiting suggests that the pain is visceral in origin. Anorexia is a nonspecific symptom, but its absence makes the serious disease less likely.

Vomiting associated with an acute condition of the abdomen may be from one of the following three causes:

- Severe irritation of the nerves of the peritoneum or mesentery. Sudden stimulation of many sympathetic nerves causes vomiting to occur early and to be persistent.
- Obstruction of an involuntary muscular tube. Obstruction of any of the muscular tubes causes peristaltic contraction and consequent stretching of the muscle wall, which results in vomiting. The area behind the obstruction becomes dilated, and as each peristaltic wave occurs, the tension and stretching of the muscular fibers are temporarily increased; therefore, the pain of colic usually occurs in spasms. Vomiting usually occurs at the height of the pain.
- The action of absorbed toxins on the medullary centers. The chemoreceptor trigger zone is stimulated by drugs such as cardiac glycosides, ergot alkaloids, and morphine or by uremia, diabetic ketoacidosis, or general anesthetics. Impulses to the medullary vomiting center activate the vomiting process.

Pain with vomiting

In sudden and severe stimulation of the peritoneum or mesentery, vomiting comes soon after the pain. In acute obstruction of the urethra or bile duct, vomiting is early, sudden, and intense. In intestinal obstruction, the timing of the vomiting indicates the location of the obstruction. If the duodenum is obstructed, vomiting occurs with the onset of pain. Obstruction of the large bowel causes very late or infrequent vomiting.

Vomiting is not usually seen in ectopic pregnancy, gastric or duodenal perforation, or intussusception. Vomiting occurring before pain indicates gastroenteritis. With appendicitis, the pain almost always precedes vomiting.

Appearance of vomitus

Clear vomitus suggests gastric fluid; bile-colored vomitus is from upper GI contents. Feculent vomitus occurs with distal intestinal obstruction. Coffee grounds or black color indicates GI bleeding. Patients with gastric outlet obstruction vomit fluid that contains food particles if the patient has eaten recently, but later the vomitus becomes clear. Infants with duodenal atresia and small bowel volvulus will vomit bilious fluid, but in pyloric stenosis, no bile is seen.

Diarrhea

Diarrhea (see Chapter 13) is associated with inflammatory bowel disease (IBD), IBS, diverticulitis, early obstruction, or infection. The presence of blood in the stool suggests that the pain originates in the intestinal tract. Blood can indicate neoplasm, intussusception, inflammatory lesions, or an invasive organism.

Diarrhea can precede perforation of the appendix as a result of irritation of the sigmoid colon by an inflammatory mass. Some patients will report gas stoppage symptoms: the sensation of fullness that suggests the need for a bowel movement. With appendicitis, the patient often attempts to defecate but without relief.

In children, mild diarrhea associated with the onset of pain suggests acute gastroenteritis but can also occur with early appendicitis. A low-lying appendix, close to the sigmoid colon and rectum, can induce an inflammatory process of the muscle wall of the sigmoid colon. Any distention of the sigmoid by fluid or gas signals the child to pass gas and small amounts of stool. The cycle repeats a few minutes later. In gastroenteritis, typically the child will have large liquid stools. Children can also have abdominal pain from chronic constipation. Constipation that precedes pain suggests a disease of the colon or rectum.

Are there any clues to implicate a particular organ system?

If the patient gives a positive response to the following history questions, refer to the topic or chapter indicated for additional discussion. Pain that is not abdominal in origin could be referred to or perceived to be in the abdomen. Accompanying symptoms of headache, sore throat, and general aches and pains suggest a viral, flulike cause.

Key Questions

Cardiovascular system (see Chapter 9):

- Does the pain occur with exertion or at rest?
- Do you have any chest pain, palpitations, fast heartbeat, or pain that goes to the arm or jaw?

Referred pain from the chest is common. Pain on exertion signals coronary artery disease (CAD) and angina. Right upper quadrant (RUQ) pain can be caused by congestive heart failure. Myocardial infarction (MI) and pericarditis can also cause abdominal pain.

Key Questions

Gastrointestinal system (see Chapters 11 and 13):

- Do you have any GI symptoms (e.g., gas, diarrhea, constipation, vomiting, heartburn)?
- Have you had any changes in your bowel habits, stools, or eating patterns?
- Is the pain relieved by defecation or burping?

Gas, bloating, diarrhea, constipation, and rectal bleeding can occur with pain that is intestinal in origin. Heartburn and dysphagia are characteristic of esophagitis and GERD. Changes in bowel habits can signal obstruction or neoplasm. Constipation alternating with diarrhea is characteristic of IBS. The patient often also reports distention, bloating, belching, gas, and mucus in the stools.

Pain relieved by defecation or the passage of gas suggests IBS or gas entrapment in the large intestine. Pain relieved by burping suggests distention of the stomach by gas.

Key Questions

Genitourinary system (see Chapters 6, 19, 28, 37, 38, 39):

- If applicable: When was your last menstrual period (LMP)? Was it normal for you? Could you be pregnant?
- If applicable: Do you have any vaginal symptoms, such as unusual discharge, unusual bleeding, or pain with sexual intercourse?
- If applicable: Do you have menstrual irregularity? (Sexual history could provide information relevant to the possibility of sexually transmitted infections [STIs], PID, and pregnancy.)
- Do you have any urinary symptoms (e.g., frequency, urgency, pain, blood in urine, change in urine color)?
- Do you have pain in the back (flank)? Can you point to it?

Menstrual irregularities, vaginal discharge, unusual bleeding, or dyspareunia indicate a pelvic origin of the pain. Sexually active adolescents are at the highest risk for contracting PID. Patients with PID may complain of both vaginal discharge and abnormal vaginal bleeding, although pain is often the only presenting symptom. The pain is usually severe and progressive. Pain just before the onset of menses indicates endometriosis. Pain related to ovulation (mittelschmerz) occurs midcycle. In patients with a uterus of childbearing age, always consider ectopic pregnancy. Regard these patients as pregnant until proven otherwise.

Urinary symptoms (dysuria, hematuria, hesitancy, or frequency) point to a urinary tract cause of the pain. In young children, abdominal pain and vomiting may be signs of a UTI. Flank pain is usually associated with renal calculi or pyelonephritis. Upper abdominal pain that radiates to the groin signals ureterolithiasis.

Key Questions

Musculoskeletal system (see Chapters 23, 24, 25):

- Does the pain occur with a change in position or movement?
- Do you have any joint pain, heat, swelling, noises, or limitation in range of motion?
- Do you have any difficulty walking?

Pain produced by musculoskeletal problems and referred to the abdomen can be

provoked by position changes or walking. Costochondritis can produce pain with respiration. Symptoms of joint involvement point to either a local cause with referred pain or a systemic cause, such as rheumatoid arthritis.

Key Questions

Respiratory system (see Chapters 12 and 15):

- Do you have a cough or difficulty breathing?
- Do you have any shortness of breath?
- Does the child complain of a sore throat?

Pneumonia, especially of the lower lobe, is a common cause of pain perceived in the abdomen, especially in children. Pleurisy can produce pain on deep inspiration. Persistent coughing can produce musculoskeletal soreness that may be referred to the abdomen. Children with strep throat may present with abdominal pain.

Is the pain psychogenic, organic, or functional?

Key Questions

- Do you feel unhappy, sad, or depressed?
- Are you able to eat, sleep, or engage in usual activities?
- Have you had recent problems with diarrhea or constipation?
- How is your energy level?
- Have you ever been diagnosed with or treated for mental health or psychiatric problem?

Abdominal pain can be functional or psychogenic in origin and presents somewhat differently from organic pain (Table 4.2). In children, functional abdominal pain is caused by one of four or a combination of more than

one of the following: functional dyspepsia, functional abdominal pain syndrome, IBS, or abdominal migraine.

The presence of vegetative symptoms suggests depression (see Chapter 5).

What else do I need to consider?

Key Questions

- What medications (prescribed and over the counter) are you taking? Why are you taking them?
- Have you had any operations? What were they?
- Have you recently had involuntary weight loss?
- Have you been camping?
- If a child: Is the child in a daycare setting?

Medications

GI distress is a common adverse reaction to many medications. Erythromycin and tetracycline are commonly associated with abdominal pain. Aspirin and nonsteroidal antiinflammatory drugs (NSAIDs) can cause the pain associated with gastritis and ulcer formation.

Surgery

Prior surgery can produce adhesions that cause intestinal obstruction. Adhesion of organs to the abdominal wall can also produce pain. Prior appendectomy does not preclude appendicitis; the stump can become inflamed.

Involuntary Weight Loss

Involuntary weight loss raises the index of suspicion for colon cancer. Identify other

Table 4.2 Organic Versus Functional Pain

HISTORY	ORGANIC PAIN	FUNCTIONAL PAIN
Pain character	Acute, persistent pain increasing in intensity	Less likely to change or get more severe
Pain localization	Sharply localized	Various locations
Pain in relation to sleep	Awakens at night	Does not affect sleep
Pain in relation to umbilicus	Farther away	At umbilicus
Associated symptoms	Fever, anorexia, vomiting, weight loss, anemia, elevated ESR	Headache, dizziness, and multiple system complaints
Psychological stress	None reported	Present

factors that would lead you to suspect neoplasms, such as a recent change in bowel habits in a middle-aged patient, family history of colorectal or gynecologic cancer, and the presence of blood in the stool.

Camping or Daycare

Ingestion of untreated water can result in intestinal parasites. Transmission of intestinal parasites is also common in daycare settings. Children with intestinal parasites may present with abdominal pain as the only symptom; therefore, stools should be evaluated for ova and parasites.

DIAGNOSTIC REASONING: FOCUSED PHYSICAL EXAMINATION

Keep in mind that some transgender or gender-diverse patients may experience anxiety or emotional discomfort related to some components of the physical examination. Gender incongruence/gender dysphoria can be exacerbated by examination of the genital anatomy.

Note General Appearance

Patients with visceral pain are restless, move about, and have difficulty getting comfortable. These are patients with colicky-type pain, often indicative of biliary obstruction, ureterolithiasis, obstruction, gastroenteritis, or early peritonitis.

Patients with parietal pain usually lie still and do not want to move. These are patients with localized peritonitis indicative of appendicitis, rupture, or perforation.

In children, note whether the child looks sick (see Chapter 18). Children can react to pain differently than adults. With peritoneal irritation, they are typically quiet and motionless with their knees flexed and drawn up. Children who are septic or have serious diseases, such as perforation or intussusception, generally lie still and look lethargic, withdrawn, and apprehensive. A child with colicky pain frequently writhes in discomfort, occasionally rocking in a rhythmic fashion.

Assess Vital Signs

Patients who are tachycardic and tachypneic, suspect a serious thoracic, intraabdominal, or

pelvic disorder that is producing an acute condition in the abdomen. Shallow respirations could indicate pneumonia or pleurisy with referred pain. Orthostatic hypotension, an unusually low blood pressure, or normal blood pressure in someone who is usually hypertensive can indicate an acute abdominal condition.

The presence of a fever suggests an acute inflammatory condition. A temperature of greater than 39.4°C (102.9°F) is associated more with pulmonary and renal infection than with an abdominal problem and can indicate pneumonia or pyelonephritis.

In adults, look for documented recent involuntary weight loss, which indicates a neoplasm. Weigh a child to determine weight loss and dehydration status.

Examine the Throat

Note exudate, erythema, and anterior cervical adenopathy suggesting group A β hemolytic streptococcal pharyngitis.

Observe Abdominal Musculature

A rigid abdomen characterizes peritoneal irritation; a soft abdomen suggests otherwise. A rigid abdomen can signal an acute condition of the abdomen that requires surgical intervention.

Note Coloring of Abdominal Skin

Ecchymosis around the umbilicus (Cullen sign) is associated with hemoperitoneum caused by either pancreatitis or ruptured ectopic pregnancy. Ecchymosis of the flanks (Grey Turner sign) is associated with hemoperitoneum and pancreatitis. Look for skin rashes of viral exanthema.

In children, a rash (palpable purpura) located on the lower extremities, buttocks, and arms indicates Henoch-Schönlein purpura (a syndrome of purpura with urticaria, erythema, arthritis, and GI symptoms).

Note Abdominal Distention

Generalized symmetrical distention can occur as the result of obesity, enlarged organs, fluid, or gas. Distention from the umbilicus to the symphysis can be caused by an ovarian tumor, pregnancy, uterine fibroids, carcinoma, pancreatic cyst, or gastric dilation. Asymmetrical distention or protrusion may indicate hernia,

tumor, cysts, bowel obstruction, or enlargement of abdominal organs. Remember the *Fs* of distention: **f**at, **f**luid, **f**eces, **f**etus, **f**latus, **f**ibroid, **f**ull bladder, **f**alse pregnancy, and **f**atal tumor.

To determine distention in children, stoop down by the child's side and view across the abdomen. If the skin is tense and taut with a distended abdomen, and if the umbilicus is everted, ascites is often present. Superficial abdominal veins are often distended in children with peritonitis. The healthy child will usually have a flat abdominal profile. A flat abdomen is a straight line from the xiphoid to the pelvis with no scaphoiding (abdomen has a concave, sunken appearance). A scaphoid abdomen can occur with marked dehydration or high intestinal obstruction.

Auscultate Bowel Sounds

If bowel sounds are absent, suspect peritonitis or ileus. Hyperactive bowel sounds suggest gastroenteritis, early pyloric or intestinal obstruction, or GI bleeding. High-pitched tinkling bowel sounds can indicate obstruction.

In children, the use of the stethoscope can be helpful in palpation to determine abdominal pain. Begin listening to the chest; the child accepts this as painless. Then gently move the stethoscope down to the belly, slightly increasing the pressure, watching the child's face and feeling the resistance when painful.

Percuss for Tones and Guarding

In percussion, look for unexpected dullness. Guarding with percussion suggests peritoneal irritation. Tenderness can be elicited with gentle tapping. Tenderness is usually local and only rarely referred.

Palpate the Abdomen

Start with gentle palpation and palpate the area of pain last. Testing for rebound tenderness should be performed gently. Tenderness, guarding, and rebound tenderness suggest peritoneal irritation. The most reliable clinical indicator of parietal peritonitis is involuntary guarding, which must be distinguished from voluntary guarding because of pain or fear of worsening pain as a result of the examination. Guarding is determined with gentle palpation of the abdomen, not by deep palpation of the underlying organs.

You can induce guarding by having the patient place the chin on the chest or cross the arms on the chest and sit up. Palpate the painful area again. Note that intraperitoneal pain is made less severe by induced guarding. If the severity of pain is not decreased by induced guarding, consider other causes such as functional pain or abdominal wall pain.

Palpate for the liver, gallbladder, spleen, kidneys, aorta, and bladder to detect organ tenderness or involvement. Abrupt cessation of inspiration on palpation of the gallbladder (Murphy sign) indicates acute cholecystitis.

Palpate for Masses

Palpation of a mass can indicate neoplasm, obstruction, hernia, or the presence of feces in the colon. Anatomical structures can be mistaken for an abdominal mass. A mass in the upper abdomen that pulsates laterally suggests an abdominal aortic aneurysm.

A sausage-shaped mass can be felt in the upper mid-abdomen in 85% to 95% of infants with intussusception. An olive-shaped mass may be palpable in the RUQ with pyloric stenosis.

Palpate the Groin

The groin must be examined in everyone who has abdominal pain to exclude an incarcerated hernia or ovary or torsion of the ovary or testicle (see Chapter 19).

Palpate for Hernias

Palpate for inguinal, incisional, femoral, and umbilical hernias. Uncomplicated hernias will reduce; strangulated ones will not. Bowel sounds will be present in uncomplicated hernias.

Percuss for Flank Tenderness

The use of direct or indirect percussion over the costovertebral angle (CVA) can elicit tenderness if the kidney is involved. Flank pain, especially with the occurrence of hematuria, can indicate a kidney stone.

Test for Peritoneal Irritation

Several maneuvers can be used to test for peritoneal irritation.

- *Obturator muscle test.* Perform this test when you suspect a ruptured appendix or pelvic abscess because these conditions

can cause irritation of the obturator muscle. Pain in the hypogastric region is a positive sign, indicating obturator muscle irritation. With the patient supine, flex the right leg at the hip and knee to 90 degrees. Hold the leg just above the knee, grasp the ankle, and rotate the leg laterally and medially.

- **Iliopsoas muscle test.** Perform this test when you suspect appendicitis because an inflamed appendix can cause irritation of the lateral iliopsoas muscle. Pain in the lower quadrant is a positive test result. With the patient supine, place your hand over the lower thigh and have the patient raise the leg, flexing at the hip while you push downward against the leg.
- **Markle (heel drop) test.** Perform this test if you suspect appendicitis. The patient stands with straightened knees and then rises on the toes. The patient then relaxes and allows the heels to hit the floor, thus jarring the body. The maneuver will cause abdominal pain if positive.
- **Rovsing test.** Perform this test if you suspect appendicitis. Press on the left lower quadrant (LLQ). If pain in the right lower quadrant (RLQ) is intensified, the test result is positive.

Perform a Pelvic Examination in Patients With a Vagina and Uterus

Perform a pelvic examination to rule out STI, PID, ovarian pain, ectopic pregnancy, and uterine fibroids. Vaginal discharge may or may not be present with STI or PID. Bleeding can accompany ectopic pregnancy.

Cervical motion tenderness (CMT) is the hallmark of PID. CMT plus adnexal pain (often bilateral) in the presence of abdominal pain and lower abdominal tenderness are criteria for a presumptive diagnosis of PID.

Adnexal tenderness in the region of pain can signal ectopic pregnancy. An adnexal mass may or may not be palpable, and its presence is not diagnostic. Vague adnexal tenderness can be present with STI. Bilateral, inflammatory ovarian pain and tenderness are usually related to PID, appendicitis, or peritonitis. A functional cyst can produce unilateral tenderness. Uterine fibroids may be palpable as masses in the uterus, or the entire uterus may be enlarged.

Perform Genital and Prostate Examinations in Patients With a Penis and Prostate

Perform genital and prostate examinations to rule out STIs and prostatitis. Look for penile discharge as an indicator of STI and perhaps prostatitis. A tender prostate signals prostatitis. In acute prostatitis, make sure the examination is gentle; vigorous examination or massage of the prostate can cause a bacterial release and produce septicemia (see Chapter 19).

Perform Digital Rectal Examination

Look for frank blood and test for occult blood. The presence of blood can indicate an acute process or carcinoma. Palpate for masses, polyps, and lesions. Occasionally, patients with a rectocecal appendix and appendicitis can have a tender, localized mass on rectal examination, even though the abdominal examination is normal.

Check Peripheral Pulses

Diminished femoral pulses in the presence of a pulsatile abdominal mass suggest a ruptured abdominal aortic aneurysm.

Perform a Generalized Examination as Indicated

Because abdominal pain can be referred from other areas, examine the lungs, cardiovascular system, head and neck structures, and musculoskeletal system. Palpate for regional lymphadenopathy.

LABORATORY AND DIAGNOSTIC STUDIES

Complete Blood Count With Differential

An elevated white blood cell (WBC) count indicates an inflammatory or infectious condition.

C-Reactive Protein

C-reactive protein (CRP) levels of greater than 1 mg/dL are commonly reported in patients with appendicitis, but CRP normalization occurs 12 hours after the onset of symptoms. Elevated levels are not specific for appendicitis.

Pregnancy Test

Urine or serum testing for the beta subunit of the human chorionic gonadotropin (β -hCG) is

used to identify or rule out pregnancy. Use serial quantitative serum testing if you are concerned about ectopic pregnancy.

Erythrocyte Sedimentation Rate

Inflammation or tissue injury causes an increased erythrocyte sedimentation rate (ESR). However, the test is nonspecific and does not indicate the source. The ESR is often elevated as a result of PID, infectious states, or AIDS.

Cardiac Enzymes

Cardiac troponin (cTn) (I; cTnT or cTnI) and cardiac enzymes are used in diagnosing MI (see Chapter 9).

Urinalysis

Urinalysis (U/A) is used to evaluate for kidney infection, presence of a kidney stone, renal failure, or a systemic disease. Microscopic hematuria suggests UTI or stone. Glycosuria and ketonuria suggest metabolic disturbances. A positive nitrite test on a U/A dipstick indicates the presence of bacteria, which can be seen on microscopic examination. The finding of 20 or more bacteria per high-powered field (HPF) indicates a UTI. The presence of greater than 0 to 1 RBCs/HPF or greater than 0 to 4 WBCs/HPF on microscopic examination also suggests UTI. RBCs can also be present as a contaminant with vaginal bleeding. The presence of red cell casts suggests kidney disease or renal infarction. White cell casts indicate pyelonephritis.

Urine for Culture and Sensitivity

If you suspect UTI, consider a urine test for culture and sensitivity (C&S). Uncomplicated UTIs may be treated empirically.

Molecular Testing for Sexually Transmitted Infection

Deoxyribonucleic acid (DNA) probes or nucleic acid amplification tests (NAAT) test for infectious organisms of *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Trichomonas vaginalis*, *Gardnerella vaginalis*, and *Candida* spp. Obtain a sample of vaginal or penile discharge with a sterile swab and place it in the medium provided. Urine can also be tested for chlamydia and gonorrhea. The results are rapid and have high sensitivity and

specificity. DNA probe testing has largely replaced Gram staining and culture.

Potassium Hydroxide Test

The potassium hydroxide (KOH) test involves a direct microscopic examination of material to determine whether fungus is present. View under the microscope for the presence of mycelial fragments, hyphae, and budding yeast cells (see Chapter 39). The presence of a fishy odor (the “whiff test”) suggests bacterial vaginosis.

Saline Wet Prep

In a female with vaginal discharge, this test can demonstrate the presence of *T. vaginalis* or *Gardnerella* organisms by microscopic examination. The presence of trichomonads indicates *T. vaginalis*. The presence of bacteria-filled epithelial cells (clue cells) indicates bacterial vaginosis (*Gardnerella*) (see Chapter 39).

Fecal Occult Blood Test

Perform the fecal occult blood test (FOBT) to rule out GI bleeding. The test result is positive if a stool smear on a prepared card turns color (usually blue or green) when a solution is applied. A three-sample series provides more reliable results.

Fecal Immunochemical Test

Also called immunochemical FOBT (iFOBT), the fecal immunochemical test (FIT) uses antibodies to hemoglobin to detect a specific portion of a human blood protein. This test is done essentially the same way as conventional FOBT but is more specific and reduces the number of false-positive results. Vitamins or foods do not affect the FIT, and some forms require only one or two stool specimens.

Stool Testing

Stool testing for ova and parasites and giardia can be useful in patients with abdominal pain accompanied by diarrhea and who have traveled recently. Fresh stool is required to preserve the trophozoites of some parasites. Giardia antigen test is a solid phase immunoassay used for the detection of Giardia-specific antigen 65. Only one stool specimen is required, and the test result is available within 1 day.

Rapid Strep Screen

The throat and tonsils are swabbed, and a rapid antigen test is ordered. The test can determine if strep is present. A negative strep result often indicates no group A streptococcus is present.

Electrocardiogram

An electrocardiogram (ECG) can add objective data to the diagnostic process if you suspect the pain is of cardiac origin. ST-segment elevation or depression indicates the presence of injured myocardium. T-wave inversion will demonstrate the presence of ischemia. The appearance of both strongly supports ischemia but is not diagnostic of CAD. Arterial spasms, pericarditis, and electrolyte imbalance can also cause these variations from normal (see Chapter 9).

Helicobacter pylori Testing

H. pylori testing may be useful in high prevalence areas or patients with epigastric pain when *H. pylori* infection is suspected. Laboratory methods for testing include antibody or antigen testing with serology, urine or stool, or urea breath test.

Radiography

Abdominal radiographs are of limited value in evaluating abdominal pain. An anteroposterior radiograph of the abdomen shows the kidneys, ureters, bladder (KUB), and adjacent structures. It can be used to exclude free air (perforation) and obstruction (e.g., renal calculi) or to confirm intestinal obstruction. A chest radiograph can reveal the presence of

pneumonia or air under the diaphragm (see Chapters 44 and 45).

Abdominal and Pelvic Ultrasound

Abdominal ultrasound is useful if you are considering ectopic pregnancy, abdominal aortic aneurysm, acute cholecystitis, acute pancreatitis, incarcerated hernia, hernia, or diverticular disease.

Computed Tomography and Magnetic Resonance Imaging

Computed tomography (CT) scanning and magnetic resonance imaging (MRI) are appropriate if you suspect retroperitoneal bleeding, pelvic abscess, pancreatitis, obstruction, hernia, incarcerated hernia, or diverticular disease. CT scanning is the preferred imaging study for diagnosing suspected appendicitis and in patients in whom appendiceal perforation is suspected. Noncontrast-enhanced helical CT is used to definitively diagnose urolithiasis. Helical CT scanning with rectal contrast is accurate and efficient in evaluating adults with equivocal presentations for appendicitis.

Colonoscopy or Sigmoidoscopy

If you suspect GI origin of pain, both colonoscopy and sigmoidoscopy are useful in directly visualizing the colon.

Anorectal Manometry

Anorectal manometry is used to evaluate constipation or fecal incontinence. The test measures the pressures of the anal sphincter muscles, the sensation in the rectum, and the neural reflexes that are needed for normal bowel movements.



EVIDENCE-BASED PRACTICE *Use of Computed Tomography in Diagnosing Appendicitis in Children*

This study evaluated the impact of a clinical algorithm on computed tomography (CT) use and diagnostic accuracy of appendicitis in children. The study included 331 patients with 41% in the pre-implementation period and 59% in the postimplementation period. CT use decreased from 39% to 18% ($P < .001$) after the implementation of the algorithm. The negative appendectomy rate increased from 9% to 11%

($P = .59$). Use of CT did not have an impact on the risk of negative appendectomy ($P = .64$). The authors concluded that the use of CT was significantly reduced after implementing a diagnostic algorithm for appendicitis without having an impact on diagnostic accuracy. Given the concern for increased risk of cancer after CT, these results support the use of an algorithm in children with suspected appendicitis.

DIFFERENTIAL DIAGNOSIS

When there is no worrisome history or there are no physical findings, use the specific history questions to point you in the right direction. Then determine whether the clinical findings are consistent. Review the history to see the evolution over time, especially of an acute condition.

Identify physical findings that are worrisome as well, such as lower abdominal pain beginning at the older age, involuntary weight loss, abnormal bleeding in a perimenopausal or postmenopausal patient, palpable abdominal or pelvic mass, or stool that is positive for occult blood.

Initially, look for surgical problems. Serial abdominal examinations are the best indicator of the progression of an abdominal problem. Try to identify what organ seems to be involved and remember that extra-abdominal systems can cause abdominal pain (e.g., pneumonia). Try to determine if the pain is organic or functional in origin. Remember that common causes of acute pain differ from common causes of chronic pain. [Box 4.3](#) lists indicators of abdominal emergencies.

Acute Conditions That Cause Abdominal Pain

Appendicitis

The incidence of appendicitis peaks at age 10 to 20 years, although it can occur at any age.

Box 4.3 Indicators of Abdominal Emergencies

SUBJECTIVE FINDINGS

- Progressive intractable vomiting
- Lightheadedness on standing
- Acute onset of pain
- Pain that progresses in intensity over hours

OBJECTIVE FINDINGS

- Involuntary guarding
- Progressive abdomen distention
- Orthostatic hypotension
- Fever
- Leukocytosis and granulocytosis
- Decreased urine output

The patient reports a sudden onset of colicky pain that progresses to constant pain. The pain can begin in the epigastrium or periumbilicus and later localize to the RLQ. The pain worsens with movement or coughing. Vomiting after the onset of pain sometimes occurs. On physical examination, the patient will be lying still and demonstrate involuntary guarding. Classically, tenderness occurs in the RLQ. The results of other tests for peritoneal irritation will be positive. Rebound tenderness may be present. Variation in presentation is common, particularly with infants, children, and older adults. Diagnostic testing includes a complete blood count (CBC) with differential to confirm or rule out infection and the use of either ultrasonography, CT scan, or MRI. Ultrasonography is the preferred modality, with MRI and CT used if the diagnosis remains unclear.

Ectopic pregnancy

Ectopic pregnancy can occur in any sexually active woman of childbearing age, especially those with a history of irregular menses. The patient experiences a sudden onset of spotting and persistent cramping in the lower quadrant that begins shortly after a missed period. On examination, the patient shows signs of hemorrhage, shock, and lower abdominal peritoneal irritation that can be lateralized. On pelvic examination, the uterus is enlarged but smaller than anticipated from the dates provided. The cervix is tender to motion, and a tender adnexal mass can be palpable. Diagnosis is confirmed by positive hCG test results and ultrasound. Serial quantitative serum hCG levels can be useful. A ruptured ectopic pregnancy is a surgical emergency.

Peptic ulcer perforation

The patient reports a sudden onset of severe, intense, steady epigastric pain that radiates to the sides, back, or right shoulder. The patient can give a history of burning, gnawing pain that worsens with an empty stomach. The patient lies as still as possible. Epigastric tenderness will be present with palpation or percussion. Rebound tenderness is intense. The

EVIDENCE-BASED PRACTICE *Clinical Diagnosis of Appendicitis*

In a review of clinical decision rules to assist in diagnosing appendicitis, the authors concluded that decision models that score combinations of findings from the history and clinical examination are more powerful than any single finding. They point to the Alvarado model as one that balances accuracy with ease of use and familiarity with clinicians. It combines the results for eight findings; a score of 7 or more of a potential 10 indicates the need for surgical intervention. The Alvarado model has a sensitivity of 81% and a specificity of 74%. The model is less useful in the geriatric population.

ALVARADO SCORE FOR EARLY DIAGNOSIS OF ACUTE APPENDICITIS

VARIABLE	SCORE
Migration of pain	1
Anorexia-acetone	1
Nausea or vomiting	1
Tenderness in the RLQ	2
Rebound pain	1
Elevation of temperature	1
Leukocytosis	2
Shift to the left on differential (neutrophils >75%)	1
Maximum total score	10
Positive score	≥7^a

^aA score of 7 or more indicates the need for surgical intervention.

RLQ, Right lower quadrant.

References: Alvarado (1986), Deiters et al. (2019), Wagner and Shojania (2009).

abdominal muscles are rigid, and bowel sounds can be absent. The diagnosis is confirmed by upright or lateral decubitus radiographs, showing air under the diaphragm or in the peritoneal cavity. Perforation is a surgical emergency.

Dissection of aortic aneurysm

This condition occurs most frequently in men and persons older than 50 years, especially those with a history of uncontrolled hypertension. The patient experiences the sudden onset of excruciating pain that can be felt in the chest or abdomen and may radiate to the legs and back. Vital signs will reflect impending shock, and there can be a deficit or difference in femoral pulses. The diagnosis can be made by CT or MRI. Additional tests include ECG and cardiac enzymes. This is a surgical emergency with a high death rate.

Myocardial infarction

In patients older than 50 years, acute MI can present with abdominal pain and GI symptoms rather than the classic chest pain. If there is no other explanation for the pain, consider a cardiac origin.

Peritonitis

The most common cause of peritonitis is perforation of the GI tract. It occurs more often in older adults. The patient experiences the sudden onset of severe pain that is diffuse and worsens with movement or coughing. On examination, the patient will be guarding and have rebound tenderness. Bowel sounds will be decreased or absent. Diagnostic tools include CBC with differential and abdominal radiographs.

Acute pancreatitis

Acute pancreatitis is more common in patients with cholelithiasis or a history of alcohol abuse. The pain is steady and boring in quality and is unrelieved by a change of position. It is located in the left upper quadrant (LUQ) and radiates to the back. The patient can also experience nausea, vomiting, and diaphoresis and will appear acutely ill. Abdominal distention, decreased bowel sounds, and diffuse rebound tenderness will be present on physical examination. The upper abdomen can show muscle rigidity. Examination of the lungs can reveal limited diaphragmatic excursion. Diagnostic testing includes CBC with differential, ultrasonography, radiography, and serum amylase and lipase levels.

Mesenteric adenitis

Adenovirus-induced (commonly *Yersinia* spp.) adenopathy of the mesenteric lymph nodes can result in fever and RLQ abdominal pain that mimics appendicitis. This condition is difficult to diagnose, but the WBC count is elevated, and an abdominal radiograph will show abnormalities of the terminal ileus.

Cholecystitis or lithiasis

Cholecystitis or lithiasis occurs more often in adults than in children and more often in females than in males. The pain is colicky in nature and progresses to a constant pain. The patient reports pain in the RUQ, which can radiate to the right scapular area. The typical pain of cholelithiasis is constant, progressively rising to a plateau and falling gradually. The patient can also experience nausea and vomiting and give a history of dark urine or light stools. On physical examination, the patient will be tender to palpation or percussion in the RUQ. The gallbladder is palpable in about half of cases of cholecystitis. Painful splinting of respiration during deep inspiration (Murphy sign) is frequently present with cholecystitis. Diagnostic testing includes CBC with differential, ultrasonography, radiography, and serum amylase and lipase levels.

Ureterolithiasis

The patient reports the sudden onset of excruciating intermittent colicky pain that can progress to a constant pain. The pain is in the lower abdomen and flank and radiates to the groin. The patient can also experience nausea, vomiting, abdominal distention, chills, and

fever. There is CVA tenderness on examination along with increased sensitivity in the lumbar and groin areas. Hematuria and increased frequency of urination can be present. U/A should be performed. Urine pH and the presence of crystals can help identify stone composition. Definitive diagnostic testing is by a non-contrast-enhanced helical CT.

Urinary tract infection and pyelonephritis

Abdominal pain associated with UTI or pyelonephritis is common in children and could be the only presenting complaint. U/A and C&S are done to confirm the diagnosis.

Pelvic inflammatory disease and salpingitis

PID occurs most commonly in patients younger than 35 years of age who are sexually active and have more than one sexual partner. Infection results from organisms transmitted via intercourse, childbirth, or abortion. PID is most often caused by *C. trachomatis* and *N. gonorrhoeae*. Infection begins intravaginally in most cases and then spreads upward, causing salpingitis. The tubal infection produces an exudate, and as it spreads, peritonitis can result. The onset is usually shortly after menses. Patients have lower abdominal pain that becomes progressively more severe. On examination, abdominal tenderness, CMT, and adnexal tenderness (usually bilateral) are present. With peritonitis, patients can also have guarding and rebound tenderness. Patients can also have a fever, irregular bleeding, vaginal discharge, or vomiting. WBC count and ESR are usually elevated. DNA probes, cultures, and Gram staining can assist with diagnosis.



EVIDENCE-BASED PRACTICE Clinical Diagnosis of Acute Cholecystitis

In both the original and updated systematic reviews, the authors concluded that no single clinical finding, or known combination of clinical history and physical examination findings, efficiently establishes a diagnosis of acute cholecystitis. Individual findings with the highest

diagnostic value are a Murphy sign and right upper quadrant tenderness. The authors concluded the clinician's gestalt is the most important piece of evidence from the clinical evaluation and that bedside ultrasonography by a trained clinician may be useful in diagnosis.

Obstruction

Obstruction occurs most often in newborns, older adults, and those with recent GI surgery. The patient presents with a sudden onset of crampy pain, usually in the umbilical area of the epigastrium. Vomiting occurs early with small intestinal obstruction and late with large bowel obstruction. Obstipation occurs with complete obstruction, but diarrhea can be present with partial obstruction. Hyperactive, high-pitched bowel sounds can be present in small bowel obstruction. A mass can be palpable in lower obstruction. Abdominal distention can be present. The rectum will be empty on digital examination. Diagnosis is confirmed with abdominal radiographs (supine and sitting), MRI, or CT.

Ileus

Ileus is associated with intraperitoneal or retroperitoneal infection, metabolic disturbances, and intraabdominal surgery. The patient experiences abdominal distention, vomiting, obstipation, and cramps. On auscultation, there is minimal or absent peristalsis. Abdominal radiographs show gaseous distention of isolated segments of both the small and large intestines.

Intussusception

Bowel obstruction in children ages 2 months to 2 years usually occurs in the ileocecal region and classically presents with vomiting, colicky abdominal pain with drawing up of the legs, and eventual currant jelly stools. The onset is dramatic. The child is asleep or awake when suddenly he or she cries out with severe pain. The child twists and squirms; nothing gives any relief until, almost suddenly, there is a lull with an absence of pain followed by a similar painful episode. The abdomen has a sausage-shaped mass that can be felt in the RUQ. The stool tests positive for blood. Although intussusception is rare in adults, most cases of adult intussusception are the result of an underlying medical condition, such as a tumor.

Malrotation and volvulus

Improper rotation and fixation of the duodenum and colon can cause an artery to obstruct, and the patient experiences ischemic necrosis. This disorder of the embryonic gut is usually seen in the first month of life. The infant presents with bilious emesis followed by abdominal distention and GI bleeding. Shock occurs from the progression of the ischemia.

Henoch-Schönlein purpura

In Henoch-Schönlein purpura, crampy, acute abdominal pain and bleeding are secondary to edema and hemorrhage of the intestinal wall. This disease is an immunoglobulin A (IgA)-mediated vasculitis that affects very small vessels. An urticarial rash occurring on the buttocks and lower extremities progresses to papular purpuric lesions. The laboratory findings show an elevated WBC count but a normal platelet count. A mild increase in ESR, an increase in IgA concentration, and negative antinuclear antibodies (ANA test) are also found.

Incarcerated hernia

Incarcerated hernia occurs most commonly in older adults. The patient reports a constant severe pain in the RLQ or LLQ that worsens with coughing or straining. Physical examination reveals a hernia or mass that is nonreducible. Diagnosis is confirmed by MRI or CT. Surgical intervention is indicated.

Pneumonia

Pneumonia is a frequently overlooked cause of abdominal pain in children. The pain is referred from right lower lobe pneumonia because of associated phrenic nerve irritation, which can cause muscular spasm, ileus, and pain referred to the RLQ. The WBC count in pneumonia is typically higher than that in early appendicitis.

Chronic Conditions That Cause Lower Abdominal Pain

Irritable bowel syndrome

IBS begins in the adolescent and young adult years. It produces crampy hypogastric pain that is of variable, infrequent duration. The pain is associated with bowel function, gas, bloating, and distention. Relief is often obtained with the passage of flatus or feces. The patient has a normal abdominal examination and the stool is negative for blood. Consider a proctosigmoidoscopy or barium enema (BE) if onset is at middle age or older, if the stool is positive for blood, if there is a family history of colorectal cancer or polyps, or if the patient fails to improve after 6 to 8 weeks of therapy.

Crohn disease

Crohn disease is an IBD that presents with abdominal pain or cramping, abdominal tenderness, and diarrhea (see Chapter 13). Rectal bleeding may accompany the diarrhea.

Lactose intolerance

Lactose intolerance produces crampy pain and diarrhea after the consumption of milk or milk product foods (see Chapter 13). It is caused by a deficiency in lactase, an enzyme that decreases in activity with increasing age. It is more common in Asians, Native Americans, and African Americans. A trial elimination of offending foods can aid in diagnosis. The use of the Hydrogen Breath Test for diagnoses is popular but lacks sensitivity and specificity.

Diverticular disease

Diverticular disease causes localized abdominal pain and tenderness. The patient will have a fever, elevated ESR, and leukocytosis. Perform a BE or proctoscopy or colonoscopy if there is rectal bleeding.

Simple constipation

In adults, constipation is associated with infrequency, or difficulty passing dry, hard stools and abdominal bloating.

Children with constipation frequently report abdominal pain. The pain is usually colicky in nature but can be dull and steady. The pain varies and is not persistent or progressively worsening. Mild, poorly localized periumbilical tenderness, and perhaps guarding are reported. A fecal mass may be palpable.

Habitual constipation

With habitual constipation, the patient presents with a lifelong history of constipation with onset as a young adult, has a normal physical examination, and does not have occult blood in the stool. Diet, activity, and bowel habits are often causal factors. Consider sigmoidoscopy, anorectal manometry, or colonoscopy if you suspect a metabolic or systemic cause, if the stool is heme positive, or if the patient is middle-aged or older or fails to respond to treatment.

Dysmenorrhea

Dysmenorrhea, a typically lower abdominal pain or cramping, occurs with menstruation. Dysmenorrhea can be classified as primary (no organic cause) or secondary (pathological cause). In primary dysmenorrhea, the onset is usually soon after menarche and gradually diminishes with age. The woman will have a normal pelvic examination. Secondary dysmenorrhea is associated with specific conditions and disorders such as endometriosis, PID, cervical stenosis, and uterine fibroids. Obtain a gynecologic (GYN) consult or pelvic ultrasound for secondary dysmenorrhea, dysmenorrhea with increasing severity, or abnormal findings on pelvic examination.

Uterine fibroids

Fibroids produce pain related to the menstrual cycle and intercourse. The patient can experience abnormal uterine bleeding (see Chapter 38). On examination, palpable myomas are often present. Suspect this cause when there is no suspicion of other pelvic disorder. Order a pelvic ultrasound if ovarian or uterine neoplasm cannot be excluded.